

Knowledge and Use of Google Educational Tools by Postgraduate Students in a Ghanaian University

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Abstract

This study examined postgraduates' knowledge and usage of Google educational tools. The study was conducted in Kwame Nkrumah University of Science and Technology (KNUST) with 350 respondents. A purposive sampling technique that allows researchers to use their judgments in selecting participants for research was used to select the participants for this study. A questionnaire was used as the data collection instrument, and it was sent to only the participants who attended a series of information literacy training sessions organized by the authors. The data collected were analyzed using SPSS software. The study revealed that most students use Google as their search engine, and Google Scholar was the most popular Google educational tool. The students gained knowledge of these tools through their colleagues, on their own, through workshops, seminars, and conferences, and their lecturers. The respondents also mentioned some challenges, such as requests to pay to access articles and slow Internet. Some recommendations, such as more education by academic librarians to encourage students to use these free tools and efforts by the students themselves to learn how to use these tools, were made.

Keywords: Google, Google Educational Tools, Google Products, Students, Postgraduates, Ghanaian University.

Introduction

The Fourth Industrial Revolution (4IR), which led to new technologies (Philbeck and Davis (2019)) has revolutionized the creation, and provision of information, teaching, learning, and

research. Today, people can create and access information freely without purchasing them, thus bypassing paywalls. This has thus bridged the information gap between the North and the South. Many people can partake in educational programs online from far and near without necessarily having to travel to those places physically. All these have been made possible because of the availability of free and subscription-based teaching, learning, and research support tools. One company that has made educational and information tools available free of charge online is Google. Since its formation in 1998, Google has developed many products in all spheres of human life, including everyday activities, education, business, communication, rest, etc. (Zymovets, 2016). Google products include Android Auto, Android OS, Android TV, Calendar, Cardboard, Chrome, Chrome Enterprise, Chromebook, Chromecast, Connected Home, Contacts, Digital Wellbeing, Docs, Drive, Earth, Exposure Notifications, Finance, Forms, Gboard, Gmail, Google Alerts, Google Arts & Culture, Google Assistant, Google Authenticator, Google Chat, Google Classroom, Google Duo, Google Expeditions, Google Family Link, Google Fi, Google Files, Google Find My Device, Google Fit, Google Flights, Google Fonts, Google Groups, Google Home App, Google Input Tools, Google Lens, Google Meet, Google One, Google Pay, Google Photos, Google Play, Google Play Books, Google Play Games, Google Play Pass, Google Play Protect, Google Podcasts, Google Shopping, Google Street View, Google TV, Google Tasks, Google Workspace, Hangouts, Keep, Maps, Messages, News, PhotoScan, Pixel, Pixel Buds, Pixelbook, Scholar, Search, Sheets, Sites, Slides, Snapseed, Stadia, Tilt Brush, Translate, Travel, Voice, Waze, Wear OS by Google, YouTube, YouTube Kids, YouTube Music, YouTube TV, YouTube VR (Google, 2021a). Several librarians already use Google Docs, Google Forms, Google Slides, and YouTube in community engagement and training activities. In the same vein, many educational establishments have also embraced Google Apps for Education, Google's official platform for email and collaboration custom-made for use at educational institutions (Izenstark & Leahy, 2015).

Problem Statement

The COVID-19 pandemic has brought about a 'new normal' way of life, such as frequent lockdowns and restrictions in the academic environment. The new way of doing things led to applying some existing technologies and new ones in the educational sector. One technology free of charge and access used in the educational sector is Google educational tools or products. Earlier studies by (Borova, Chekhratova, Marchuk, Pohorielova & Zakharova, 2021; Popescu, 2015) have highlighted the relevance of Google educational tools in students' lives. Even though many people know this product and students are using it in some universities, our interactions with the participants of this study during information literacy training sessions revealed that they do not have adequate knowledge about these tools and, as a result, are not using them. Therefore, this study sought to investigate whether postgraduate students at KNUST were aware of these tools and whether they use them in their research study and day-to-day academic activities, considering the vast array of Google educational tools and their convenience in usage and free access.

Objectives

The following objectives guide the study.

- To ascertain the first port of call for information for postgraduate students.
- To identify postgraduate students' preferred search engines.

- To determine their knowledge of Google educational tools.
- To find out if postgraduate students use other educational resources apart from Google educational tools and;
- To determine the challenges postgraduates face when searching for information.

Theoretical framework

Technology Acceptance Model (TAM) developed by Davis (1989) is the primary theoretical framework for this study. TAM is a widely utilized theoretical framework for assessing people's decisions regarding new technology adoption (Koul & Eydgahi, 2017). TAM effectiveness is explained by people's motivations to accept and use a new technology (Zheng, 2020).

Literature review

Even though a lot exists in the literature about specific Google educational products, not much exists on the entirety of Google educational tools or products. Therefore, this review will look at Google's origin, some studies on Google educational products, and specific Google educational products.

The Origin of Google

The term 'Google' results from the mathematical notion 'Googol', which is the term for a 1 followed by 100 zeros and was coined by Milton Sirota, nephew of American Mathematician Edward Kasner (Schuster, 2010). The name reflects Larry and Sergey's mission "to organize the world's information and make it universally accessible and useful" (Google, 2021a). Google's services are known to virtually every user of the Internet and it is often used to represent all other Internet service providers because it has the most significant market share (Schuster, 2010).

Google-Suite for Education

One of Google's educational products worth looking at is Google's G-Suite for Education (GS-E). Google for Education is the greatest tool in the digital era (Maheshwary & Bhandari, 2019). Brown (2018) intimates that Google has invested much in GS-E and publicizes it as a full-fledged member of Google's family of suites. Brown (2018) further indicates that GS-E integrates all of Google's previous education products, Google Apps for Education, into one system. According to Izenstark and Leahy (2015) many educational institutions have adopted Google Apps for Education, Google's official platform for email and collaboration. G-suite for education consists of Docs, Slides, Sheets, Drive, Forms, Jamboard, Classroom, Assignments, Gmail, Meet and Chat, Keep, Calendar, Tasks and Admin (Google, 2021b).

Google as a search tool

Several studies by Mayse (2017); Baranova, Khalyapina and Yakhyaeva (2019), and López-fitzsimmons and Nagra (2019) have reported on students' reliance on Google as their primary search tool and the usefulness of Google tools in promoting student autonomy and engagement. López-fitzsimmons and Nagra's (2019) study investigating Google versus library databases found that students prefer using Google as the primary search tool regardless of its numerous limitations as a search engine for scholarly and academic research. They further

mentioned that the students would persist in using Google because of its quick delivery, easy access to limited authoritative sources, and natural language, simplifying reading comprehension without dedicating time to technical and academic jargon (ibid). Similarly, in a study of how Google can help promote 21st-century skills, Mayse (2017) found that Google is helping to increase student engagement and autonomy. Mayse further revealed that the students have more access to two-way communication, allowing them to question, comment, and express their opinions. Another study by Baranova et al. (2019) investigating Google products as a source of students' autonomy in content and language integrated learning. The research revealed that the development of educational autonomy with the help of mobile applications not only improves the process of students' preparation for classes, but also facilitates it for the teachers.

Google Educational Tools

Google Docs

Google Docs is an online word processor offered by Google which permits users to create and edit documents online while collaborating with other users in real-time. There are many studies by Fayez and Mahmoud (2015), Zheng, Lawrence, Warschauer and Lin (2015), Neumann and Kopcha (2019) and Abdu, Mohammed and Al-jaberi (2021) which have also reported on the use of Google Docs by their study participants in the educational setting. Zheng et al. (2015) investigation on middle school students writing and feedback in a cloud-based classroom environment revealed that the students had a positive attitude towards using Google Docs for editing and the provision and receipt of feedback. In a study on the impact of Google Docs on student collaboration Fayez and Mahmoud (2015) found that Google Docs is a valuable application to promote student–student and student–instructor interactions as well as possessing the power to improve student–content and student–interface interactions through the resources and features offered by the application. In a study on using Google Docs for peer-then-teacher review on middle school students' writing, Neumann and Kopcha (2019) found that both peers and the teacher provided most of their feedback in the same areas. Again the students also used Google Docs to discuss the feedback with their peer rather than the teacher. Another study explored the process in which two Master's students respond to feedback through Google Docs and Microsoft (MS) Word in a Malaysian public university by Abdu et al. (2021) using comments on feedback, oral reports, text revisions, and follow-up interviews found that despite the role of both tools in facilitating the two graduate students' engagement with feedback, Google Docs appeared as an interactive tool because it supports synchronous and immediate edits.

Google Classroom

Google Classroom is a free blended learning platform developed by Google for educational institutions that aims to simplify creating, distributing, and grading assignments. Some studies have highlighted the usefulness of Google Classroom. Izenstark and Leahy (2015) found in their study on Google classroom for librarians that the study participants generally responded favourably to the use of Google Classroom in library instruction and information literacy classes because they saw it as a supplement to the learning management system they are already familiar with. Izenstark and Leahy (2015) further mentioned that the students were particularly familiar with the design, as they were already using Google products via their student Google

Apps accounts to collaboratively carry out class assignments online. Similarly, Beaumont (2018) study on Google Classroom found that the students actively involved themselves in discussions, answered questions, and posed questions to encourage discussion. Bondarenko, Mantulenko and Pikilnyak (2018) study on the use of Google Classroom to support blended learning for geography students revealed that the organization of the learning process using Google Classroom ensures the unity of in-class and out-of-class learning, promotes interaction of the subjects learning in real time and monitors the quality of training and control of the students' learning achievements in class as well as out of it.

Google Translate

Google Translate is a multilingual machine translation service developed by Google, to translate text, documents and websites from one language into another. Some studies by Groves and Mundt (2015); Stapleton, Leung and Kin (2019) and Cancino and Panes (2021) have reported on the use of Google Translate in the educational setting. Cancino and Panes (2021) found that syntactic complexity and accuracy scores were higher in the groups that had access to GT. In a similar study on whether Google Translate is a friend or foe Groves and Mundt (2015) found that the translation engine was far from able to produce error-free text. However, judging about international testing standards, the level of accuracy is approaching the minimum needed for university admission at many institutions (ibid). Another study by Stapleton et al. (2019) assessing the accuracy and teachers' impressions of Google Translate of primary L2 found that GT has too many inaccuracies to be trusted and can negatively affect students' learning.

Google Forms and Sheets

Google Forms, a survey administration software and Google Sheets, a spreadsheet offered by Google allow users to create, edit surveys online and edit files online while collaborating with other users in real-time. The use of Google Forms and Sheets in educational activities have also been mentioned by (Almache Granda & Ramirez-Avila, 2020; Kunicki, Zambrotta, Tate, Surrusco, Risi & Harlow, 2019; Mansor, 2012; Scheef & Johnson, 2017). Parra, Jacobs and Trevino's (2021) study on augmenting accounting education with Google Sheets found that participants had a self-perceived ability to create pivot charts and will be able to use the Google Sheets functions in their accounting profession. Mansor (2012) reported in a study on managing students' grades and attendance records using Google Forms and Google Spreadsheets that he created a number of potentially useful innovations, one of which is the management of students' grade and attendance records. A similar study by Kunicki et al. (2019) on using Google Sheets in the classroom found favourable student attitudes toward Google Sheets. Scheef and Johnson's (2017) study on Google Forms for transition assessment discussed transition assessment and described how the process might be simplified using Google Forms. Almache Granda and Ramirez-Avila (2020) also aimed at analyzing the effects of classifying vocabulary into parts of speech through Google Sheets to improved students' word recognition. They found that classifying parts of speech using Google Sheets improved reading comprehension skills.

Google Scholar

Google Scholar is a freely accessible web search engine that indexes the full text or metadata of scholarly literature across various publishing formats and disciplines (Kumar,

2019). Gusenbauer (2019) compared Google Scholar with 12 academic search engines and bibliographic databases and reported that Google Scholar is the most comprehensive academic search engine with over 389 million records. In a study to examine how graduate students perceive and use Google Scholar, Wu and Chen (2014) found that students prefer the usability of Google Scholar over library databases and that science and technology students favoured Google Scholar more than those who study the humanities and social sciences.

Materials and Methods

The study was conducted at KNUST with approximately nine thousand five hundred and thirty-four (9,534) postgraduate students (Kwame Nkrumah University of Science and Technology, 2021). The sample was selected from several training sessions organized for first-year postgraduate students at the University. Even though the entire population of postgraduate students in the study setting was more than nine thousand, the survey developed and deployed online via Google Forms was purposively sent to only the training sessions participants whose contact details were collected by the authors for this research. Out of the number of participants of the training sessions who received the questionnaire, only three hundred and fifty responded. The sample of this study therefore comprised 350 participants aged 19–55 and above drawn from first-year postgraduate students. Using a quantitative research design, postgraduate students from the Kwame Nkrumah University of Science and Technology (KNUST) were studied to examine their knowledge and use of Google educational tools. This type of research design is influenced by the fact that it promotes the generalisation and replication of research findings (Creswell, 2009). The study developed and distributed an online survey to the first year postgraduate students to commence data collection. Areas the survey covered respondents' demographics and their first port of call for information to solve a problem. The search engine they use quite often, the Google educational tools they are aware of and how they learned about them. Other survey areas included frequency of use, if they use other databases apart from Google Education products and the challenges they face in searching for information online. Some of the questions were closed-ended, while others were open-ended. The closed-ended ones required one response from a checklist of possible replies while the open-ended ones encouraged them to provide their answers to the questions. The analysis of this study was done using the Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics were used to summarize the data.

Results

Demographic information of respondents

The first part of the presentation of the results provides the respondents' demographic information, namely their gender and college affiliation. Most of the 350 participants were male (76.6%) with (23.4%) representing the female population. The participants are affiliated with the following colleges: College of Engineering (22.9%), College of Humanities and Social Sciences (22.6%), College of Science (14.8%), College of Agriculture and Natural Resources (13.4%), College of Art and Built Environment (12.3%), Institute of Distance Learning (7.4%) and College of Health Sciences (6.6%).

First port of call for information

This part of the study asked the respondents to mention the primary sources they consulted

to address their information needs (see Figure 1). As shown in Figure 1, most (62.0%) of the students browsed the Internet for information, 22.9% use Google, 4% consulted textbooks in the library, 3.4% consulted Google Scholar and 2.3% consulted online databases.

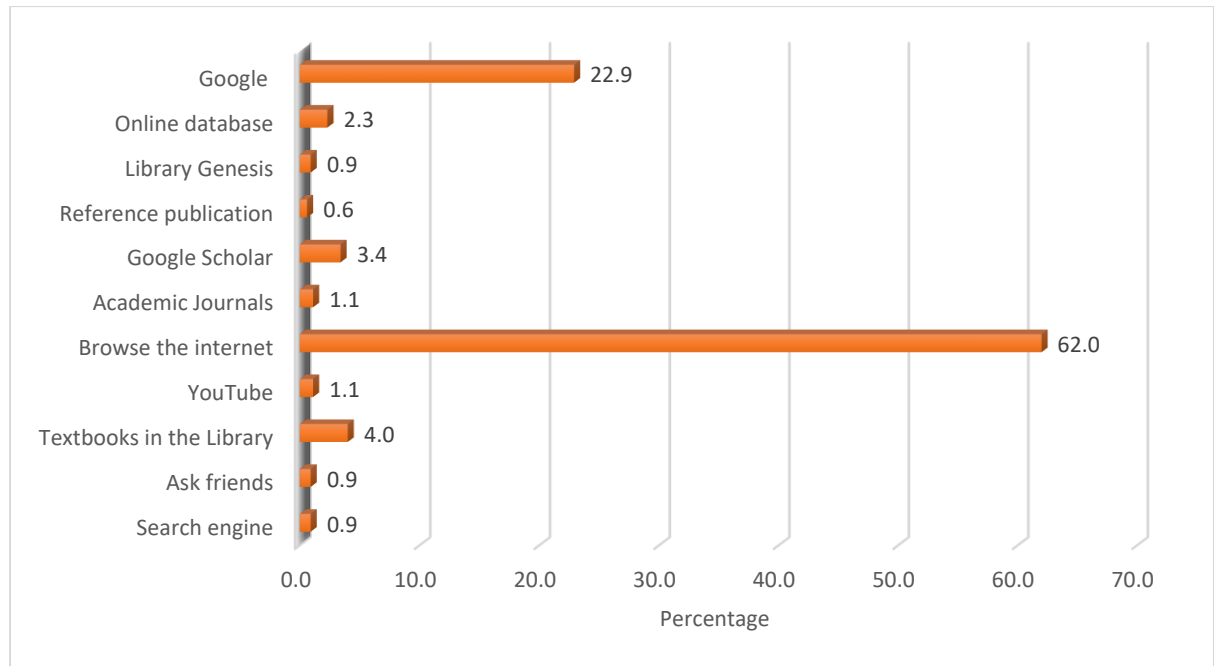


Figure 1: First port of call for information

Source: Field survey, 2021

Search engine

This part of the study asked the respondents to mention the search engines they use quite often. Their responses are presented in Figure 2. The majority of the students, as seen in the Figure, overwhelmingly mentioned Google (94.5%) as their preferred search engine and the one they use most frequently.

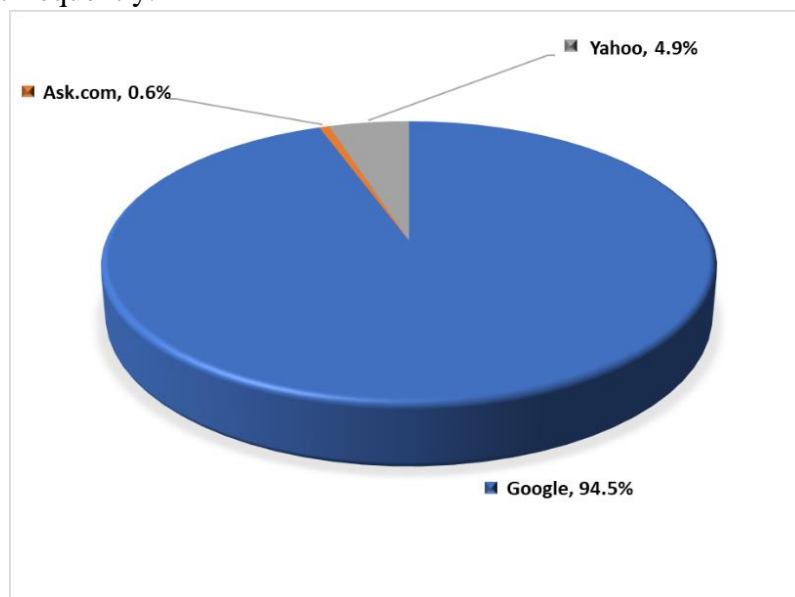


Figure 2: Search engine used by respondents

Source: Field survey, 2021

Knowledge of Google educational tools

This part of the study sought to determine the awareness of some Google educational tools amongst the students (see Table 1). From the results, Google Scholar ranked as the item with the highest Relative Importance Index (RII=90.57). Thus, Google Scholar was the most popular Google educational tool among the respondents, as shown in Table 1. Google Sheets (RII=54.76) was ranked as the least of the Google educational tools the respondents were aware of.

Table 1

Google educational tools

Google educational tools	Aware	Not sure	Not aware	RII	Rank
Google Scholar	296 (84.6%)	9 (2.6%)	45 (12.9%)	90.57	1 st
Google Advanced Search	210 (60.0%)	46 (13.1%)	94 (26.9%)	77.71	2 nd
Google Translate	209 (59.7%)	45 (12.9%)	96 (27.4%)	77.43	3 rd
Google Books	200 (57.1%)	61 (17.4%)	89 (25.4%)	77.24	4 th
Google Videos	165 (47.1%)	70 (20.0%)	115 (32.9%)	71.43	5 th
Google Documents	163 (46.6%)	51 (14.6%)	136 (38.9%)	69.24	6 th
Google Forms	144 (41.1%)	60 (17.1%)	146 (41.7%)	66.48	7 th
Google Alerts	110 (31.4%)	85 (24.3%)	155 (44.3%)	62.38	8 th
Google Sheets	70 (20.0%)	85 (24.3%)	195 (55.7%)	54.76	9 th

Source: Field survey, 2021

Source of knowledge of Google educational tools

There is a plethora of ways to gain knowledge of Google educational tools. To know how the respondents in this study learned about these tools, they were asked to select some options provided by the researchers (see Figure 3). The respondents were allowed to select as many options as applicable to them. As depicted in Figure 3, their colleagues (28.9%), on their own (25.6%), workshops, seminars, and conferences (17.5%), and their lecturers (16.6%) were the avenues through which they were exposed to these tools.

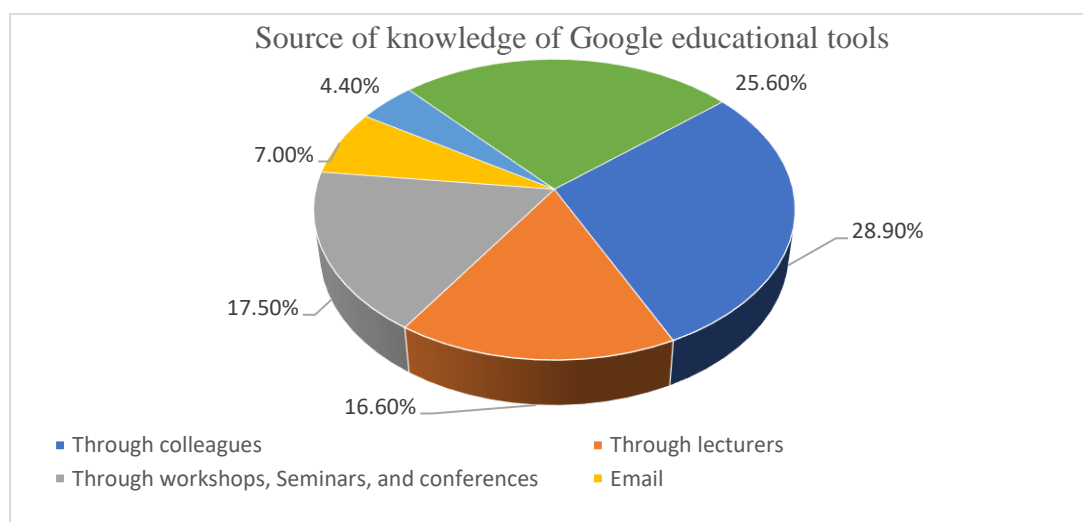


Figure 3: Source of knowledge of Google educational tools

Source: Field survey, 2021

Frequency of use of Google educational tools

Besides knowing these tools, the researchers sought to know the frequency of use by the study participants (see Figure 4). As depicted in Figure 4, many students (39.2%) used the tools daily. Almost 26% of them used the tools weekly and monthly, respectively.

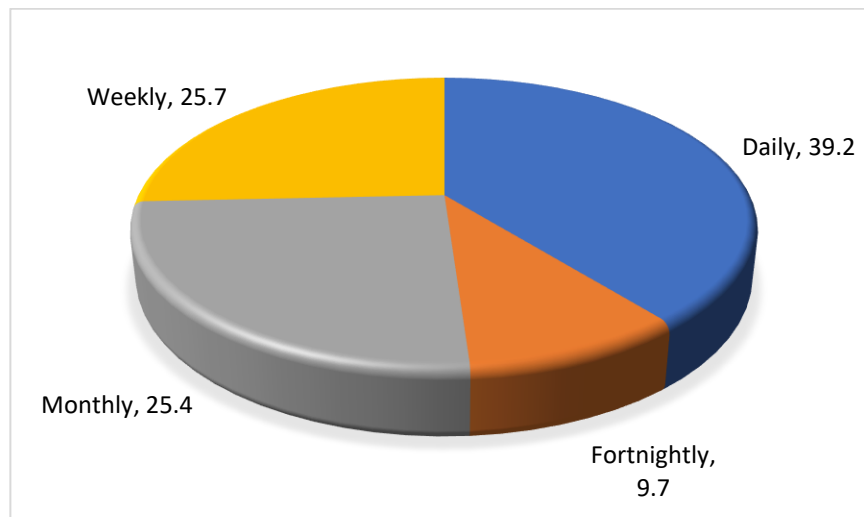


Figure 4: Frequency of use of Google educational tools

Source: Field survey, 2021

Other educational resources

There are other educational resources available apart from Google educational tools for use by students. To know what other educational resources the respondents use, they were asked to list them. Many of the resources mentioned by the respondents are academic databases except ResearchGate, Mendeley, Google Books, KNUSTSpace, Academia, FreeFullPDF, Booksee.org, Library Genesis, Sci-hub, Wikipedia, Yahoo, Medscape, YouTube, Amazon, Google Video, and CiteSeer. The resources majority of the respondents' use were PubMed (11.6%), Research Gate (11.2%), ScienceDirect (6.4%), JSTOR (6.0%), Mendeley (6.0%), Google Books (5.6%), KNUSTSpace (5.6%), Academia (4.5%), FreeFullPDF (3.7%) and Booksee.org (3.4%). Other sources mentioned by the respondents include EmeraldInsight (3.0%), Library Genesis (2.6%), Sci-hub (2.6%), Wikipedia (2.6%), Elsevier (2.2%), Sage (2.2%), Yahoo (2.2%), EBSCOHost (1.9%), AGORA (1.5%), Springer (1.5%), Web of Science (1.5%), HINARI (1.1%), Medscape (1.1%), Scopus (1.1%), YouTube (1.1%), AJOL (0.7%), Amazon (0.7%), Cochrane Library (0.7%), Google Video (0.7%), OARE (0.7%), CiteSeer (0.7%), Taylor and Francis (0.7%), ERIC (0.4%), IEEE (0.4%), iiste.org (0.4%), MeSH (0.4%), TEEAL (0.4%) and Wiley (0.4%).

Challenges in searching for information

There are numerous challenges that information users face when searching for information online. Respondents were asked to indicate the challenges they encounter when searching for information for their research works (see Table 2). From the results request to pay to access articles that are not open access (13.1%), slow internet connectivity (9.1%), difficulty in finding related and relevant research topics (7.1%), inability to locate the needed and current materials

(6.0%), lack of access to full text but rather abstract (6.0%), difficulty in downloading E-books (5.1%), not familiar with most of the resources (5.1%) were mentioned by the respondent as some of the challenges they encounter when searching for academic literature for their research work.

Table 2

Challenges in searching for information

Challenges	Frequency	Percent
No Response	83	23.7
Request for payment for access to articles since they are not open access	46	13.1
Slow internet connectivity	32	9.1
Difficulty in finding related and relevant research topics	25	7.1
Inability to locate the needed and current materials	21	6.0
Lack of access to full text but rather abstract	21	6.0
Difficulty in downloading E-books	18	5.1
Not familiar with most of the resources	18	5.1
How to use Zotero and Mendeley	17	4.9
Difficulty in getting articles from Ghanaian authors	16	4.6
Getting raw data for further analysis is a challenge	16	4.6
Cases of irrelevant search results	13	3.7
Citation challenges with some of the articles	12	3.4
Referencing and inserting citation in research work.	12	3.4
Total	350	100.0

Source: Field survey, 2021

Discussion

The majority of the students (94.5%) in this study mentioned Google as their regular search engine compared to others such as Yahoo (4.9%) and Ask.com (0.6%). This implies that students would surely use Google educational platforms for their research if they acquire enough knowledge or are made aware of their existence. Many researchers have earlier indicated the use of Google as the most preferred platform for students (Asiedu, Plockey & Kordie, 2020; Baranova et al., 2019; Charalambous, 2018; Dahlen, Haeger, Hanson & Montellano, 2020; Fázik & Steinerová, 2020; Hamade, 2020; Kocevar-Weidinger, Cox, Lenker, Pashkova-Balkenhol & Kinman, 2019; López-fitzsimmons & Nagra, 2019; Mayse, 2017; Robison, Fawley & Marshall, 2020). About KNUST postgraduate students' knowledge of Google educational tools, Google Scholar stood out (RII=90.57). It is not surprising that students were very much aware of Google Scholar, this is because literature has shown that it is a very useful web tool for bibliography/scientific literature research. This resource is often promoted during information literacy sessions by academic librarians because in the view of Cole, Davis, Eyer and Meier (2018) and Luftig and Plungis (2020), it has the potential to provide easy, one-stop access to articles in both subscription journals and items in institutional repositories and open access journals. In Addition to Google Scholar, postgraduate students at KNUST were also aware of Google Advanced Search (RII=77.71), Google Translate (RII=77.43) and Google Books (RII=77.24). These resources, in the view of this study can help in the conduct of effective research study by students.

Postgraduate students at KNUST knew Google educational tools with most of them (39.2%) indicating daily usage, but they got to know through their colleagues. Literature had indicated that most students prefer to receive information from their peers before considering other sources. A study by Lee, Anderson and Burnett (2014) indicates that doctoral students rely on their colleagues and friends when seeking for information. Apart from Google educational tools, the use of other databases for research by postgraduate students was also sought for in this study. PubMed topped the list with 17.4% of respondents. The KNUST Library system subscribes to databases (<https://library.knust.edu.gh/online-databases>) made freely accessible to the entire university community. It is not surprising that PubMed tops the list of other databases accessed. This is because the University is a Science and Technology University and most programs are science and health based.

Request for payment to access articles that are not open access was the major challenge indicated by respondents in their search for academic literature for their work. This was followed by slow connectivity. Referencing and inserting citations in research work was indicated as the least challenge. This indicates the need to make students aware of free Google products such as Google scholar to aid in accessing some content from other databases with less restrictions and constraints. Gusenbauer (2019) compared Google Scholar with 12 academic search engines and bibliographic databases and reported that Google Scholar is the most comprehensive academic search engine with over 389 million records.

Conclusion

This study investigated whether postgraduate students at KNUST were aware of Google educational tools and whether they use them in their day-to-day academic activities. The study shows that postgraduate students at KNUST know some Google educational products especially Google Scholar and have utilised them. More than half used the tools on a daily, weekly and monthly basis. However, there should be more education by academic librarians to encourage students to use these free Google educational products to augment the library resources and services provided by the KNUST library system, especially in this period of COVID-19 pandemic. Besides, the education by academic librarians to encourage the use of these tools, it is recommended that the students themselves should also make efforts to learn how to use these tools and use them. Again since this study focussed on postgraduate students, future studies should be directed at undergraduate students to ascertain their knowledge and use of Google educational tools since their information-seeking behaviour will differ from postgraduate students.

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Data availability

The data associated with this study can be found at:
<https://data.mendeley.com/datasets/9s8jgw9zx5/1>

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