

## **Appraisal of Agro-Students' Exploitation of Digital Education Apps for Academic Tasks Performance in Federal University of Agriculture Abeokuta, Nigeria**

**O. A. Lawal-Adebawale & O. Oyekunle**  
**Federal University of Agriculture, Abeokuta, Nigeria**

### **ABSTRACT**

The importance of education to individual and national development engendered the need for both quality teaching and learning by teachers and students respectively. To accomplish these objectives, digital education apps have become intensively deployed for teaching and learning in the school system. Based on the potential of integrating the digital apps for self-learning and academic tasks performance, this study examined the commonly exploited digital education apps for executing educational activities by agriculture students in the Federal University of Agriculture Abeokuta, Nigeria (FUNAAB). Using a stratified sampling technique, a total of 261 students were surveyed, and a validated and reliable questionnaire was used to obtain information on the commonly used digital education apps and its impact on their academic task performance. The study revealed that digital apps such as Wikipedia/Google engine, WPS/Office Pro, Notability, Calculator and Grammarly had significant impacts on the agro-students' academic tasks execution. The need to sustain and strengthen the use of the apps for academic tasks performance among the agro-students was recommended.

**Keywords:** *Digital education apps, academic tasks performance, agro-students, impacts of the digital apps*

### **INTRODUCTION**

Education plays a significant part in the intellectual development of individuals and the overall development of a nation. It serves as a means of training and integrating knowledge, critical thinking and professional skills in individuals that are enrolled in the formal school system. Attainment depends on the ability of teachers to ensure effective instructional delivery, to motivate and direct the students' learning experience (Bulger, Mohr & Walls, 2002; Ko, 2013), while actual learning depends on the self-learning efforts of the learners (Ejubovic and Puska, 2019; Hayat et al., 2020). According to Chuang and Crowder (2019), the self-learning effort is a strategy by which a learner takes charge of their own learning process or the ability of a person to formulate a plan and identify tools, resources and strategies needed to enhance one's learning (Geng, Law & Niu, 2019). This suggests that attainment of a good understanding of taught lessons and subject matter through self-learning could be enhanced through the provision of education-support resources in the school system, or around the learners to serve as learning aids. The availability of library resources and other teaching and learning aids likely play significant roles in this regard (Atieno, 2014; Ida, 2016; Banleman and Adjoa, 2017), and the emergence of digital education tools has become the main support for development of education resources by which self-learning and improved studying by students is realized.

Digital education tools, as noted by Beschoner (2020), are programmes, apps, and other software designed and operated on digital devices like laptops, iPads, and smartphones for educational purposes. In the same vein, Ruiz, and Gracia (2020), referred to digital tools as software and platforms that can be used to effect tasks such as writing, drawing, imaging, audio, and video recordings, by means of computers or mobile devices. According to Chauhan (2018), there are hundreds of digital education tools, which have been applied in teaching and learning in the global education system. Arising from the dynamic utility of information technology (IT), which underlies

the designs, functionalities and operations of digital education tools, these tools now exist in forms such as educational games (Brom, Preuss & Klement, 2011; Barab et al., 2012), video and audio recordings (Mayo, 2009; Bartee, 2016; Romaniuk, 2018); text-to-speech apps (Pappas, 2013), and several other e-learning tools (Ekarani, 2018).

Integration of digital tools in the educational system have not only revolutionised the teaching and learning process within and beyond the walls of classrooms, but have also given autonomy to students for self-learning, alongside facilitation of other educational tasks (Chauhan, 2018). For example, deployment of language-based digital tools for foreign language learning reveals that the tools have not only increased learners' attention toward learning but made it easier for new things to be learned. It also aids permanent retention of knowledge by learners with ease of recalling the lessons (Celik & Aytun, 2014). As further pointed out by Fokides (2018), integration of digital games for teaching mathematics enhances learning and performance among the learning groups. According to Conde-Caballero et al (2019), learners' access to blogs on food and nutrition was observed to have encouraged their interests in the subject basically because the blog provided them with detailed information on food content computation, using databases. It also provided the learners with the link to other sources of information on the subject matter for deeper learning.

Although, most digital education Apps could be deployed for self-learning by students, irrespective of their course of study, some Apps were designed for applications in specific subjects only. For instance, digital education Apps, such as *Agrilearner*, *Agricultural dictionary*, *Agriquiz*, *Agriquest*, *Agriance*, were designed for teaching and learning of agricultural courses in Tamil Nadu Agriculture University (TNAU). According to the Google Play Blog (2021), the *Agrilearner* App, which is a knowledge sharing platform, is designed for all BSc Agriculture undergraduate and also graduate students to serve as one of the master guides for agriculture students. With the App, the agro-students could get all the agriculture notes from the BSc to the MSc level; and as well obtain updates about new agricultural research as events unfold. The *Agriance* App, as indicated by Kumar and Karthikeyan (2019) provides old question papers, study material, syllabi, and PowerPoint files on important topics, and relevant articles with which the students could practice with mock tests in preparation for the main examinations. This notwithstanding, the general education Apps have had wide integration for learning by agro-students across the globe. The impact of the Apps has spurred on use of the technologies for learning among students in general.

The pervasiveness of digital education Apps and accessibility through the Internet made them available for use by students in the Nigerian education system. Although, the subject of interest and/or academic tasks to be performed by the students determines the types of digital tools or Apps they use, there is an increasing use of educational Apps among agriculture students in the Federal University of Agriculture Abeokuta (FUNAAB), Nigeria, for accomplishing certain academic tasks. The use is aided, not only by the increasing accessibility of computers and/or smartphones and Internet service to the students, but also by the availability of several educational Apps that could be freely downloaded from the Google Play Store. Arising from this observation, it becomes essential to take an appraisal of the commonly used digital education Apps, and academic tasks to which the Apps are deployed by the students. To following specific objectives guides this research:

1. Identify the commonly exploited digital education Apps by the students of agriculture in FUNAAB;
2. Examine the specific education tasks to which the digital Apps are deployed by the students;
3. Ascertain the extent to which the digital education Apps are deployed for academic tasks by the students.

## **METHODOLOGY**

The study was conducted in FUNAAB between the last quarter of 2018 and the first quarter of 2019. The university, which was established on January 1, 1988, is situated in Abeokuta, the capital of Ogun State, in the Southwest part of Nigeria. The institution has the mandate of training and developing intellectual capacity and production skills of individuals that may enroll to study agriculture and other science-based disciplines at the university. On admission, the students are placed in various Departments across the Colleges of Agriculture, namely the College of Animal Science (COLANIM), the College of Plant Science (COLPLANT) and the College of Agricultural Management and Rural Development (COLAMRUD). However, all students take a general training programme on agricultural production and management until they get to the final year or the 500 level when each of them takes more courses and their research projects in their respective Departments. The mode of training includes instructional delivery and practical training in laboratories and fields/farms for knowledge acquisition on the principles and practice of agriculture and field application of the knowledge for farm enterprise production and management. The agricultural programmes are run on a semester basis with a curriculum plan of 10 semesters or 5 academic sessions for completion of the programmes.

Although, Information and Communication Technologies (ICT) is pervasive in Nigeria and its education system has made most of the students ICT compliant, FUNAAB made it mandatory to provide ICT training for all newly admitted students with a view to enhancing their capacity for ICT usage for both academic and administrative tasks at the university (Lawal-Adebowale and Oyekunle, 2021). The students are exposed to and acquire the skills for use of digital education apps with which they could execute certain academic tasks. In addition, a preliminary survey of digital education App usage among the students showed that many of them make use of one form of the education Apps or the other, specific to their subjects for study.

### **Study population and sampling procedure**

The study population consists of the students registered in the agriculture programmes at FUNAAB in the 2018/2019 academic session. The records from the university's Information and Communication Resources Centre (ICTREC) indicate that 5, 976 were registered. A sample of 361 of the students were selected, using stratified sampling technique, which made it possible to have a fair representation of all the students across the three Colleges of Agriculture, Departments and levels or year of study. The sample size of 361 was arrived at using Watson (2001) sample size determination charts at 96% confidence interval, 10% variability and +3 margin error. However, following distribution of the questionnaires, 261 were assessed as useful for analysis in this study; and all the uncompleted questionnaires were discarded. The distribution of the 261 students in the sample across the levels was as follows: 83 students in the 500 Level (student in fifth year of the programme); 61 in the 400 Level or fourth year; 53 in the 300 Level or third year; 38 in the 200Level or second year; and 26 in the 100 Level or first year of the programmes. The sample included a larger proportion of students in the higher levels than the lower levels (500 to 100 Level) given the higher number of digital education Apps used by students in the higher levels than the lower levels at the University.

### **Measurement of variables**

Variables such as commonly used digital education Apps were dichotomously measured (nominal level of measurement) using yes and no as indicators. This was found appropriate to ascertain the actual digital Apps used and not used by the students. Fourteen (14) related Apps (Wikipedia/Google engine, WPS/OfficePro, EasyBib, Quizlet, Google Drive, E-books. Evernote, Notes, Notability, Dictionary, Calculator, YouTube, Grammarly, and Calendar/doodle) were

identified using a preliminary survey of digital Apps usage by the students. The outcome of the dichotomous responses on the specific Apps used by the students were thus reflected by frequencies and percentages.

In addition, academic tasks were measured by categorizing into five sub-groups, namely, sourcing and accessing academic information (with 3 items), note taking at lectures (3 items), scheduling, and tracking of academic activities (3 items), execution of academic exercises (6 items), and grammatical learning (4 items). Interval level measurements were used to reflect how often the Apps were used for academic tasks; using a 4-point rating scale with options of Hardly Done (HD=1), Occasionally Done (OD=2), Intermittently Done (ID=3) and Mostly Done (MD=4). Based on the rating scale of 1 to 4, the mean scores of 1-1.75; 1.76-2.59; 2.6-3.25; and 3.26-4.00 were used to explain the degree or extent of variance in the academic tasks that were executed with the digital education Apps by the students.

### **Data collection**

Data were collected from the sampled students using a validated and reliable questionnaire. The data included the commonly used digital education Apps by the agro-students, specific academic tasks to which the digital Apps were deployed and impact of the digital Apps on the students' educational task performance. The questionnaire was subjected to face and content validity whereby resource persons in education practice and ICT in education assessed the listed items to be sure that the study objectives were addressed by the items. The content validity was ascertained by ensuring that the items on the questionnaire were adequate or comprehensive to capture each of the study objectives. Reliability of the data gathering instrument was established through a pre-study survey in which the questionnaire was administered to a purposively sampled group of 30 agriculture students at the university. Scrutiny of responses to the items in the questionnaire was used to rework the questionnaire in order to ensure appropriateness of the measuring items for the eventual study. This was attained by removal of redundant items and ambiguous statements, or the statements were simplified for clarity and informed responses.

### **Data analysis**

The data obtained were subjected to analysis using both descriptive and inferential statistics to obtain results for interpretation and explanation of the agro-students' responses. Using descriptive statistics such as frequency counts, percentages and means, the responses of the agro-students were categorised for discussion of the findings and to guide explanation of the responses. Inferential statistics included the one-tail chi-square and Loglinear correlation tests. The one-tail chi-square test was found appropriate because use of the digital Apps was measured at the nominal level, and because it allows for the test of variance between those using and not using a particular App. By scaling down the variables measured at interval level to ordinal level, it became possible to use the Loglinear correlation to test the association between the ordinal variables and the nominal ones. Consequently, the Loglinear correlation tool was used to test the correlation or association between the digital Apps and the academic tasks to which the Apps were deployed by the students in the survey.

## **RESULTS AND DISCUSSION**

### **Personal characteristics of respondents**

Table 1 shows the personal characteristics of respondents in which a little more than half (59.8%) of the surveyed agro-students were male, with a modal (52.9%) age range of 20-24years. All the respondents had achieved the West African School Certificate (WASC) with 19.9% of them having the National Diploma (ND) or National Certificate of Education (NCE), and 8.1% had the Higher

National Diploma (HND) as added certificates. With the acquired certificates, a modal proportion (61.7%) of the students gained admission into FUNAAB's degree programmes from the 100 Level, and a few (25.7%) did so through the pre-degree programme of the university. The least proportion (11.5%) of the students gained admission by direct entry, either at 200 Level or 300 Level. The academic performance of the students was reflected by their CGPA range of 3.50 to 4.49. The lowest proportion (4.2%) of them were high performing students with CGPA of 4.50 out of the obtainable 5.00.

The observation of more male students than females in the study may be due to skewness of the sampled population. Studies (such as by Lawal-Adebowale and Oyekunle, 2014; NUC, 2017) have consistently shown that more male students enroll in agriculture programmes than their female counterparts across the country. This is because the agricultural profession is relatively less attractive to females as a course of study. However, most of the surveyed students were relatively young, with the desire to learn the rudiments of agricultural practice for skill development, and competence for professional practice on graduation. Acquisition of the WASC by all the respondents was obvious because the certificate, which is acquired on completion of secondary school education, and it is a requirement for any candidate to take the Unified Tertiary Matriculation Education (UTME) – a national examination for admission into any of the post-secondary school educational institutes in Nigeria for tertiary education.

The WASC, though qualifies an individual for admission into the pre-degree programme at FUNAAB without the UTME, but both (WASC and UTME) are required for admission into the core degree programmes of the university, particularly in the first year or 100 Level. The added certificate(s) on the other hand, specifically ND or NCE, which are obtained on completion of two years of study in Polytechnics or three years of study in Colleges of Education, respectively, qualifies an individual for admission into the 200 Level or second year of the agriculture programmes. The HND, which is obtained on completion of four years of study in Polytechnics, qualifies one for admission into the 300 Level or third year of the programmes. While both WASC and UTME were required for admission into the 100 Level or first year of the agriculture programmes, admission by direct entry requires the WASC and upper credit in ND/NCE and HND. Variance in the students' pre-university academic background thus underlies the observed differences in their mode of admission into the university in the same period. Cumulative grade point average (CGPA) shows that a modal proportion (42.1%) of them were average students with the CGPA range of 2.40-3.49 and a few (28.4%) of them were above average.

**Table 1:** *Personal characteristics of respondents*

<b>Variables</b>	<b>Freq</b>	<b>%</b>
<b>Sex</b>		
Male	156	59.8
Female	105	40.2
<b>Age</b>		
≤ 19	62	23.8
20 – 23	138	52.9
24 – 27	49	18.8
≥ 28	12	4.5
<b>Acquired certificate</b>		
WASC	188	72.0
ND/NCE	52	19.9
HND	21	8.1

<b>Mode of entry</b>	69	26.4
Pre-degree	163	62.1
UTME	30	11.5
Direct entry		
<b>CGPA</b>	14	5.4
1.0 – 1.99	52	19.9
2.0 – 2.39	110	42.1
2.4 – 3.49	74	28.4
3.5 – 4.49	11	4.2
≥ 4.5		

Variance in the academic performance of the students depends on the academic prowess of each of them, in terms of their understanding of taught lessons, status of assimilation and retentive memory, preparation drive for examinations, and good understanding of examination questions. In addition, performance of the students depends on the learning strategies and other resources at their disposal for learning, good literary skills and expression of thought. This is in line with the observation by Sothan (2019) that these variables, alongside class attendance, study effort, self-efficacy and family socioeconomic status are positively associated with academic performance.

#### Commonly exploited digital Apps for academic tasks by FUNAAB agro-students

Among the array of existing digital education Apps in today's world of information technology, the data in Table 2 shows the common digital Apps used by the agro-students surveyed for executing certain academic tasks. Outstanding among them were the Wikipedia/Google Engine (96.9%), EasyBib (90.4%), You Tube (93.1%) and Grammarly (94.6%). Other educational Apps with a high degree of usage among the respondents include E-book (80.1%), Dictionary (75.5%), Calculator (77.0%), Google Drive (66.3%) and Notability (56.3%). These data suggest their usefulness for fulfilling certain academic tasks. Wikipedia served as a useful source of information to the students on several subjects of interest, with them using the App to develop term papers, project write ups and for presentations by the students. WPS (Word, Presentation and Spreadsheets)/Office Pro served the useful purpose of accessing Portable Document Files (PDF) and word documents for reading at convenience. You Tube served as the video platform where information is sourced for deep learning of a particular subject matter.

**Table 2:** Commonly used digital education apps by agro-students

Variables	Freq	%
<b>Digital edu Apps*</b>		
Wikipedia/Google search	253	96.9
WPS/OfficePro	236	90.4
EasyBib	197	75.5
Quizlet	119	45.6
Google Drive	173	66.3
E-books	209	80.1
Evernote	121	46.4

Notes	114	43.7
Notability	147	56.3
Dictionary	197	75.5
Calculator	201	77.0
YouTube	243	93.1
Grammarly	247	94.6
Calendar/doodle	117	44.8
<b>Type of phones</b>		
Apple	7	2.7
Nokia	46	17.6
Samsung	35	13.4
Infinix	54	20.7
Techno	89	34.1
Others	30	11.5
<b>Phone operating systems</b>		
Android	185	70.9
Windows	69	26.4
IOS	7	2.7

**\*Multiple responses**

Alongside learning, is the need for the students to write for presentations and assessment throughout their period of schooling. With English as the official language for communication in the Nigerian schools, every student is expected to have good grasp of the language both in speaking and writing; thereby necessitating their use of Grammarly to correct grammatical and typographical errors in their writing. In line with this is the wide use of the dictionary for checking the meaning of words and to better understand the vocabulary they might come across while studying. The use of E-books affords the students the opportunity to have access to online books for consultation with a view to enriching their knowledge of taught lessons. With open access of certain publications, most of the students sourced free downloadable E-books for reading and referencing. Due to the need for execution of computational tasks in many of the agricultural courses, such as econometrics, statistics in agriculture, and computation of weighed samples in practical and/or experimental activities, the agro-students heavily relied on the use of the calculator App for computation of mathematical related tasks. In view of the danger of losing information or data because of a computer crash or loss of portable storage devices, the students resorted to saving their documents in the Google Drive as online backup. The need for annotation of key points while reading and revision of notes and books underscore the use of the android-compliant Notability App by the surveyed students.

Other digital Apps of value used by a lower proportion of the students include Note (43.7%), Quizlet (45.6%), Evernotes (46.4%) and Calendar/Doodle (44.8%). The use of these digital Apps by the students is underscored by several factors. For instance, interactive discussion with the

respondents revealed that it is inconvenient to record lectures due to interference of emerging noises from fellow students, and it becomes cumbersome to have all lectures always recorded. Similarly, it was inconvenient to use the Notes App for extensive note taking, and as such, it is rather used for short notes, memos, and documentations. The use of the Calendar/Doodle app is underscored by the fact that there is little or no need for frequent scheduling of academic activities by the students. The App was however used for the design of the lecture timetable and schedule of other academic programmes of importance to the students.

Usage of the digital educational Apps by the agro-students was made possible by their access to smartphones using operating systems such as IOS, Android and Windows. Among the brands of smartphones used the students, Techno is the most common brand among the students (34.1%), followed by Infinix (201.7%) and Nokia (17.6%). These brands of phones were relatively cheap and affordable to most students than the Apple and Samsung brands. Only a low proportion of the students, 2.7% and 13.4% respectively could afford the brands of Apple and Samsung phones, respectively. This observation implies that the students, although they found the smartphones important for both their social relations and academic engagement, went for cheaper smartphones, if it could satisfy their communication and educational needs. Utility of the smartphones however depends on their embedded operating system as certain Apps could only function with a specific operating system. Many utility Apps are Android operating system compliant, and as such, a modal proportion of the surveyed students (70.9%) owned Android-based smartphones with 26.4% of them owning Window-based smartphones and 2.7% had IOS-powered smartphones.

### **Academic tasks for which digital educational apps are used by respondents**

The academic tasks for which the digital education Apps were used by the agro-students surveyed were: sourcing of academic information; notes and information taking during lectures; scheduling of academic activities; execution of academic exercises, and grammatical learning. In the context of sourcing information for academic activities the Apps were intermittently used for sourcing of more information on taught lessons ( $\bar{x} = 3.20$ ; SD = 0.92); sourcing of information for project and term paper development ( $\bar{x} = 3.04$ ; SD = 0.98); and sourcing of information for take-home academic work ( $\bar{x} = 2.98$ ; SD = 0.95). The act of sourcing for academic information, using Wikipedia and search engine like Google, is a common trend among the students. The information is usually needed to improve their knowledge of subjects or develop a term paper and any other take-home assignment.

Integration of digital Apps for notes and information during lectures was facilitated by the intermittent use of mobile phone cameras for image and note capturing ( $\bar{x} = 3.03$ ; SD = 0.91); occasional use of the Apps that support voice or video recording of lectures ( $\bar{x} = 2.46$ ; SD = 0.96), and the Apps that support texting and/or note writing ( $\bar{x} = 2.41$ ; SD = 1.05). Interactive discussion with the surveyed students on photographic capturing of field images, written notes or pasted information on notice boards was informed by the ease of documentation and retrieval of such images and information when needed, and on the other hand, saved them the longer time it would have taken to write the notes and to retrieve them from paper documentation. However, integration of the video-audio digital App saw lesser usage among the students, as it was occasionally used for recording and playing back the recorded lectures where it is convenient to do so. In as much as the students preferred writing notes on their phones, the occasional use of the Notes App for this purpose was underscored by the inconvenience of typing with the use of the phones' digital keyboards, which slowed writing ability. Those students who used a stylus, particularly those making use of tablets, however found it a lot better to write directly on the phones.

The need to schedule certain academic activities by the agro-students informed their intermittent usage of digital Apps for scheduling of examination ( $\bar{x} = 3.13$ ; SD = 0.87) and lecture timetables ( $\bar{x} = 2.71$ ; SD = 1.03); and keeping track of class and take-home work assignments ( $\bar{x} = 2.60$ ; SD =

1.07). Usage of the activities-scheduling Apps is underscored by the fact that most of the academic activities are time bound. Consequently, it becomes essential to have a schedule for lecture attendance and participation in examination sessions. Failure of the students to have and monitor scheduled timetables for both lectures and examinations will imply missing out of the educational activities with consequential effects on their academic performance. Notation of academic activities using the digital Notes and/or the Calendar Apps is crucial to ensuring timely execution of class and take-home academic tasks.

In Table 3 below, the students used some essential Apps intermittently for checking typographical and correcting grammatical errors in written expressions ( $\bar{x} = 3.00$ ;  $SD = 0.97$ ), searching of images or pictorial representations of objects for learning ( $\bar{x} = 2.92$ ;  $SD = 0.98$ ); viewing practical demonstrations or tutorials on specific subjects ( $\bar{x} = 2.88$ ;  $SD = 0.98$ ), notation of key points in notes and manuscripts ( $\bar{x} = 2.84$ ;  $SD = 1.05$ ), computation of mathematical tasks ( $\bar{x} = 2.72$ ;  $SD = 0.94$ ); and reading and revision of lesson notes ( $\bar{x} = 2.69$ ;  $SD = 1.07$ ). The digital Apps used for these academic tasks, include Grammarly, the Internet, YouTube, Notability and Calculator. Grammarly, was used intermittently by the students to check and minimise grammatical and typographical errors thereby improving their written expression, while the Internet was used to seek images of certain objects for visual learning and better understanding of a subject matter. On the other hand, the YouTube App was used for viewing practical demonstrations and further learning on a taught subject. Given that certain agricultural courses are mathematical in content and composition, the agro-students intermittently used the phone-based calculator for computations. Usage of the digital Calculator App is underscored by the fact it hastens the pace of computations and saves a lot of time that would have been spent if such computations were to be manually done. The need to access online manuscripts designed in different formats underscored the use of digital WPS, Office Pro and the Notability Apps among the surveyed agro-students. With these Apps, it becomes possible for the students to access documents in any of the Microsoft formats (word, PDF, and spreadsheets) for reading. On another note, the App equally made it possible for the students to prepare their manuscripts in any of the Microsoft formats for online distribution or sent by mail to designated persons.

Another digital App of value to reading by the agro-students is the digital Dictionary which, in most cases are downloaded from the Google Play Store platform. The students found the dictionary App useful for grammatical improvement and as such used it intermittently for learning the correct pronunciation of words ( $\bar{x} = 2.81$ ;  $SD = 1.02$ ), build their vocabulary for usage ( $\bar{x} = 2.80$ ;  $SD = 0.95$ ), and for ensuring good oral grammatical presentations ( $\bar{x} = 2.76$ ;  $SD = 1.06$ ). Alongside this is the use of the App for seeking the meaning of technical word and vocabularies ( $\bar{x} = 2.75$ ;  $SD = 0.97$ ). Given that English is the official language for teaching in Nigeria's education system, use of the Dictionary App becomes essential to the students for good grasp of grammar and improved written and oral expressions.

**Table 3.** Academic tasks to which digital apps are deployed by respondents ( $n = 261$ )

Variables	$\bar{x}$	SD
<b>Usage for academic information sourcing</b>		
Sourcing of more information on taught lessons and homework	3.20	0.92
Sourcing of electronic books and publications	2.98	0.95
Sourcing of information on project and tern paper development	3.04	0.98
<b>Usage for note and information taking during lectures</b>		

Voice or video recording of lecture deliveries	2.46	0.96
Documentation of notes and information by text	2.41	1.06
Photographic taken of notes and information	3.03	0.91
<b>Usage for schedule of academic exercise</b>		
Keeping tracks of class and home work	2.60	1.07
Monitor examination schedule for preparation	3.13	0.87
Schedule of reading time table	2.71	1.03
<b>Usage for execution of academic exercise</b>		
Computation of mathematical tasks	2.72	0.94
Reading and revision of lesson notes	2.69	1.07
Notations of key points in notes and manuscript	2.84	1.05
Seek practical demonstration or tutorials on specific subjects	2.88	0.98
Seek image or pictorial representations of objects for learning	2.92	0.98
Conduct of checks for typographical and grammatical errors in write ups	3.00	0.97
<b>Deployed for grammatical learning</b>		
Seek meaning of technical words and vocabulary	2.75	0.97
Seek correct pronunciation of words	2.81	1.02
Need improved vocabulary	2.80	0.95
Drive at ensuring good oral grammatical presentations	2.76	1.06

*Hardly Done (HD) 1-1.75; Occasionally Done (OD) 1.76-2.59; Intermittently Done (ID) 2.6-3.25; Mostly Done (MD) 3.26-4.00*

### **One-tail Chi-square test of variance among the digital education Apps used by the agro-students**

The one-tail Chi-square test of variance among the commonly used digital education Apps by the surveyed agro-students (shown in Table 4 below) revealed a significant variance between usage and non-usage of the Apps at  $p < 0.05$  level. Out of the 14 Apps, a significance variance of usage was observed among 11 of them, constituting 78.6%. With this observation, it implies that, digital education Apps such as Wikipedia/Google search ( $\chi^2 = 229.98$ ,  $df = 1$ ) WPS/OfficePro ( $\chi^2 = 170.57$ ,  $df = 1$ ); EasyBib ( $\chi^2 = 67.77$ ,  $df = 1$ ); Google Drive ( $\chi^2 = 27.68$ ,  $df = 1$ ); E-books ( $\chi^2 = 94.44$ ,  $df = 1$ ); Notes ( $\chi^2 = 4.17$ ,  $df = 1$ ); Notability ( $\chi^2 = 4.17$ ,  $df = 1$ ); Dictionary ( $\chi^2 = 67.77$ ,  $df = 1$ ); Calculator ( $\chi^2 = 76.17$ ,  $df = 1$ ); YouTube ( $\chi^2 = 193.96$ ,  $df = 1$ ); and Grammarly ( $\chi^2 = 208.00$ ,  $df = 1$ ) had intensive integration for academic activities among most of the students surveyed. The usage is based on the students' perceived usefulness of the Apps in fulfilling or executing specific academic tasks; with a view to bringing about improved learning and better performance. The non-significant variance in the usage of Apps such as Quizlet ( $\chi^2 = 2.03$ ,  $df = 1$ ); Evernote ( $\chi^2 = 4.17$ ,  $df = 1$ ); and Calendar/Doodle ( $\chi^2 = 4.17$ ,  $df = 1$ ), at  $p < 0.05$ , implies that the Apps may have been of lesser relevance to the usual academic tasks performed by the students.

**Table 4:** One-tail Chi-square test of variance among digital education Apps used by the agro-students ( $n = 261$ )

Variables	$\chi^2$	Df	$p < 0.05$
<b>Digital edu Apps*</b>			
Wikipedia/Google search	229.98	1	0.000
WPS/OfficePro	170.57	1	0.000
EasyBib	67.77	1	0.000
Quizlet	2.03	1	0.155
Google Drive	27.68	1	0.000
E-books	94.44	1	0.000
Evernote	1.38	1	0.240
Notes	4.17	1	0.041
Notability	4.17	1	0.041
Dictionary	67.77	1	0.000
Calculator	76.17	1	0.000
YouTube	193.96	1	0.000
Grammarly	208.00	1	0.000
Calendar/doodle	2.79	1	0.095

#### **Loglinear correlation test of association between the digital education Apps and academic task performance**

In Table 5 below the results are shown of the loglinear correlation test of association between the commonly used digital Apps and the academic tasks performed by the agro-students. The summed academic task performance shows a positive and significant association with Apps such as Wikipedia/Google search engine ( $r = 0.025$ ), WPS/Office Pro ( $r = 0.022$ ), Notability ( $r = 0.000$ ), calculator ( $r = 0.005$ ), and Grammarly ( $r = 0.004$ ). With these outcomes, it implies the digital education Apps were crucial to fulfilling many of the academic tasks by the students. In other words, the Apps had intensive use for enhancing learning and as such, were conscientiously used for academic activities such as information sourcing and accessibility, noting or highlighting of key points when reading ( $r = -0.049$ ). Apps such as Google Drive ( $r = -0.024$ ), E-book ( $r = -0.032$ ), Notes ( $r = -0.028$ ) and You Tube ( $r = -0.014$ ) had a significant but negative correlation with the academic tasks performed by the students. The observed inverse association implies that the Apps though essential to accomplishing certain academic activities, were either occasionally or less used by the students. This may have been because of lesser engagement of the students in academic tasks that require regular use of any of these Apps.

**Table 5:** Loglinear correlation of association between the exploited digital education Apps and academic task performance

Edu Apps Variables	Acad task1	Acad task2	Acad task3	Acad task4	Acad task5	Sum acad task
Wikipedia/Google search	-0.278	-0.329	-0.320	-0.278	-0.225	-0.025
WPS/OfficePro	-0.082	-0.014 <sup>^</sup>	-0.074	-0.136	-0.060	-0.022 <sup>^</sup>
EasyBib	-0.220	-0.219	-0.191	-0.106	-0.118	-0.110
Quizlet	-0.146	-0.153	-0.101	-0.032 <sup>^</sup>	-0.004 <sup>^</sup>	-0.049 <sup>^</sup>
Google Drive	-0.022 <sup>^</sup>	-0.042 <sup>^</sup>	0.002 <sup>*</sup>	0.058	-0.020 <sup>^</sup>	-0.024 <sup>^</sup>
E-books	0.018 <sup>*</sup>	0.038 <sup>*</sup>	0.023 <sup>*</sup>	0.004 <sup>*</sup>	-0.161	-0.032 <sup>^</sup>
Evernote	0.000 <sup>*</sup>	-0.056	-0.013 <sup>^</sup>	0.094	-0.073	0.038 <sup>*</sup>
Notes	0.026 <sup>*</sup>	-0.149	-0.047 <sup>^</sup>	0.030 <sup>*</sup>	-0.064	-0.028 <sup>^</sup>
Notability	0.011 <sup>*</sup>	0.022 <sup>*</sup>	0.028 <sup>*</sup>	-0.011 <sup>^</sup>	0.030 <sup>*</sup>	0.000 <sup>*</sup>
Dictionary	-0.231	0.326	0.096	0.314	-0.354	0.076
Calculator	-0.192	0.022	-0.136	-0.001 <sup>^</sup>	-0.105	0.005 <sup>*</sup>
YouTube	-0.251	-0.048	-0.026 <sup>^</sup>	-0.076	-0.118	-0.014 <sup>^</sup>
Grammarly	-0.303	-0.329	-0.002 <sup>^</sup>	0.018 <sup>*</sup>	-0.207	0.004 <sup>*</sup>
Calendar/doodle	-0.326	-0.051	0.157	0.298	-0.067	0.210

<sup>\*</sup>Direct significant association

<sup>^</sup>Inverse significant association

A breakdown of the academic tasks into information sourcing (acad task 1), note and information taking at lectures (acad task 2), scheduling, and tracking of academic activities (acad task 3), academic exercise execution (acad task 4) and grammatical learning (acad task 5) and their cross-tabulation with the digital education Apps, shows a varying level of significance at  $p < 0.05$  level (Table 5). The results shows a positive and significant association between information sourcing (acad task 1) and Apps such as E-books ( $r = 0.018$ ), Evernote ( $r = 0.000$ ), Notes ( $r = 0.026$ ), and Notability ( $r = 0.011$ ). These outcomes imply that the Apps are important to the students' academic tasks, and they use the apps to access essential information for learning. For instance, the Evernote App enables the students to write notes and organise the notes into notebooks with possible categorisation into topics, which could as well be saved online (Hamburger, 2012). With the Note App, short pieces of information are documented and retrieved from the mobile smart phones, as may be necessary, by the students. Observation of a significant but inverse association between the Google Drive App ( $r = -0.022$ ), and information sourcing suggests that the App plays an important role in online information documentation and retrieval among the students. The inverse relationship however suggests that a lesser proportion of the students used this App for information sourcing or documentation possibly because the App could not be operated offline as Internet service is required for both uploading and downloading of saved documents from the App.

The E-books ( $r = 0.038$ ), and Notability ( $r = 0.022$ ) Apps were positively and significantly related to note and information taking (acad task 2). This suggests that, with the E-books App, the students were able to easily source and access relevant academic information to support the notes and information captured during the lecture hours. According to Dube (2019), an E-book could be created by typing documents and converting to the cloud using an E-book editor. In the same vein, the Notability App helps the students with note taking by typing, writing, drawing, and highlighting

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key points of interest in different colours (Common Sense Education, 2018). The Google Drive ( $r = -0.014$ ) and WPS/Office Pro ( $r = -0.042$ ) Apps also had a significant but inverse relationship with note and information taking. This implies that while both Apps were thought important for usage in the execution of academic tasks, they had little application for taking or writing notes and information during lectures. These Apps largely support academic tasks such as saving and retrieving information online and accessing documents in word, PDF, excel and PowerPoint formats.

Examination of the association between the digital Apps and scheduling or tracking of academic activities (acad task 3) showed a positive significant association with the Google Drive ( $r = 0.002$ ), E-book ( $r = 0.023$ ), and Notability ( $r = 0.028$ ) Apps at  $p < 0.05$  level. Although the Google Drive App functions as an online storage device, the App made it possible for information to be tracked for usage or review, as and when so desired by the students. Instead of having to take a laptop or a flash drive everywhere, the Google Drive App made it possible for users to access stored documents anywhere and anytime, if Internet service is available at the location (Alghini, 2014). With other features of the App, such as documents, sheets, slides, and drawings utilities, it is conscientiously used by the students for scheduling 'to-do-lists' of academic activities. The inverse but significant association between scheduling or tracking of academic activities (acad task 3) and digital education Apps such as Evernote ( $r = -0.013$ ), Note ( $r = -0.047$ ), YouTube ( $r = -0.026$ ), Grammarly ( $r = -0.002$ ) at  $p < 0.05$  level, suggests that these Apps, though useful to the students, had little or no usage for scheduling of academic activities.

Tests of association between academic exercise execution (acad task 4) and the digital education Apps showed a positive significant association with the E-book ( $r = 0.004$ ), Note ( $r = 0.030$ ), and Grammarly ( $r = 0.018$ ) Apps. This outcome implies that these Apps play significant roles in the academic activities performed by the students. With the potential of the Evernote App for writing and storing notes, the App certainly made it possible for the students to access their notes for reading and revisions whenever the need arose. According to Mann (2012), the Evernote App makes it possible for users to collect a variety of texts either by copy-and-paste or drag-and-drop into a new note, thereby creating a new note from selected texts. In the same vein, the Note App enables the users to create plain text or notes, even with photos, audio, and videos, and to conveniently save and retrieve from their smartphones or tablets. The Grammarly App plays an important role in the correction and elimination of grammatical and typographical errors. Its potential for assisting with writing enhances its use for notes or writing up short pieces of information among the students surveyed. The inverse but significant association between the execution of academic exercise (acad task 4) and digital Apps such as Quizlet ( $r = -0.032$ ), Notability ( $r = -0.011$ ) and Calculator ( $r = -0.001$ ) at  $p < 0.05$  level suggests that the Apps were of significant value to the students in academic activities, such as self quizzes on specific subjects, taking and reading of notes, and computation of mathematical tasks; but had less applications for these academic tasks.

A cross tabulation for the test of association between the agro-students' grammatical competence (acad task 5) and the Apps used shows a positive and significant association with Apps such as Notability ( $r = 0.030$ ), Dictionary ( $r = 0.035$ ) and Grammarly ( $r = 0.027$ ) at  $p < 0.05$  level. With these observations, it implies that the Apps had intensive application for grammatical learning among the students with most of them using Grammarly for detection and correction of typographical and grammatical errors. The Dictionary App served the useful purpose for finding the meaning of words and vocabulary and determining the correct pronunciation of words. The Notability App served the useful purpose of note organisation and annotations. Emphasising the importance of the Grammarly App for grammatical competence, Karyuatry (2018), noted the importance of the App as an appropriate tool for minimisation of errors and improvement of quality writing among learners. The inverse but significant association observed between grammatical competence and Apps such as Quizlet ( $r = -0.004$ ), and Google Drive ( $r = -0.020$ ) implies that the Apps were used for developing

competence among the students. Although the Quizlet App is essential to improving the learners' vocabulary as proven in a posttest experiment on a learning group by Sansosi (2018), the App was applied less by the students surveyed in this study.

## CONCLUSION AND RECOMMENDATIONS

The appraisal of digital education Apps used for academic task execution by the agriculture students in FUNAAB showed that the students used several of the emerging digital education Apps for self-learning and execution of certain academic tasks. This was aided by student access to smartphones, laptops, and Internet services, provided either by the University or subscribed to from the mobile phone network service providers in the country. Although, most of the digital Apps were less used among the students, the Loglinear correlation test of the Apps and executed academic tasks showed that the Apps were of great value to the students and they enhanced the students' tasks of information sourcing, taking of notes and information during lectures, scheduling and tracking of academic activities, execution of academic tasks, and grammatical learning. This implies that, with quality Internet services, accessibility and affordability of the digital Apps and Smartphones, and possibly with good understanding of the applications, the students will make use of the digital Apps in their quest of for improved learning and the performance of academic tasks. In view of this, the study is recommending the need for the FUNAAB administration and every other school system to create the enabling environment for digital App access and use by the learning groups or students to enhance the execution of their academic tasks. This may call for university-based subscription for relevant digital education Apps such that students could download them for use; and where possible, provide them with technical training for use of such Apps in their academic tasks. For further studies, the authors recommend the need for experimental tests of the impact of the digital education Apps on knowledge acquisition and academic performance of the students.

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