International Journal of Information Science and Management
Vol. 20, No. 2, 2022, 15-34
https://dorl.net/dor/20.1001.1.20088302.2022.20.2.2.7

Original Research

Design of a Mobile Application for Providing Information to Advanced Level Students in Uganda

Ninyikiriza D. Lynn
Student of Magister Informatika, Universitas Atma Jaya Yogyakarta, Indonesia
dninyikiriza000@gmail.com
ORCID iD: https://orcid.org/0000-0002-4370-9226

Andi W. R. Emanuel
Associate Prof. Magister Informatika, Universitas Atma Jaya Yogyakarta, Indonesia
Corresponding Author: andi.emanuel@uajy.ac.id
ORCID iD: http://orcid.org/0000-0002-9723-334X

Pranowo Pranowo
Associate Prof. Magister Informatika, Universitas Atma Jaya Yogyakarta, Indonesia
pranowo@uajy.ac.id
ORCID iD: https://orcid.org/0000-0002-2509-1338

Received: 03 March 2020
Accepted: 29 May 2021

Abstract

Education is the key to success in the existing world. Providing necessary information to students at the right stage of education that determines their future is useful to students, simplifies work, and reduces responsibilities for educators. Unfortunately, the existing ways of providing information to A'Level students in Uganda are unmodernized, and thus, important information is inadequately accessible to the students. Because of this, most students make uninformed decisions and study without focus. A prototype mobile application was designed to enable A'Level students to access necessary information about qualifications requirements, study materials, subjects, schools, etc. A rule-based method was also used to help students choose subjects that match their desired career options. The user interface design process followed a User-Centered Design approach to meet the students' requirements. SPSS software was used for analyzing the data, and results were obtained. The evaluation of the design showed that 95.76% of Advanced Level students who were participants agreed with the designed application prototype. This result indicated that A'Level students are interested in using mobile application technology to access information. This prototype design will ease students' getting information and ease educators' work, thereby saving the time wasted in attending to students physically to deliver all the necessary information.

Keywords: Information Systems, Mobile Application, A'Level students, Rule-based Method.

Introduction

In this era of education, the use of digital information and its antecedent factors continue to affect students and their learning outcomes significantly. According to Kochungu & Migunde (2011), the current era of knowledge advancement requires thorough career planning and adequate access to related career information. This plan helps in adjusting to today's evolving

socio-economic condition. This important information can be accessed using recent technologies such as mobile applications. Mobile applications are believed to have numerous benefits to students, such as ease of access to educational materials (Law, Thome, Lindeman, Jackson & Lidor, 2018), improving students' knowledge, raising students' confidence and self-efficacy, and lowering their levels of anxiety in learning activities (O'Connor & Andrews, 2018). More so, mobile applications use can be an effective method to equip students with practical skills (Kim & Suh, 2018; Salahli, Yildirim, Gasimzadeh, Alasgarova & Guliyev, 2017), improve students' language vocabulary (Hao, Lee, Chen & Sim, 2019; Llema & Vilela-Malabanan, 2019), and help students to think critically (Ismail, Harun, Zakaria & Salleh, 2018). In Uganda, while a few Advanced Level students luckily know and concentrate on what they want to become in the future and satisfy their wishes by luck, it is the other way around with most students. Most students do not put enough effort into choosing and aiming at subjects that match career options that suit them. This observation is mostly caused due to a lack of adequate information; thus, the students make uninformed decisions. In this manner, they pick the wrong subjects they cannot handle and fail to join university or drown in the wrong majors contrary to their wishes.

While the Ugandan Government has introduced universal primary and secondary education, this recognizes the importance of education. However, students in Ugandan secondary schools still lack adequate information concerning their education and future goals. This situation has caused school dropouts as some children start school late, and others over age throughout their school life and drop out early. While almost every child enrolls at the start of primary school, only 49% percent enter secondary school, and only 10% complete all six years of secondary school (McMullen & McMullen, 2018). Therefore, the Education system performance indicators in Uganda are generally low. Even though Uganda releases thousands of students from the Advanced Level of secondary school to join Universities every year, most of these students still face difficulties selecting higher education majors. This condition is because a student's advanced-level performance is the main determinant for joining university education. However, many students fail to join university due to several factors, including the Uganda Advanced Certificate of Education (UACE) exams, failure to be enrolled in their desired courses, etc. Some of these students end up going for professions at the certificate level, such as nursing, nursery teaching, building, and construction skills, etc. (Abedi, Ogwal, Pintye, Nabirye & Hagopian, 2019). This condition is caused by a lack of access to the necessary information while students are in the advanced level education stage. This important information includes knowledge about subject choice, career options, access to adequate study materials, etc.

Currently, Advanced Level students physically rely on approaching teachers to attain information concerning the subject choice, qualifications, questions about study materials, career options, and many others. On the other hand, most students do not even bother to approach the teachers or visit the career guidance offices to get the necessary information, they end up choosing subjects on their own or following their parents and friends' decisions, and this could be contrary to their abilities handle the subjects, or these subjects could end up not meeting their career desires. What is more, for students who try to consult, the information attained is inadequate to help students since the teachers are too busy and have to teach all day long and thus do not provide details of the information to the students yet, this information is very necessary for the students to pass A'Level and join University education. Therefore,

students need to be provided with adequate information-seeking capabilities and reliable digital information sources to effectively improve their academic performance learning experiences and ease work for educators (Pensabe-Rodriguez, Lopez-Dominguez, Hernandez-Velazquez, Dominguez-Isidro & De-la-Calleja, 2020).

This paper focused on designing a mobile application for providing information to Advanced Level students in Uganda. The students can access qualifications and subjects, career options, study materials, schools, etc. The interface was designed using a user-centered design method to consider the users' needs. The application is expected to equip students with the necessary information and ease work for educators. This study followed five main stages, i.e., Data collection, Analysis phase, systems planning (storyboard creation and prototype design), prototype Testing and result evaluation, Report writing. The prototype design was created using Adobe XD as a designing tool. This technique of information provided through a mobile application is expected to reduce student failure, increase the number of students who join university, match students to their desired majors, and ease work for educators.

Literature Review

Before we designed a mobile application for providing information to Advanced Level students in Uganda, it was very important for us first to understand the current work about the design of the mobile application and understand the field and users for whom we intended to design the mobile application. Existing studies help researchers know the gaps, hence providing better designs to the users. These studies also helped us know more about mobile applications, their uses, and the necessary features in the design. Generally, Mobile applications can be used for various activities in different fields, such as in the medical field, monitor and provide guidelines to patients (Magalhães, Fernandes, Martinez-Galiano & Santos, 2020; Morte, Marenco, Lammers, Bingham, Sohn & Eckert 2020), and carry out biomedical research (Folgado-de la Rosa, Palazón-Bru & Gil-Guillén, 2020). In education for course assessment (Barreiro-Gen, 2020) and student motivation (Jeno, Grytnes & Vandvik, 2017). In communities, provide important training (Brown et al., 2020) and share health information (Emmanuel, Emanuel & Setyohad, 2020). In chain supply systems to monitor goods (Suyoto Arefin Islam Sourav, 2020), as well as in easing social life by carrying out online shopping(Lynn, Sourav & Setyohadi, 2020), (Kim, Wang & Roh, 2020). Even though mobile applications are applied in various fields, we found several previous studies that can be used as research references for designing a mobile application for providing information to Advanced Level students in Uganda. Some of the studies aimed at using mobile applications for providing skills (Llema & Vilela-Malabanan, 2019), (Salahli et al., 2017), providing oral education (Isa , Suhaimi, Misron, Bohary & Amin, 2020), improving students' vocabulary (Hao et al., 2019), (Poláková & Klímová, 2020), providing study materials (Huizenga, Admiraal, Dam, ten & Voogt, 2019), and many others as shown in table 1. The studies are listed with their main objectives.

Table 1
A summary of some of the existing related studies

No.	Reference	Research objective
1.	(Tamtama et al., 2020), (Watomakin et al., 2020)	To design language vocabulary mobile applications for children using gamification and User-Centered Design.
2.	(Isa et al., 2020)	To design a mobile game-based application for children on oral health education.
3.	(Steinmaurer et al., 2019), (Salahli et al., 2017)	To design mobile applications for providing programming skills to secondary school students.
4.	(Llema & Vilela-Malabanan, 2019), (Hao et al., 2019)	To design and develop a user-centered mobile learning application for senior school students' English reading and writing skills.
5.	(M. Hussein et al., 2019)	To design a prototype mobile application that meets the needs of patients at a clinic.
6.	(Poláková & Klímová, 2020)	To provide information on the formative assessment of vocabulary knowledge through a vocabulary mobile learning application.
7.	(Shi & Shih, 2012)	To design a digital mobile game for providing career information to students in a fun way.
8.	(Kenny et al., 2020)	To evaluate the effect of mobile devices in providing students with educational resources via mobile devices.
9.	(Cerea et al., 2020)	To assess the efficacy of a mobile application based on cognitive-behavioral principles among university students.
10.	(Jeno et al., 2017)	To know the effect of a mobile-application tool on biology students' motivation and achievement in species identification
11.	(Ismail et al., 2018)	To find the effect of mobile applications on students' critical thinking and explore how the app helps them think critically.
12.	(Huizenga et al., 2019)	Uses mobile application technology to make secondary school students access study materials using tablets.
13.	(Makhsin et al., 2020)	To determine the impact of spiritual mobile applications among Islamic students.
14.	(Kim & Suh, 2018)	To evaluate the effect of interactive nursing skills mobile application for nursing students.

Materials and Methods

This part of the study briefly explains the methodology used in this study. It explains the research tools, area of study, population and sample size, research questionnaire, and lastly, the research process in brief by describing it in a flow chart.

Research Tools

To complete the design process of this study, the researchers used both Hardware and software tools. The hardware tools included (1) A Laptop device with CPU specifications

Intel(R) Core(TM) I3 processor 8145U CPU (2.10 GHz 2.30GHz), 4 GB Ram, and (2) A smartphone device. The software tools included (1) Windows 10 PC operating system, (2) Adobe XD desktop application, (3) Adobe creative cloud (4) Adobe XD mobile application software. The researchers also used information about A' Level education in Uganda. The information was collected from education experts taught in A'Level for at least five years in Uganda. This information greatly guided the mobile application design to suit the current needs of A' Level students in Uganda.

User-Centered Design (UCD)

The user-centered design method was used to design the interface of this study. This method governed the design process. The method involved various phases, i.e., identifying the need for human-centered design, identifying the context of use, specifying the user and organizational requirements, producing design solutions, and evaluating the design. The four main phases of the User-Centered Design method are briefly described in the flow chart in figure 1.

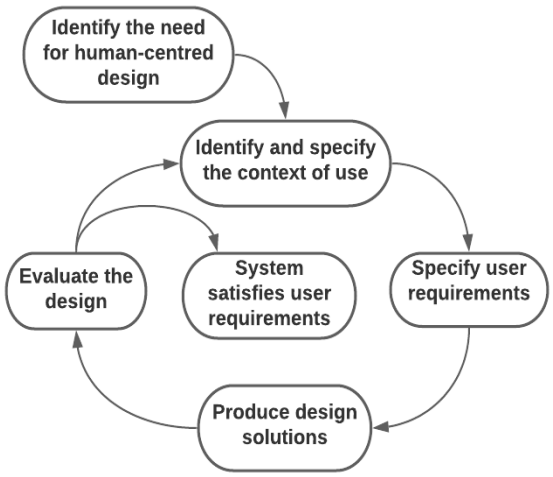

Figure 1: UCD Process Flow Chart, ISO-13407

As shown in figure 1, designers must identify the people who will use the design and then identify user goals that must be met to succeed. The design process may be done in stages, building from a rough concept to a complete design. Lastly, evaluation is done through usability testing with actual users. The last phase is very important as quality testing is good for software development.

Area, Population, and Sample Size of the Study

The study used 174 participants of a total population size of 315 students who were all A'Level students from 5 selected schools in Kanungu District, Western Uganda, i.e., Bishop Comboni college Kambuga, San-Giovani School Makiro, Kinkizi high School Nyakatare, Kambuga secondary school, and Kihiihi high school. The schools were chosen because they admit students from rural and urban areas of Western Uganda, which easily gave accurate data to the researchers. The location of the area of study, i.e. (Kanungu District) on the map of Uganda is shown in figure 2.

Figure 2: Location of the Study Area on the Map of Uganda

Research Questionnaire

As a method of collecting data for this research, a questionnaire was used. The questionnaire consisted of two parts. Part A and Part B. Part A was intended to collect Demographic data, i.e., statistical data collected about the characteristics of the participants, i.e., gender, age, and the class of A'Level students. Part B contained the statements for the Reliability and the Validity Test Phase. The statements in part B were distributed under four main factors to be tested about the mobile application design. The tested factors were the Usefulness of the design, Ease of Use of the design, Functionality of the design, and user satisfaction when they used the mobile application. Each factor consisted of 4 questions, which totaled up to 16 items. The respondents used a 5-point Likert-type scale ranging from (1 = Strong disagree, 2 =Disagree, 3 = Less agree, 4 =Agree, 5= Strong agree) to answer each question.

Research Process

A research process can be defined as a series of steps to conduct a research study. This study intended to design a mobile application for providing information to A'Level students in Uganda was involved in 5 basic stages, as shown in figure 3.

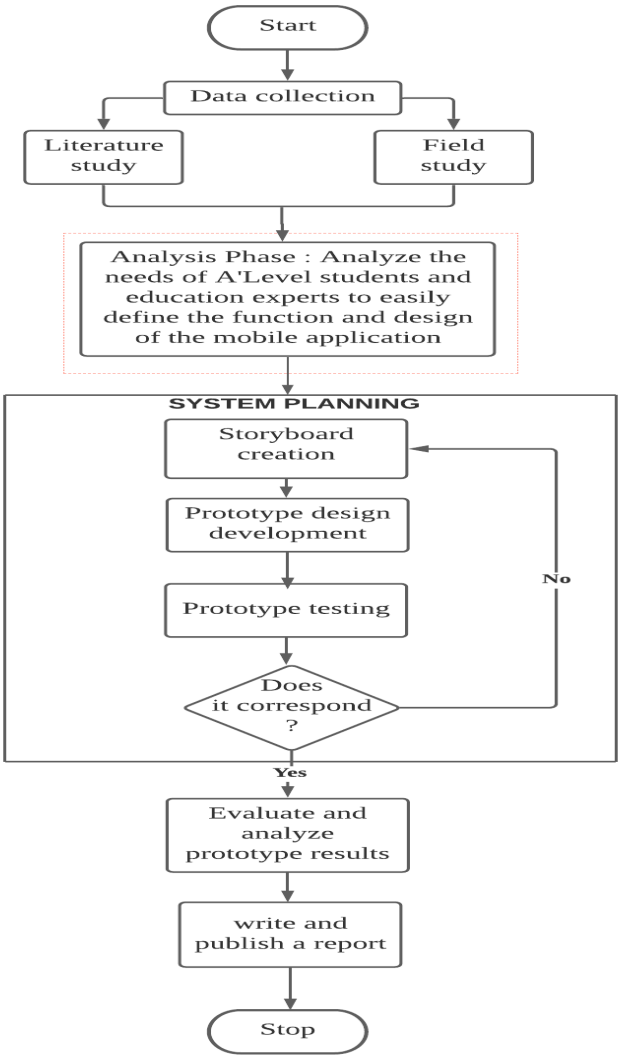

Figure 3: Research Flow Chart

As shown in figure 3, the first stage of the research process was data collection. Collecting data included studying the related literature and searching data about the study field. This activity was done by gathering related articles, books, journals to help the authors understand, include the current information about the chosen field, and identify the missing gaps. The second stage was the analysis phase, which defined users' and organizational requirements. The third stage was system planning. This stage involved gathering system requirements, creating a storyboard that is the first stage of the design process that identifies user interaction with the system, and finally designing the prototype. Stage 4 was "prototype testing," which involved sending the prototype alongside a set of questionnaires to the study participants to assess the effectiveness of the mobile application design. The participants interacted with the prototype and sent feedback by answering a questionnaire through the created google form. The respondents' data was used to measure the effectiveness of the design by evaluating the results. At stage 5 of the research process, a report about the research was written and sent for publication.

Results

Prototype Design

The result of this study was the design of the proposed prototype mobile application for providing information to Advanced Level students in Uganda. The storyboard design for all mobile application pages was created first before designing the mobile application pages to guide the design process successfully. The prototype contains various pages that give the stakeholders a chance to perform various tasks with the mobile application. The prototype design includes some of the following pages explained below.

Application Login page and Home page

The login page is the main door of the mobile application. The user needs to text in the correct account and password to proceed to the main menu page. While at the main menu page, there are several activities that the user can carry out. The home page contains nine icons. By clicking on the respective icon, the student can be able to view the qualifications that are required to join A'Level, view the subjects taught in A'Level, view the lists of schools, with the best performing schools on top from each region of Uganda, students can text subject experts and ask questions and get instant feedback, download materials for private study, get advice about choosing subjects for A'Level that match their desired careers, ask for help from the admin when needed, view important news and updates matching A'Level education, and the responsible admin can as well edit and add all necessary information to the mobile application through the Admin icon. Figure 4 shows the login page design, while figure 5 shows the home page design of the user interface.

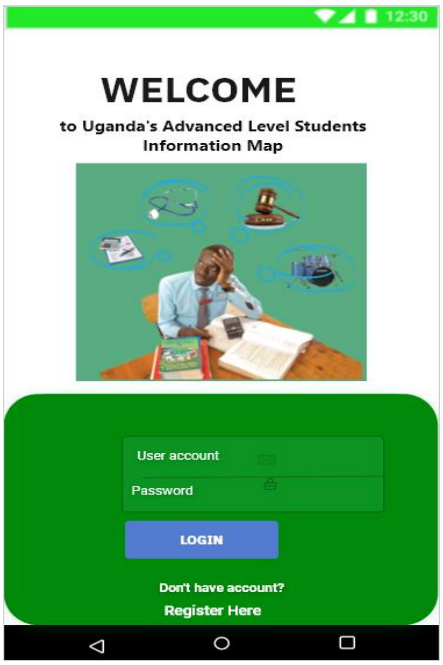

Figure 4: Application Login Page

Figure 5: Application Home Page

Qualifications and Subjects' Pages

Users can view the general requirements and other essentials for joining A' Level education in Uganda from the qualifications page. The subjects' page displays details about subjects taught at A' Level. It contains information regarding different subjects and the conditions of studying a particular subject at A' Level. Figures 6 and 7 show the design of the qualifications page and subjects page.

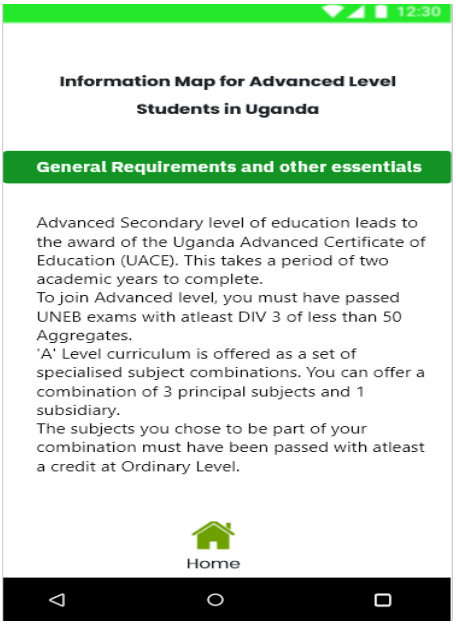

Figure 6: Qualifications Page

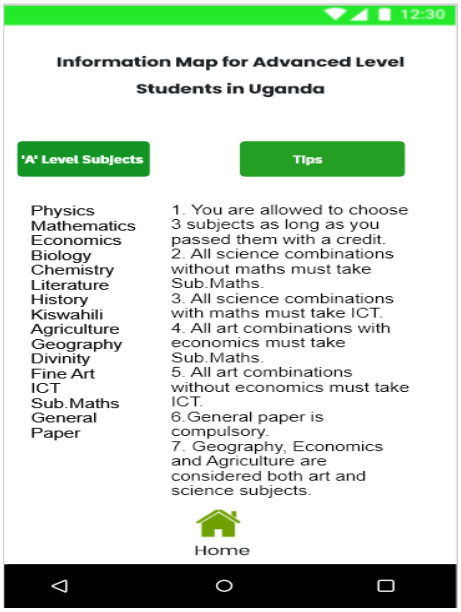

Figure 7: Subjects Page

Schools and Materials Pages

The schools' page contains the schools' details, and the user can further access the schools' details by clicking on the region of their choice. The materials page can also be accessed by users from the main menu page of the mobile application. The students need to get adequate access to study materials besides the materials provided in their school libraries. The schools' and materials page designs can be seen in Figures 8 and 9, respectively.

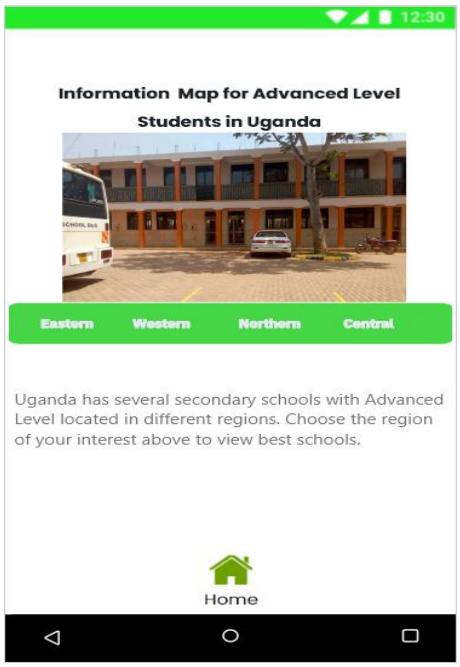

Figure 8: Schools Page

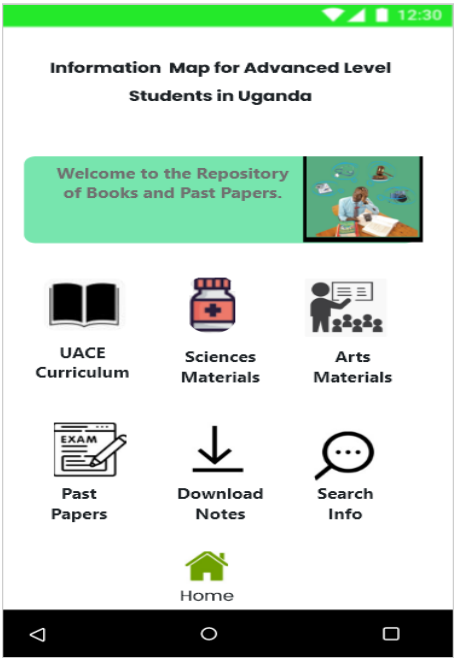

Figure 9: Materials Page

Career Options Page

The career options page is one of the most important pages of this Mobile application. This statement is because choosing subjects is always the most challenging for A'Level students in Uganda. For a student to meet his/her career desire in Uganda, one must have made the correct choice of subjects at the Advanced Level stage of education. A'Level education is the most determinant for University Education in Uganda. The career options page contains six menus. When opened, these provide concise guidance on choosing the best subjects to match the desired future career. The student can choose to study A'Level while aiming at one of the listed careers. The careers include Medical Careers, Engineering Careers, Social Sciences Careers, Agriculture Careers, Teaching Careers, and Technical Studies. When the user clicks on any of the mentioned career options, a rule-based system was used to help students choose A'Level subjects that lead to the corresponding desired career options after completing their A'Level studies. Figure 10 shows the career options menu page.

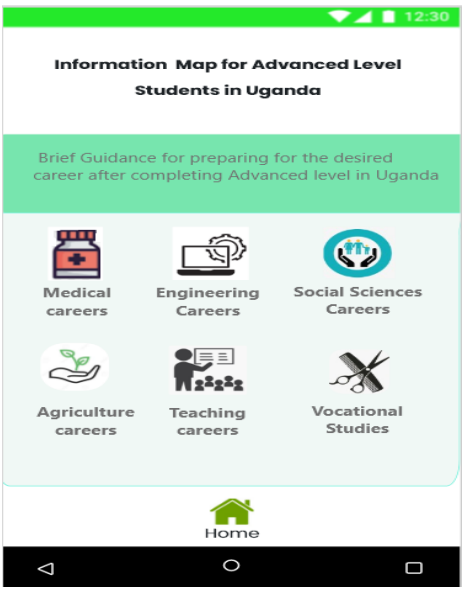

Figure 10: Career Options Menu Page

Figures 11 and 12 display a design example of the career options rule-based pages for an A'Level student interested in pursuing any medical career later at university.

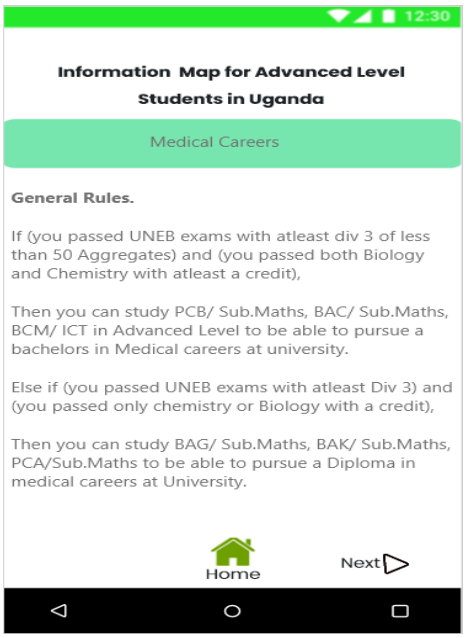

Figure 11: Rules Page 1 for Medical Careers

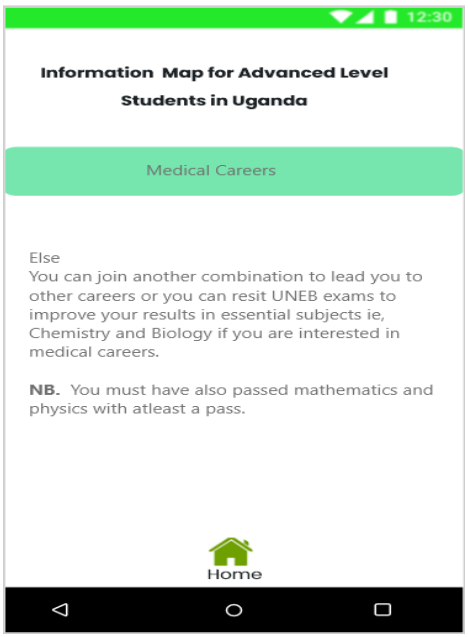

Figure 12: Rules Page 2 for Medical Careers

Mobile application Stakeholders

The term stakeholders in this design refer to the people affected by our designed mobile application software. Stakeholders exist both within the area of the target and outside of it. They may be end-users or be among the people affected by the process. Identifying and involving all stakeholders from the beginning was the most impactful step developers needed to take. Input from stakeholders helped define the required kind of software by suggesting ideas for features and the problems they needed to solve. In this case, the key stakeholders of the designed mobile application are Advanced Level students and education Experts.

Advanced Level Students: Advanced Level students are the direct users of this mobile application. Direct users directly interact with the software itself. The mobile application design will help students access information by navigating various mobile application pages.

Education Experts: Experts are, in this case, are the secondary users of this mobile application. They aim at ensuring that the mobile application works in a way that eases their job and satisfies their students with the necessary information.

Use Case Diagrams for Stake Holders

In this study, Use Case diagrams for stakeholders show the interaction of the users and the designed prototype mobile application. Figure 13 is the use case diagram that illustrates how Advanced Level students interact with the designed prototype mobile application system, while figure 14 is the use case diagram for education experts. It also shows how education experts interact with the designed prototype's mobile application system.

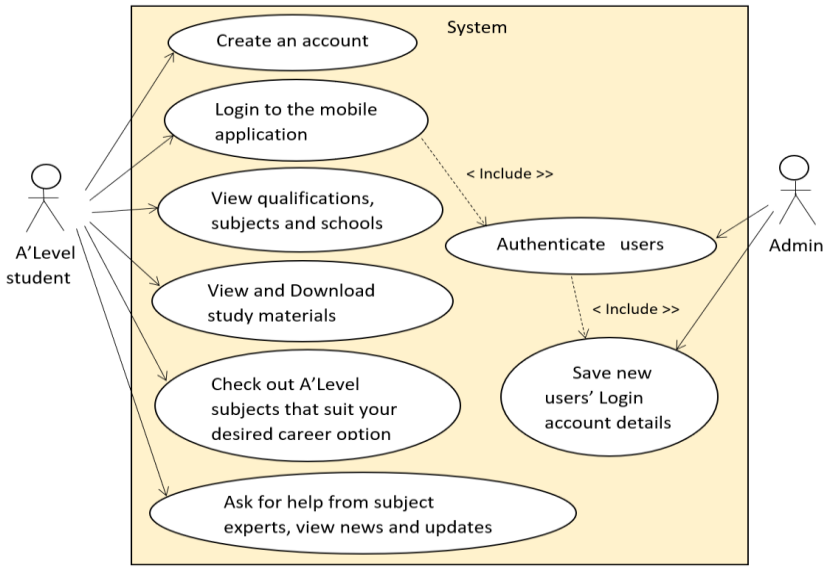

Figure 13: The Use Case Diagram for Advanced Level students

As shown in figure 13, there are several activities that the student will perform with the mobile application. The student will create a user account and then log in to the mobile application. The A'Level student will then be able to view qualifications, subjects, schools' details, the student can ask questions from subject experts, view and download study materials, check out subjects to study that match his/her desired career option, view news, and updates, and finally can ask help from any related team in case of an emergency. On the other side, the administrator will authenticate users and save new user login account details to the database.

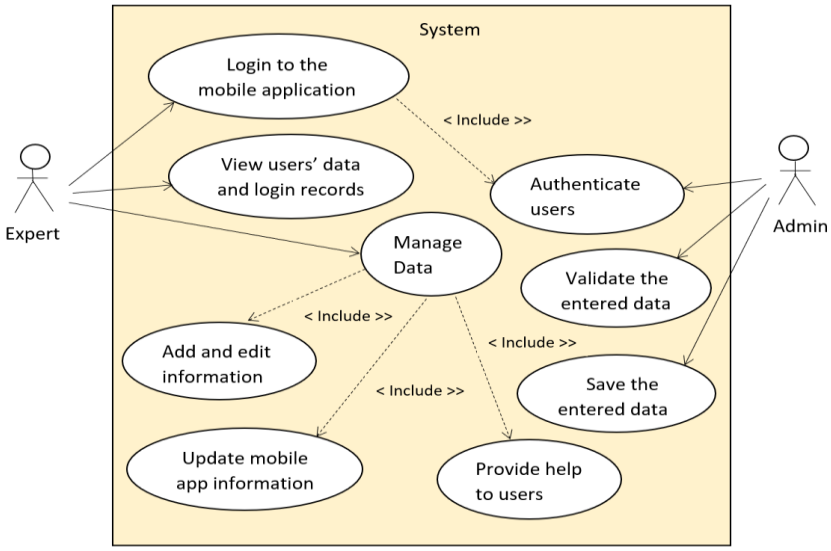

Figure 14: The Use Case diagram for Education Experts

As illustrated in figure 14, the proposed information mobile application prototype for Advanced Level students allows the education experts to perform various activities. After logging in, the expert can view users' records and manage data by performing activities such as editing, adding, updating, and responding to users who request help. This design helps maintain the purpose of mobile applications, providing Advanced Level students with accessible information. On the other hand, the system administrator authenticates users, validates, and saves data entered by the expert.

Prototype Testing and Evaluation

The prototype was tested on 174 A'Level students from a total population of 315. The prototype was tested using a questionnaire method consisting of 4 factors, i.e., Usefulness, Ease of use, Functionality, and User satisfaction. Each factor to be tested comprised four questions, which totaled up to 16 questions, and all were required to be attempted by the participant. A 5-point Likert-type scale (1 = Strong disagree, 2 =Disagree, 3 = Less agree, 4 =Agree, 5= Strong agree) was provided for the respondents to choose what suited most questions after interacting with the prototype.

Before the questionnaires were distributed for the main survey, a pilot test was first done on the questionnaire with 10% of the sample size to ensure that the questions used for the main survey were valid and reliable. According to existing literature, a pilot study should be 10% of the sample of the larger parent study (Doody & Doody, 2015). The reliability and validity results of the main survey were measured using Cronbach's Alpha correlated with the number of items which was 16. From performing the validity test using SPSS software, the results showed that all questions were considered valid because the total score of each item exceeded the level of significance of 16 items which is 0.497. This result means that the question items significantly correlated to the total score and were considered valid. In addition to that, to confirm the reliability test was valid, Cronbach's alpha results were obtained at 0.977%.

In this case, Alpha exceeded the level of significance of the total number of items (16) on the scale, 0.497. Thus, the questionnaire was considered reliable, as shown in table 2.

Table 2
Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.977	0.978	16

Prototype Testing Results

The output from collecting and analyzing data gave 95.76%, which indicated and confirmed to the researchers that the respondents understood and agreed with the design of an information Mobile Application for Advanced Level students in Uganda. The high result also indicated that a mobile information application for Advanced Level students positively impacts A' Level students and can play a big role in helping students join university education in Uganda and help students achieve their dream careers.

The results from collecting demographic data showed that the highest number of respondents were males, i.e., 64.36% and only 35.64% were females. The data further indicated that 59.78% of the participants were aged between 16-20 years of age, while 40.22% were above 20. As an indicator that the proposed prototype could be very effective if developed and implemented, 74.7% of the respondents were in their first year of Advanced Level (senior 5), while 25.3% of the respondents were in their final year A'Level (senior 6). This observation has further shown that the students need much help when they newly joined this level of education. From the result explained, the researchers confirmed that the proposed prototype was agreed or acceptable to the users and thus can be further developed and implemented. The results of the questionnaire are clearly shown in table 3 below.

Table 3
Questionnaire Results

Questions	Categories	1	2	3	4	5
The design of the application will help me to access information concerning Advanced Level education	UF1	3	0	0	33	138
The design of this application is useful to Advanced Level students	UF2	3	0	3	32	136
The design of this application matches my needs as an Advanced Level student	UF3	3	1	0	35	135
The design of this application works according to what I expect as an Advanced Level student	UF4	3	1	5	35	130
The design of this application is easy to use	EU1	3	1	6	25	139
This application design is easily understood by Advanced Level students	EU2	5	1	5	23	140
I can easily interact with the features of this mobile application design without any confusion	EU3	0	3	7	32	132
I can easily use this application without any written instructions	EU4	1	8	7	30	128
The design of this application is user friendly and allows free navigation	FN1	4	1	5	36	128
The presentation of information in the application design is clear and understandable	FN2	4	0	0	30	140
The application features are fast to respond and bring corresponding information	FN3	3	0	3	36	132

Questions	Categories	1	2	3	4	5
I think this application design could help Advanced Level students to study towards their desired future careers	FN4	3	0	1	31	139
I am satisfied with the design of this mobile application.	ST1	3	0	4	36	131
I would recommend this application design to other schools with Advanced Level	ST2	3	0	2	34	135
The design of this application will quickly help me to choose the right combination of subjects to study in Advanced Level	ST3	3	0	1	32	138
I think this application will help to reduce the dropout of Advanced Level students in Uganda	ST4	5	0	4	27	138
Total		49	16	53	507	2,159
Percentage		1.76	0.57	1.91	18.21	77.55
Result		95.76				

According to the result of the highest scores of the Likert scale (4 and 5), i.e., Agree (18.21) and Strongly Agree (77.55), respectively, the result was 95.76% which indicated and confirmed to the researchers that the respondents understood and agreed with the design of an information Mobile Application for Advanced Level students in Uganda.

Discussion

This study aimed to design a mobile application to help Advanced Level students in Uganda to access necessary information. The existing way of accessing information by Advanced Level students is through approaching their teachers, headteachers, career guidance offices, i.e. 'for those few schools who have them,' reading manuals if they are available, asking help from friends and family, role models, etc. All this process strains the students to attain information, and in return, the information they receive is inadequate. On the other hand, some students do not like this hectic process, so they do not seek information, yet it is important for their past and future career preparation. In addition to that, the method is so stressful to teachers. It increases their workload since they have to physically attend to the students to guide and give them information and perform in the daily scheduled class teaching activities. The method is difficult, especially for more than 200 students in each Advanced Level class. The proposed prototype has implemented electronic information provision that is easy to manage even for the educators despite many students in Advanced Level classes. The admin can edit, add, and update necessary information to the application for the students to access. The students can access all the necessary information for their academic performance and future career preparation.

Comparing the proposed mobile application method with the existing method where students have to be given information and guidance, both users, i.e., the students and the experts' work, will be eased since everything concerning information alongside classroom activities will be accessed through the proposed mobile application. In this manner, the proposed prototype design will automatically reduce the difficulties experienced by students in seeking the information and educators in providing information to students. This prototype will also minimize the costs of buying guidance books and manuals since soft copies can be uploaded for students to download. The method used to design the prototype is based on open source technologies, which allows future development with less effort and costs as it can be affordable

and manageable by the economy of educators.

Regarding the findings in this research, there are some similarities and differences compared to other works. One research group intended to apply the gamification method to motivate children to learn English. The researcher aimed to increasingly motivate them in learning English and helping teachers in giving material (Tamtama et al., 2020). Similarly, this prototype aimed to help provide easy access to the necessary information to Advanced Level students, such as study materials, and after the evaluation, this prototype showed to be highly acceptable by Advanced level students in Uganda. Another research group concentrated on a mobile game-based learning application that embedded the Islamic cultural element for role-playing. The researcher's objectives included identifying requirements for designing and developing the mobile game-based learning application. Data collection involved interviewing parents and kindergarten teachers in gathering requirements (Makhsin et al., 2020). In this study's prototype evaluation, data were collected using questionnaires from a sample of students, and 95.76% of these students agreed to the designed prototype.

There are also some similarities in these findings compared to the other works. This prototype was tested and hoped to improve the performance of Advanced level students who apply it in Uganda compared to those who do not. Another research aimed to design and develop a mobile learning application for senior high school students' English reading and writing skills. The researchers used a Five-Design Sheet methodology while utilizing modified evolutionary prototyping in designing and developing the mobile application and gave a user-centered mobile learning application (Llema & Vilela-Malabanan, 2019). Similarly, the design of this mobile application also used a user-centered design structure, and the researchers underwent iterations with user evaluation to ensure the mobile applications' functionalities and usability. In addition, another research study attempted to design a digital game for career planning. The researchers aimed to design a digital mobile game for providing career information to students in a fun way (Shi & Shih, 2012). Similar to this study where career information is also included in the information provided to students by the design of this prototype which was accepted by 95.76% of these students when tested on a sample population who were all Advanced level students in Uganda. Lastly, one study designed a mobile application and aimed to assess the efficacy of a mobile application based on cognitive-behavioral principles among university students, and the survey result indicated a good effect (Cerea et al., 202). Similarly, when tested on a sample of students for this study, the designed prototype showed a percentage of 95.76% of students who agreed to the designed prototype, which revealed a high level of user satisfaction and acceptance.

Advantages of the Prototype Design

The designed prototype has many advantages: (1) The design is very easy to use and gives clear information for A'Level students, (2) The knowledge used to design the prototype application can easily develop mobile applications for users of all education and technological backgrounds, (3) The application eliminates time wastage of students going to seek help physically and also reduces the workload for educators, thus giving them enough time to attend to their teaching activities since the students can access the information they need digitally, and lastly, (4) The application design is meant for mobile smartphones; therefore, the method is affordable by students, and experts can also feed in all the useful information as long as they have internet access.

Limitations

The designed prototype has limitations such as; (1) the design was limited to the use of Android and iOS operating systems. Therefore, interested users without smartphones cannot access the application, (2) Accessing information using this mobile application requires one to have internet, and (3) Information included in this design is only limited to Advanced Level students; therefore, this information will not be helpful to the students outside this boundary.

Conclusion

In this research, a mobile application prototype was designed to provide information to Advanced Level students in Uganda. This mobile application allows students to access necessary information that greatly contributes to the pass of Advanced Level students in Uganda and greatly determines what the student becomes. The advanced level is the most important stage in the Ugandan education cycle as it is the level that greatly determines the students' entry to university. Therefore, students need to be well provided with necessary information such as study materials, career guidance and matching subjects choice, best schools to attend, etc. These are the exact key features that the designed mobile application contains. This prototype will greatly help students study with a focus and make informed decisions while in this tough level of education that determines their future. This design, therefore, acts as a solution to eliminating the problem facing A'Level students. The prototype was designed, evaluated, and tested on 174 Advanced Level students from 5 different schools to assess the effectiveness of using mobile application technology to provide necessary information to Advanced Level students. The result showed that 95.76% of these students agreed to the designed prototype. The results indicated a high level of user satisfaction acceptance, and therefore, the application can further be developed and implemented. This mobile application could help ease information access to Advanced Level students, thereby reducing time wastage and increasing student performance by using mobile application technology.

Future Work

This study only made a design of the mobile application. Future studies can use this work to develop the designed mobile application. In addition to that, other researchers can also use this work, both its theory and practical parts, as a basis for new research in the education field or other related fields. Furthermore, the design considered a few areas of information such as qualification information and subjects, career options, and rules to follow in choosing A'Level subjects, school information, and study materials. Future designers can consider improving the design by adding more information that A'Level students need. Moreso, the design was specifically designed for A'Level students only. Future researchers can aim to expand the design and also consider lower secondary school students since for students to pass well at A'Level; it would be better if this important information, especially career information, is administered to students while they are still in their lower secondary school so that they can concentrate on desired subjects early. Lastly, future researchers could also use this data to develop a web-based mobile application so that students who do not have mobile phones can also access the information via the web.

Acknowledgment

We are grateful to Universitas Atma Jaya Yogyakarta and The Kemitraan Negara Berkembang (KNB) scholarship program for supporting this work. We cannot forget to thank our anonymous reviewers, who worked for hand in hand to reach our goal.

References

Abedi, A. A., Ogwal, D. S., Pintye, J., Nabirye, R. C. & Hagopian, A. (2019). Baccalaureate prepared nurses as the new entry-level nursing cadre in Uganda: A qualitative study of BSN student and faculty perspectives in two universities. Nurse Education Today, 76, 131–136. https://doi.org/10.1016/j.nedt.2019.01.023

Barreiro-Gen, M. (2020). Evaluating the effects of mobile applications on course assessment: A quasi-experiment on a macroeconomics course. International Review of Economics Education, 34. https://doi.org/10.1016/j.iree.2020.100184

Brown, K., Toombs, M., Nasir, B., Kisely, S., Ranmuthugala, G., Brennan-Olsen, S. L., Nicholson, G. C., Gill, N. S., Hayman, N. S., Kondalsamy-Chennakesavan, S. & Hides, L. (2020). How can mobile applications support suicide prevention gatekeepers in Australian Indigenous communities? Social Science and Medicine, 258. https://doi.org/10.1016/j.socscimed.2020.113015

Cerea, S., Ghisi, M., Bottesi, G., Manoli, T., Carraro, E. & Doron, G. (2020). Cognitive behavioral training using a mobile application reduces body image-related symptoms in high-risk female university students: A randomized controlled study. Behavior Therapy. 52(1), 170-182. https://doi.org/10.1016/j.beth.2020.04.002

Doody, O. & Doody, C. M. (2015). Conducting a pilot study: Case study of a novice researcher. British Journal of Nursing, 24(21), 1074–1078. https://doi.org/10.12968/bjon.2015.24.21.1074

Emmanuel, G., Emanuel, A. W. R., & Setyohadi, D. B. (2020). Design of mobile application for community health workers: A case study in Rwanda. International Journal of Interactive Mobile Technologies, 14(11), 271–279. https://doi.org/10.3991/ijim.v14i11.13307

Folgado-de la Rosa, D. M., Palazón-Bru, A. & Gil-Guillén, V. F. (2020). A method to validate scoring systems based on logistic regression models to predict binary outcomes via a mobile application for Android with an example of a real case. Computer Methods and Programs in Biomedicine, 196, 105570. https://doi.org/10.1016/j.cmpb.2020.105570

Hao, Y., Lee, K. S., Chen, S. T. & Sim, S. C. (2019). An evaluative study of a mobile application for middle school students struggling with English vocabulary learning. Computers in Human Behavior, 95, 208-216. https://doi.org/10.1016/j.chb.2018.10.013

Huizenga, J., Admiraal, W., Dam, G. ten & Voogt, J. (2019). Mobile game-based learning in secondary education: Students' immersion, game activities, team performance and learning outcomes. Computers in Human Behavior, 99, 137–143. https://doi.org/10.1016/j.chb.2019.05.020

Isa, W. A. R. W. M., Suhaimi, A. I. H., Misron, M., Bohary, N. A. A. & Amin, I. M. (2020). Designing mobile-game based learning application for children on oral health education using Islamic culture. International Journal of Advanced Science and Technology, 29(6s), 1595–1602.

Ismail, N. S., Harun, J., Zakaria, M. A. Z. M. & Salleh, S. M. (2018). The effect of mobile problem-based learning application dicScience PBL on students' critical thinking. Thinking Skills and Creativity, 28, 177–195. https://doi.org/10.1016/j.tsc.2018.04.002

Jeno, L. M., Grytnes, J. A., & Vandvik, V. (2017). The effect of a mobile-application tool on biology students' motivation and achievement in species identification: A Self-Determination Theory perspective. Computers and Education, 107, 1–12. https://doi.org/10.1016/j.compedu.2016.12.011

Kenny, L. A. T., Gaston, T., Powers, K. & Isaac-Dockery, A. (2020). Anxiety in nursing students: The impact of using mobile technology with quick response codes. Nurse Education Today, 89, 104382. https://doi.org/10.1016/j.nedt.2020.104382

Kim, H. & Suh, E. E. (2018). The effects of an interactive nursing skills mobile application on nursing students' knowledge, self-efficacy, and skills performance: A randomized controlled trial. Asian Nursing Research, 12(1), 17–25. https://doi.org/10.1016/j.anr.2018.01.001

Kim, Y., Wang, Q. & Roh, T. (2020). Do information and service quality affect perceived privacy protection, satisfaction, and loyalty? Evidence from a Chinese O2O-based mobile shopping application. Telematics and Informatics, 56 101483. https://doi.org/10.1016/j.tele.2020.101483

Kochungu, E. & Migunde, Q. (2011). Factors influencing students career choices among secondary school students in Kisumu Municipality, Kenya. Journal of Emerging Trends in Educational Research and Policy Studies, 2(2), 81–87. Retrieved from https://repository.maseno.ac.ke/bitstream/handle/123456789/1824/Factors_Influencing_Students_Career_Choices_among_Secondary_School_students_in_Kisumu_Municipality__Kenya.pdf?sequence=1&isAllowed=y

Law, J. K., Thome, P. A., Lindeman, B., Jackson, D. C. & Lidor, A. O. (2018). Student use and perceptions of mobile technology in clinical clerkships – Guidance for curriculum design. American Journal of Surgery, 215(1), 196–199. https://doi.org/10.1016/j.amjsurg.2017.01.038

Llema, C. F. & Vilela-Malabanan, C. M. (2019). Design and development of MLERWS: A user-centered mobile application for English reading and writing skills. Procedia Computer Science, 161, 1002–1010. https://doi.org/10.1016/j.procs.2019.11.210

Lynn, N. D., Sourav, A. I., & Setyohadi, D. B. (2020). Increasing user satisfaction of mobile commerce using usability. International Journal of Advanced Computer Science and Applications, 11(8), 300–308. https://doi.org/10.14569/IJACSA.2020.0110839

M.Hussein, P. W., Salim, M., & Ahmed, B. I. (2019). A prototype mobile application for clinic appointment reminder and scheduling system in Erbil city. International Journal of Advanced Science and Technology, 28(1), 17–24.

Magalhães, B., Fernandes, C., Martinez-Galiano, J. M. & Santos, C. (2020). Exploring the use of mobile applications by cancer patients undergoing chemotherapy: A scoping review. International Journal of Medical Informatics, 144, 104293. https://doi.org/10.1016/j.ijmedinf.2020.104293

Makhsin, M., Narawi, S. M. S. & Ismail, N. H. (2020). Evaluation of mobile learning application in hisbah reflection al-nafs among islamic spirituality students. In International Journal of Advanced Science and Technology (Vol. 29, Issue 4s, pp. 2720–2727).

McMullen, J. D. & McMullen, N. (2018). Evaluation of a teacher-led, life-skills intervention for secondary school students in Uganda. Social Science and Medicine, 217, 10–17. https://doi.org/10.1016/j.socscimed.2018.09.041

Morte, K., Marenco, C., Lammers, D., Bingham, J., Sohn, V. & Eckert, M. (2021). Utilization of mobile application improves perioperative education and patient satisfaction in general surgery patients. The American Journal of Surgery, 221(4), 788-792. https://doi.org/10.1016/j.amjsurg.2020.03.034

O'Connor, S. & Andrews, T. (2018). Smartphones and mobile applications (apps) in clinical nursing education: A student perspective. Nurse Education Today, 69, 172–178. https://doi.org/10.1016/j.nedt.2018.07.013

Pensabe-Rodriguez, A., Lopez-Dominguez, E., Hernandez-Velazquez, Y., Dominguez-Isidro, S. & De-la-Calleja, J. (2020). Context-aware mobile learning system: Usability assessment based on a field study. Telematics and Informatics, 48, 101346. https://doi.org/10.1016/j.tele.2020.101346

Poláková, P. & Klímová, B. (2020). Assessment of vocabulary knowledge through a mobile application. Procedia Computer Science, 176, 1523–1530. https://doi.org/10.1016/j.procs.2020.09.163

Salahli, M. A., Yildirim, E. Gasimzadeh, T., Alasgarova, F. & Guliyev, A. (2017). One mobile application for the development of programming skills of secondary school students. Procedia Computer Science, 120, 502–508. https://doi.org/10.1016/j.procs.2017.11.271

Shi, Y. R. & Shih, J. L. (2012). Game-based career guidance systems design concept. In Proceedings 2012 4th IEEE International Conference on Digital Game and Intelligent Toy Enhanced Learning, DIGITEL 2012, 187–191. https://doi.org/10.1109/DIGITEL.2012.53

Steinmaurer, A., Pirker, J. & Gütl, C. (2019). sCool - Game-based learning in computer science class A case study in secondary education. International Journal of Engineering Pedagogy, 9(2), 35–50. https://doi.org/10.3991/ijep.v9i2.9942

Suyoto Arefin Islam Sourav, N. D. L. (2020). Smart monitoring system design for perishable food supply chain management based on iot in bangladesh. International Journal of Advanced Science and Technology, 29(1), 1069–1079.

Tamtama, G. I. W., Suryanto, P. & Suyoto. (2020). Design of English vocabulary mobile apps using gamification: An Indonesian case study for kindergarten. International Journal of Engineering Pedagogy, 10(1), 105–162. https://doi.org/10.3991/ijep.v10i1.11551

Watomakin, D. B., Santoso, A. J. & Suyoto (2020). Mobile application design of learning word in Lamaholot language for children using user-centered design. International Journal of Engineering Pedagogy, 10(5), 103–115. https://doi.org/10.3991/ijep.v10i5.13411