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SEARCH ENGINES, ACCESSIBILITY OF ELECTRONIC INFORMATION RESOURCES AND ACADEMIC ACTIVITIES AMONG COLLEGE OF MEDICAL SCIENCE STUDENTS, UNIVERSITY OF MAIDUGURI, BORNO STATE

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ABSTRACT

Access to electronic information resources is believed to enhance medical students' academic engagement, research skills, and performance. Search engines emerged to render the responsibilities. However, if accessibility is disrupted, students' activities could be negatively altered.This study investigates the influence of search engines and accessibility of electronic information resources (EIRs) on academic activities among 585 medical students at the College of Medical Sciences, University of Maiduguri, Nigeria. Employing a correlational survey design, a sample of 233 students from seven departments was selected using multi-stage sampling. Data were collected via a validated questionnaire (Cronbach's alpha = 0.83) with a 93% response rate and analysed using descriptive (mean, standard deviation) and inferential (logistic regression) statistics. Findings reveal high engagement in literature reviews, research projects, and exam preparation ($\bar{x}$= 1.91–1.93), but low participation in evidence-based medicine assignments and journal clubs ($\bar{x}$= 1.40–1.49). EIR accessibility is low, with multimedia resources moderately used ($\bar{x}$ = 1.63) compared to online journals and e-books ($\bar{x}$= 1.24–1.39). YouTube is the most used search engine ($\bar{x}$ = 1.84), while academic search engines like Google Scholar are underutilized ($\bar{x}$ = 1.26). Logistic regression indicates significant relationships between multimedia search engines (OR = 2.48, p < 0.001), Google Scholar (OR = 1.68, p = 0.001), and EIR accessibility, and between multimedia resources (OR = 2.29, p < 0.001), e-books (OR = 1.79, p < 0.001), and academic activities. Low digital literacy and institutional barriers limit EIR use. The study concluded that search engines play significant roles in accessing EIR and enhanced academic activities depend on extent to which EIR are used through accessibility. It is recommended thatmandatory workshops, promotional campaigns, and provision of digital infrastructure should be the priorities of libraries with financial support from governments.

Keywords: Search engines, Electronic information resources, Academic activities, Medical students, Digital literacy

Introduction

Academic activities represent structured scholarly tasks and engagements undertaken by students in pursuit of educational objectives, skills development, and knowledge application. These activities include, but are not limited to, literature reviews, research project writing, seminar presentations, systematic reviews, and preparation for examination (Patience, 2024; Nwokedi&Sani,

2010). Through participation in these academic tasks, students develop critical thinking and innovative skills, communication and analytical skills and problem-solving skills that are essential for academic and professional success (Okiki & Asiru, 2011). Academic activities serve as indicators of a student's academic growth and are frequently aligned with curriculum demands, institutional expectations, and professional development goals. The frequency of engagement in academic activities is relatively influenced by the use of search engines to access electronic information resources (Patience, 2024).

Search engines (SE) have become indispensable tools for information retrieval in the digital age, thereby shaping how users, particularly students, access and utilize academic resources. The SE operates by indexing vast amounts of online content for easy location of resources. This allows users to quickly locate specific information based on keywords or phrases (Ortega, 2014). However, the accessibility, quality, and relevance of the information accessed can vary depending on the search engine, user skills, and the nature of the content itself (Salehi, Du, & Ashman, 2018).

Search engines vary widely, each designed to cater to specific types of information. General search engines like Google, Bing, and Yahoo provide broad access to information but are limited in academic specificity (Ortega, 2014). Academic search engines, such as *Google Scholar*, *PubMed*, and *Microsoft Academic*, are tailored for scholarly content, providing access to peer-reviewed articles, conference papers, and academic journals (Nwokedi&Sani, 2010). Specialised search engines, like those used in legal (LexisNexis) or medical research (*PubMed*), offer even narrower, highly curated content that meets the needs of specific academic fields. This categorization allows students to select search engines based on their academic discipline, efficiency and relevance of their research (Ortega, 2014). The basic of selecting desired search engine is to search, locate, retrieve, evaluate and use electronic information resources.

Electronic information resources are of different types and could include but not limited to digital materials such as e-books, journals, e-book chapters, and reference materials (Finch, 2014; Ogbole, 2017; Myliutchenko&Kulko, 2023) . These resources help students to complete literature reviews, prepare for examinations, carry out research projects, and stay informed about new developments in their field (Patience, 2024; Okiki&Asiru, 2011). However, for students to benefit from EIRs, the resources must be both available and accessible. Accessibility involves not just having the materials but also having the skills, time, and Internet connectivity to use them. Studies have noted that even when institutions provide these resources, students may not use them effectively due to limited training or awareness. Thus, accessibility is not only about the presence of digital content but also about students' ability to find, evaluate, and use electronic information resources.

Statement of the Problem

There is a strong connection among the use of search engines, the accessibility of electronic information resources, and students' academic activities. When students know how to use search engines efficiently, they are better positioned to locate high impact electronic resources, which can directly supports their academic activities (Nwokedi&Sani, 2010). This correlation has been observed in multiple studies showing that students who frequently use search engine and electronic information resources tend to perform better in research and coursework (Okiki&Asiru, 2011). However, factors like poor digital literacy, inadequate internet access, and lack of institutional support may lead to students fall back on outdated or unreliable sources, which negatively affect their academic activities (Ortega, 2014).

Medical students are expected to use search engines and electronic information resources (EIRs) to access up-to-date, peer-reviewed, and evidence-based information necessary for academic excellence and clinical competence. However, many students underutilize or resources or are not familiar with relevant search engine that can support their academic activities. This might be due to poor digital literacy, limited awareness, or lack of training. This negatively affects the student's ability to use search engines to access electronic information resources for their academic activities. Although several studies have examined access and awareness, only few have specifically examined the use of search engines and accessibility of information resources for academic activities. This gap warrants the need to examine the use of search engines and accessibility of information resources their influence on academic activities. This study aims to fill this gap by examining medical student's use of search engines and EIRs for academic activities.

Research Questions

Make an opening statement to introduce the questions.

1. What are the types of academic activities engaged in by college of medical science students in the University of Maiduguri?
2. What are the types of electronic information resources accessed by college of medical science students in the University of Maiduguri?
3. What are the types of search engines used by college of medical science students in the University of Maiduguri?
4. What is the frequency of use of electronic information resources by college of medical science students in the University of Maiduguri?

Hypotheses

Ho₁ There is no significant relationship between accessibility of electronic information resources and academic activities among college of medical science students at the University of Maiduguri.

Ho₂ There is no significant relationship between search engines and accessibility of information resources among college of medical science students at the University of Maiduguri.

Review of Related Literature

In the follow literature review, we synthesised empirical findings on the types of academic activities students engage in, the electronic information resources (EIRs) they access, and the search engines used to retrieve these resources.

Types of Academic Activities Engaged in by Students

Academic activities play a critical role in shaping students' educational experiences, fostering engagement, and promoting retention in higher education. CôrteVitória et al. (2018) found that institutions engage students through dynamic problem-solving, collaborative learning, and research initiatives. These activities are strategically designed to stimulate motivation and encourage active learning, creating a stronger bond between students and their academic environment. This suggests that such interactive and participatory activities are essential for enhancing student involvement and academic success. Similarly, Eckman et al. (2015) identified a diverse set of academic activities, including travel abroad, community-based service projects, design-build projects, and the development and commercialization of new technologies. These programs, varying in goals and methodologies, cater to different student interests, focusing on outcomes like education, infrastructure, or business ventures. Their findings highlight the importance of offering varied opportunities to meet diverse student needs.

In a related vein, Cheong and Ong (2016) explored student engagement within a liberal arts program, reporting that involvement in clubs and organizations significantly contributes to students' sense of belonging, academic competencies, and self-development. This underscores the value of extracurricular activities in fostering holistic growth. Furthermore, Sá (2023) found that participation in student unions, study groups, academic choirs, and institutional decision-making bodies is perceived as vital for personal development and integration into the academic community. These activities not only enhance students' educational experiences but also support persistence in higher education, emphasizing the role of community-oriented engagement.

Types of Electronic Information Resources Accessed by Students

The accessibility and use of electronic information resources are pivotal in supporting academic activities, particularly in resource-constrained environments. Levin (2017) identified a wide array of EIRs accessed by students, including websites, web portals, electronic libraries, document collections, web

services, databases, CD-ROMs, electronic journals, online databases, internet-based information sources, electronic encyclopedias, electronic books, and electronic theses. These resources are increasingly integrated into library collections to meet diverse user needs, reflecting the growing reliance on digital platforms for academic purposes. This finding highlights the need for robust digital infrastructure to support access. Similarly, Finch (2014) reported that EIRs encompass ebooks, ejournals, databases, electronic theses and dissertations, websites, government documents, digital libraries, and repositories, all requiring technology mediation for access, either remotely via the Internet or locally on physical media. This emphasizes the critical role of technological systems in ensuring resource availability, particularly in settings with limited physical library resources. Myliutchenko and Kulko (2023) provided a classification of EIRs based on common features, aligning with broader categories such as ejournals, databases, portals, and websites. While specific types were not detailed, their study underscores the significance of EIRs in the context of advancing information technologies, suggesting that these resources are indispensable for academic research and learning.

Types of Search Engines Used for Accessibility of Information Resources

Search engines are fundamental tools for accessing EIRs, and their usage patterns reveal preferences that impact resource retrieval efficiency. Nwosu and Anyira (2011) found that Google and Yahoo are the primary search engines used by Nigerian internet users, with a strong preference for Google due to its efficiency, relevance, and ease of use. This dominance of Google suggests that students prioritize accessibility and user-friendliness when retrieving information, which may influence the types of resources they access. Complementing this, Ogbole (2017) identified a broader range of search engines used by undergraduate students in Nigeria, with Google (mean = 4.30) and Yahoo (mean = 3.9) being the most popular, followed by AOL Search, Ask.com, Bing, Kayak, DuckDuckGo, and Alta Vista. The study highlights Google's overwhelming preference but also indicates that students explore alternative search engines, possibly to access diverse or specialized resources. These findings collectively suggest that while Google remains the dominant tool, the use of other search engines reflects students' efforts to navigate the vast digital landscape, particularly in contexts where academic search engines like Google Scholar may be underutilized.

We therefore conclude that academic activities, electronic information resources (EIRs), and search engine utilization among students are correlated. Findings indicate engagement in collaborative learning, research, and extracurricular activities, with EIRs such as ejournals, databases, and ebooks being accessed. In Nigeria, Google predominates as the preferred search engine, followed by Yahoo and others. The studies underscore the necessity of enhanced digital infrastructure and literacy to optimize EIR accessibility, thereby fostering academic performance and engagement in higher education contexts.

Methodology

This study adopted a correlational survey research design to examine the influence of search engines and accessibility of electronic information resources on academic activities among students in College of Medical Sciences, University of Maiduguri, Borno State, Nigeria. The population of the study constituted 585 students distributed across seven departments: Medicine & Surgery, Dental Surgery, Human Anatomy, Nursing Science, Physiotherapy, Radiography, and Medical Laboratory Science. A sample size of 233 students was determined using the Raosoft Sample Size Calculator. The study employed multi-stage sampling technique. In the first stage, the respondents were stratified based on departments. The second stage involved determining the sample size, which resulted in 233. At the third stage, the proportionate sample size was determined to ensure unbiased distribution of the respondents among the stratified departments. At the fourth stage, accidental sampling technique was employed in engaging the respondents during questionnaire administration.

Data were collected using a self-designed questionnaire, validated by three different experts- two from the Department of Library and Information Science and one from test and measurement in the Department of Education University of Maiduguri, respectively. The reliability coefficient of 0.83 was obtained through Crombach alpha reliability testing from a split-half administered questionnaire to 40 students (from the Department of Biology University of Maiduguri) outside the research setting. A response rate of 217 (93%) was achieved from the administered questionnaire. The collected data were sorted and collated using Microsoft Excel and Statistical Package for Social Science (SPSS v.27, for statistical analysis. Descriptive statistical tools such as mean score, and standard deviations presented in bar chart and tables were used to answer the four research questions because bar chats present a visual and clearer pictograph of organized opinions while tables offer a well structure output for easy readability. In addition, inferential statistics such as logistic regression was used to the test the two hypotheses at 0.05 level of significance because the dependent variable with nominal categorical value could only predicted by the criterion with logistic statistical tool. The results of the logistics regression are presented in tables.

Data Analysis and Results

Table 1: Population distribution

Department	Estimated Population	Proportional Sample Size
Medicine & Surgery	130	52
Dental Surgery	70	28
Human Anatomy	50	20
Nursing Science	100	40
Physiotherapy	75	30
Radiography	80	32
Medical Laboratory Science	80	31
Total	**585**	**233**

Source: Field Survey, 2025

Types of Academic Activities

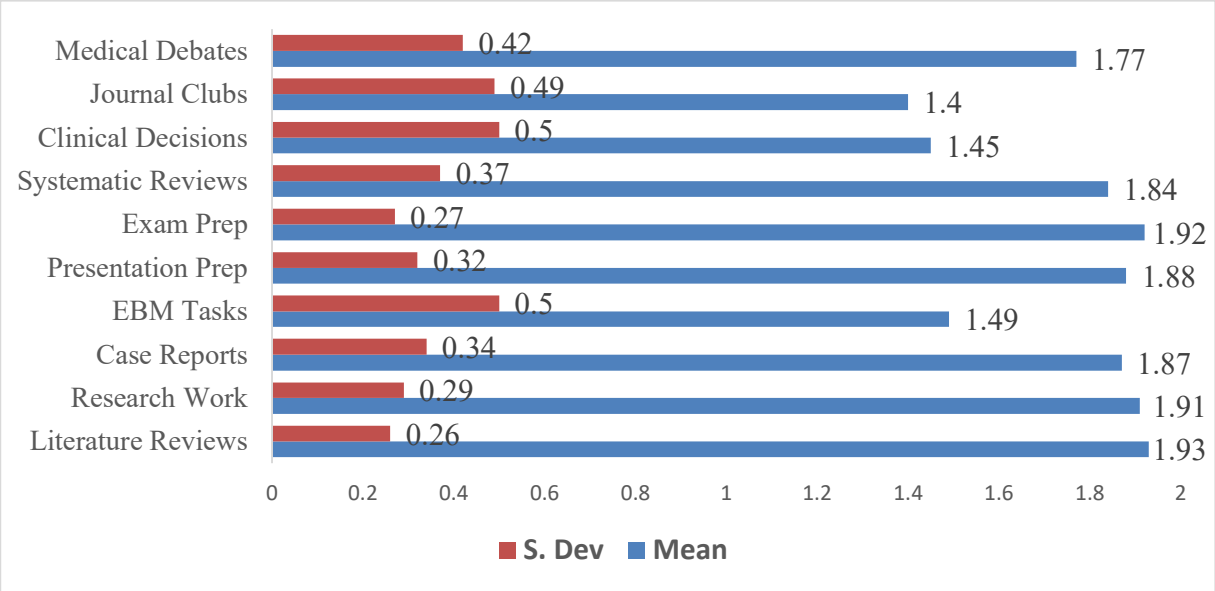


Figure 1: Types of Academic Activities
Source: Field Survey, 2025

Figure 1 showcases various responses of the respondents. The findings reveal students involvement in various types of academic activities such as literature reviews, research projects, and exam preparation taking the highest ($\bar{x}$= 1.93, $\bar{x}$=1.92 and $\bar{x}$=1.91) respectively among others, which indicated strong agreement. Conversely, low engagement was reported in evidence-based medicine assignments ($\bar{x}$=1.49), clinical decision-making ($\bar{x}$=1.45), and journal clubs ($\bar{x}$=1.40), which suggest that these activities may be under-prioritised or less emphasized. The weighted mean of 1.75 shows a moderate engagement across most activities.

Types of Electronic Information Resources accessed by medical students

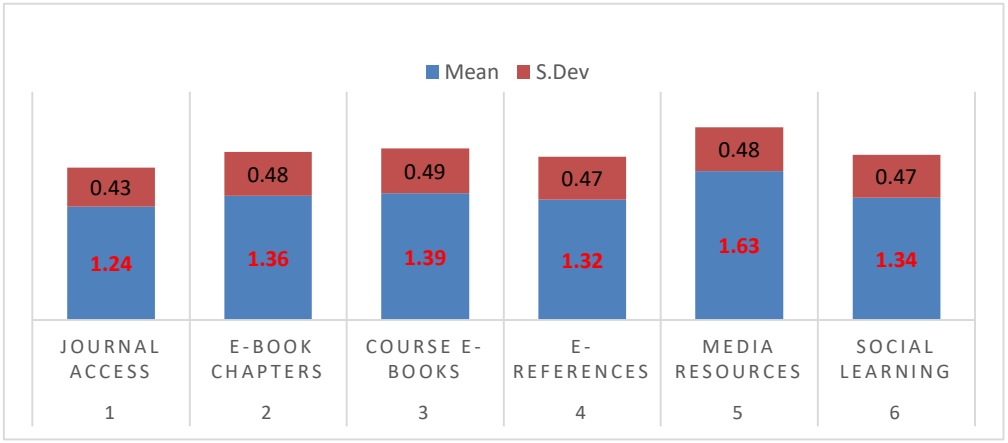
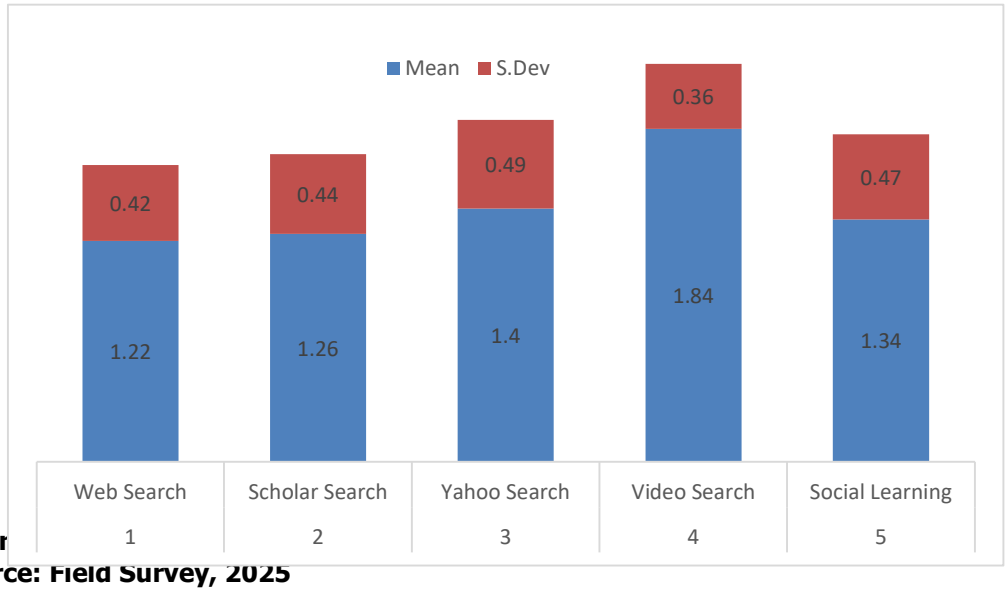


Figure 2: Types of Electronic Information Resources Accessed
Source: Field Survey, 2025

Figure 2 presents the responses on the types of electronic information resources accessed by the students. The findings indicate that students exhibited low to slightly moderate accessibility of various electronic information resources, with $\bar{x}$=1.24 for online journals, $\bar{x}$=1.36 for e-book chapters, $\bar{x}$=1.39 for e-books, $\bar{x}$=1.32 for reference materials like e-encyclopedias and e-dictionaries, and $\bar{x}$=1.34 for educational posts and reels on social media. Meanwhile, multimedia resources such as videos and audio recordings were accessed at a moderate level with $\bar{x}$=1.63.



Figur
Source: Field Survey, 2025

The findings in Figure 3 on the type of search engines used by medical students for accessing electronic information resources reveal a generally low use of search engines for academic purposes where we obtained $\bar{x}$=1.22 for general search engines like Google,$\bar{x}$=1.26 for academic search engines like Google Scholar, $\bar{x}$=1.40 for Yahoo, and $\bar{x}$=1.34 for social media platforms such as *Facebook* and *Twitter*. The

findings however, reaffirmed multimedia search engines like *YouTube*having the highest level of usage with $\bar{x}$=1.84.

Frequency of Use of Electronic Information Resources

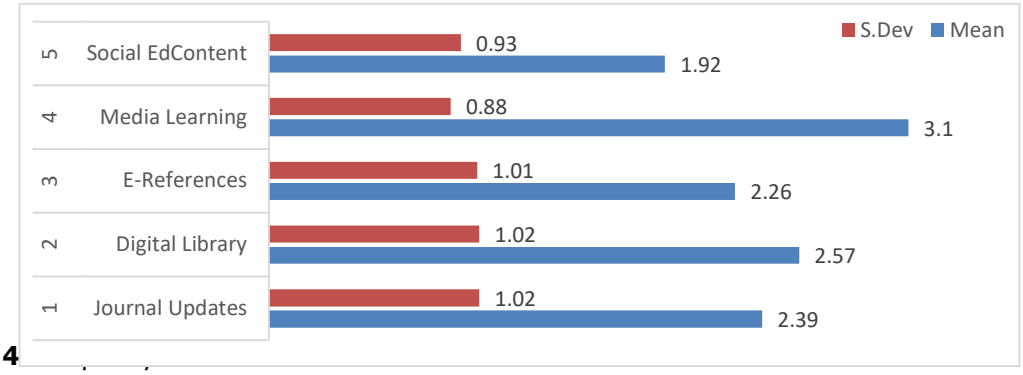


Figure 4
Source: Field Survey, 2025

The frequency of use of electronic information resources is presented in Figure 4 with the bar chart showing the various cumulated responses. Based on the findings the frequency of use of electronic information resources among students is generally low, particularly for social media posts ($\bar{x}$=1.92), reference materials ($\bar{x}$=2.26), e-books and online journals ($\bar{x}$=2.39), while the digital libraries ($\bar{x}$=2.57) and multimedia resources were used alwaysand often ($\bar{x}$=3.10). Nonetheless, the weighted mean, $\bar{x}$=2.45 shows the frequency of sometimes, equivalent to moderate frequency in using electronic information.

Test of the Hypotheses

Search engines are importance systems that facilitate access to online information resources. The roles they play can improve accessibility and lead to use of the EIR to support learning and research. The following tables presented the predictive influence of search engines on the accessibility of information resources among College of Medical Science Students at the University of Maiduguri

Ho₁ There is no significant relationship between search engines and accessibility of information resources among College of Medical Science Students at the University of Maiduguri

Table 2: Logistic regression results on search engines and accessibility of information resources by the Respondents

Predictor	β (Coeff)	SE	Wald χ^2	p-value	Odds Ratio	95% CI for OR
Google	0.48	0.17	7.96	0.005	1.62	[1.16, 2.26]
Google Scholar	0.52	0.16	10.56	0.001	1.68	[1.23, 2.30]
Yahoo Search	0.21	0.15	1.96	0.162	1.23	[0.92, 1.65]
Multimedia Search (YouTube)	0.91	0.19	22.94	<0.001	2.48	[1.71, 3.60]

Social Media Search	-0.1	0.14	0.51	0.475	0.9	[0.68, 1.19]
Constant	-0.85	0.21	16.38	<0.001	0.43	-

Source: Field Survey, 2025

A logistic regression analysis was conducted to test the hypothesis assuming a predictive relationship between use of Search engines and accessibility of information resources by the respondents. The logistic regression analysis revealed significant relationships between search engine usage and accessibility of electronic information resources (EIR) among the respondents. Multimedia search engines (YouTube) demonstrated the strongest positive association (OR=2.48, p<0.001), indicating students who used these platforms were 2.5 times more likely to frequently access EIR compared to non-users. Academic search engines (Google Scholar) also showed a substantial effect (OR=1.68, p=0.001), followed by general search engines (Google) (OR=1.62, p=0.005), confirming their role in facilitating resource accessibility. In contrast, Yahoo search (OR=1.23, p=0.162) and social media platforms (OR=0.90, p=0.475) did not demonstrate statistically significant relationships with improved EIR access. The model explained 18-24% of variance in accessibility patterns (Cox & Snell R^2=0.18, NagelkerkeR^2=0.24), with excellent fit (Hosmer-Lemeshow p=0.554).

Ho_2 There is no significant relationship between accessibility of electronic information resources and academic activities among college of medical science students at the University of Maiduguri

Table 3: Logistic regression results on accessibility of electronic information resources and academic activities among the Respondents

Predictor	β (Coeff)	SE	Wald χ^2	p-value	Odds Ratio	95% CI for OR
Online Journal Usage	0.52	0.14	13.78	<0.001	1.68	[1.28, 2.21]
E-book Usage	0.58	0.13	19.91	<0.001	1.79	[1.38, 2.31]
Reference Material Usage	0.19	0.12	2.5	0.114	1.21	[0.95, 1.54]
Multimedia Resource Usage	0.83	0.16	26.91	<0.001	2.29	[1.67, 3.14]
Social Media Usage	-0.12	0.11	1.19	0.275	0.89	[0.72, 1.10]
Constant	-1.75	0.27	42.06	<0.001	0.17	-

Source: Field Survey, 2025

A logistic regression analysis was conducted to test the hypothesis assuming a predictive relationship between the accessibility of information resources and academic activities by students of Medical College University of Maiduguri. The logistic regression analysis revealed significant relationships between EIR accessibility and academic activities among medical students. Multimedia resources demonstrated the strongest positive influence (OR=2.29, p<0.001). This indicates that students who frequently used educational videos and podcasts were 2.3 times more likely to engage in academic activities (learning and researching) compared to infrequent users. Similarly, both e-book access (OR=1.79, p<0.001) and online journal usage (OR=1.68, p<0.001) showed substantial positive

correlation with academic activities. However, reference materials (online encyclopedia and dictionaries) (OR=1.21, p=0.114) and social media (*Facebook*, *Twitter* and *LinkedIn*) (OR=0.89, p=0.275) did not demonstrate statistically significant relationships. This model explained that 20-27% of variance in academic activities can be explained by EIR accessibility (Cox & Snell R^2=0.20, NagelkerkeR^2=0.27), with excellent fit (Hosmer-Lemeshow p=0.502).

Discussion of the Findings

The findings of the current study reveal a concerning trend of low usage of EIR among students, with only moderate engagement with multimedia formats and limited reliance on academic search engines. These results stand in contrast to prior research, which consistently reports higher engagement with EIR, including scholarly databases, e-books, and academic search engines, across various academic contexts. This analysis examines the discrepancies between the current findings and existing literature, exploring potential institutional, contextual, and behavioral factors contributing to these differences. By synthesizing the findings with prior studies, this discussion aims to identify barriers to EIR adoption and propose targeted interventions to enhance students' academic resource utilization.

The current study indicates that students exhibit low engagement with a range of EIR, including scholarly databases, e-books, digital reference materials, and open-access resources, with only moderate use of multimedia formats. This contrasts sharply with prior research. For instance, Van Loon and McCann (2024) found that students primarily relied on scholarly databases for peer-reviewed journals, citing their reliability and positive impact on academic performance. Similarly, Mune and Agee (2016) reported high student engagement with e-books and digital reference materials, driven by convenience and accessibility. Olabode (2017) further highlighted the significant use of open-access resources among financially disadvantaged students, emphasizing affordability as a key factor in resource selection.

The discrepancy between these studies and the current findings suggests several potential barriers. Limited awareness of available EIR, inadequate training on their use, or restricted institutional access may hinder students' engagement. For example, if students are not sufficiently trained to navigate scholarly databases or are unaware of open-access platforms, they may default to less reliable or non-academic sources. Additionally, institutional factors, such as subscription limitations or outdated digital infrastructure, could restrict access to high-quality EIR. These findings underscore the need for targeted interventions, such as workshops on EIR navigation, promotional campaigns to raise awareness, and institutional investments in accessible digital resources.

The current study also reports low usage of both general and academic search engines for academic purposes, with the exception of relatively higher engagement with multimedia platforms like *YouTube*. This finding contrasts with earlier studies, such as Jansen and Eastman (2006), which documented heavy reliance on general search engines like Google due to their accessibility and breadth of content. Ortega (2014) similarly noted frequent use of academic search engines like Google Scholar

among graduate students for accessing credible scholarly content. Gonzalez-Ibanez (2021) further emphasized the adoption of field-specific search engines, such as *PubMed* and *IEEE Xplore*, among students in technical disciplines.

The preference for multimedia platforms observed in the current study may reflect evolving student learning styles, with a growing inclination toward audio-visual content for understanding complex concepts. However, the low engagement with search engines, both general and academic, suggests a potential gap in digital literacy or discipline-specific training. For instance, students in non-technical fields may lack exposure to specialized search tools, leading to underutilization. This variance highlights the importance of promoting digital literacy programs that emphasize the effective use of academic search engines and the critical evaluation of online content.

The current study's finding of low frequency of EIR usage, with low mean scores for social media posts, reference materials, e-books, digital libraries, and online journals, contrasts with the high frequency reported in prior research. Nwokedi and Sani (2010) found that a majority of students at the University of Lagos accessed EIR at least weekly, with many using platforms like *Google Scholar* and *JSTOR* daily. Ortega (2014) reported that over 85% of engineering students at Tsinghua University used EIR daily, relying on specialized databases like *IEEE Xplore* and *ScienceDirect*. Ani (2014) similarly noted high daily EIR usage among medical students, particularly for clinical databases like *PubMed*.

These studies suggest a trend of frequent EIR usage, particularly in research-intensive or specialized disciplines. The low frequency observed in the current study may stem from contextual factors, such as limited digital literacy, insufficient awareness of EIR benefits, or access barriers. For example, students may not be adequately trained to integrate EIR into their academic routines or may face technical challenges, such as unreliable internet access or restricted database subscriptions. These findings highlight the need for comprehensive user training programs and improved institutional access to EIR platforms to foster regular engagement.

Conclusion

Students in the College of Medical Sciences, University of Maiduguri, showed high engagement in core academic activities such as literature reviews, research projects, and exam preparation, meanwhile, there is notably low participation in evidence-based medicine assignments, clinical decision-making during rotations, and journal clubs. The findings shows that students predominantly utilise academically credible EIR such as online journals, e-books, and book chapters, accessed primarily through reliable search engines like *Google* and *Google Scholar*, but sources including social media, *Yahoo*, and multimedia content are less frequently used.

Recommendations

The discrepancies between the current study and prior research point to multifaceted barriers to EIR adoption, including limited awareness, inadequate training, and institutional access issues. To address these challenges, the following recommendations are proposed:

1. Medical College, University of Maiduguri, should implement mandatory workshops to teach students how to navigate scholarly databases, academic search engines, and open-access resources effectively. These programs should emphasize critical evaluation of sources and discipline-specific tools.
2. The Medical College, University of Maiduguri, should launch promotional campaigns to highlight the availability and benefits of EIR, targeting both students and faculty. Collaborations with librarians can facilitate outreach efforts.
3. Medical College, University of Maiduguri, need to invest in robust digital infrastructure, including reliable internet access and comprehensive database subscriptions. Partnerships with open-access platforms can further enhance affordability for financially disadvantaged students.
4. Given the moderate use of multimedia platforms, educators should incorporate audio-visual content into curricula to align with students' evolving learning preferences while guiding them toward credible sources.

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