Journal of Health Informatics in Africa

The Evaluation of the Impact of Online Training Program on the Level of Knowledge on medicals students in a Sub-Saharan African setting, using the African Build Portal

Djientcheu VP[1,2,3,4]; Tcheumagam K[1]; Ramirez M[5]; Njajou O[1]; Bello F[4]; Nguifo JE[4]; Kamga Y[2,4]; Essiene A[2,4]; Maoyo V[3,4].

1) ISS /UdM (Institut des Sciences de le Santé/ Université des Montagnes)
2) FMSB /UYI (Faculty of Medicine and Biomedical Siences/ University of Yaoundé I)
3) ABP: Africa Build Portal
4) RAFT: French speaking African Network for Telemedicine
5) UPM: Polytechinical of Madrid.

BACKGROUND: Many initiatives of e-learning have been developed in Sub-Saharan African countries, but limited has been carry up to evaluate the impact of this method of training in our context with his socio-economics particularities. The rational of this study is to evaluate the effect of an e-learning program using the Africa Build Portal on the level of the knowledge on final year medical students.
METHODOLOGY: In this interventional study, the final year medical students of 2 universities in Cameroon (one private and one public) were summited to an on-line program of lectures. After a brief presentation of the lectures program the students were evaluated before (pre-test) and after (post-test) the training. A questioner was filled by each student to express the satisfaction and the obstacles encountered during the training. The training program was elaborated through South-South collaboration (Mali-Cameroon-Ghana) with a support of North (ITM-WHO).
RESULTS: A total of 121 students over 129 were registered; 112 students (92%) followed the online lectures and underwent the whole online procedure (pretest, training, posttest and the questioner filling) were included. The mean age was 25.16 years (range from 22-33years). The sex ratio 1:1. The mean marks of student on pre-test was 43.32/100 compared to mean marks of post-test 69.69/100 ($p = 0.0001^{E}$-21). The significant difference on pretest between the students who in addition followed the face to face presentation (83 students) and the others did not appear on the post- test. The platform was very welcome in general with an average of 7 on a scale of 10. The main obstacles to e-learning were the poor bandwidth internet connection and the overload academic program with less free time. The module on EBM and the methodology of the research were more visited with a total of 12275273 minutes and a mean of 1301.29 min per page because of the direct impact on the ongoing redaction and defense of their thesis.
CONCLUSION: Under certain conditions, e-learning is an effective method of training even in Sub-Saharan African countries. This is a good indicator to promote numeric libraries in that environment. The motivation of the learner is a key point to consider. The parameter to improve is the individual and institutional internet connectivity.

Keywords: e-learning, health education, research, IT

*Corresponding author address: Vincent Djientcheu; mail: Vincent_djientcheu@yahoo.com; Kelly Tcheumagam: keltche@yahoo.fr.
 J Health Inform Afr. 2019;6(1):1-8. DOI: 10.12856/JHIA-2019-v6-i1-135

1 Introduction:

In the higher education sector, especially in the domain of health education and research, there is a need of qualified and specialized personnel to train students and researchers. The offer and the demand in human resources is increasingly unbalanced, quantitatively and qualitatively [1-11].

Since 2002 many initiatives have been developed in the continent in the field of e-learning to cover as possible the deficit. The lead initiatives were the French speaking African Network for Telemedicine (RAFT), the "Université Numérique Francophone Mondiale (UNFM)" and the Pan African Indian project which educated in the continuous medical training [12-19].

Despite the development of these new methods of learning, just very little serious evaluation have been done on the effectiveness or the impact of this method of training on the level of knowledge of the learners in Sub-Saharan Africa where the cultural, economic and social considerations are marked by a limitation for the extend of numeric [20-22].

The purpose of this study is to evaluate the impact of an on-line training program on the level of knowledge of final year medical students, using the Africa Build Portal (ABP). Specifically:

1. After a brief presentation of ABP, each student was submitted to an online pre-test (multiple choice questions) on a topic; an online lecture on the same topic and a post-test (multiple choice questions) on the same topic;
2. The marks obtained by each student before (the pre-test) an after (the post-test) the online training were compared and analyzed.
3. The appreciations and obstacles on the ABP by each student via a questionnaire fill were analyzed.

2 Methods

In this interventional study, an online training program composed of many modules was proposed to final year medical students in Cameroon. The structure of each module is made of a pre-test before the course, the lecture itself, the references and a post-test at the end of course. The lectures can be repeated as needed but the tests can be performed only once.

Two universities where selected for the evaluation: one private and one public institution respectively the institute of health science of "Université des Montagnes" and the faculty of health science of the university of Buea. All the final years' medical students of the selected universities were recruited.

The procedure started by a face to face session with students where the ABP were presented, the demonstration of the registration using a personalized password and user name, and a brief presentation of the contain were performed on May 2014. The students were then invited to go individually to the portal to do the pre-test, to follow the lecture and to do the post-test when they were ready at the end of the lectures. A 3-month period was given to students to achieve the program.

On August 2014, the students were track online and the statistics were performed on the following variables: the pre-test notes, the post-test notes, the activities of students on the ABP, the modules followed by the students, the duration and learning period. A questioner filled by students was used to evaluate their satisfaction through a scale from 0 to 10 and the obstacles encountered.

The analysis was done with Google statistics, ABP statistics, Epi-info 3.5.4, SPSS 20 and Microsoft Excel 2010. Comparisons of variables were done with Chi-Square test, Students test, Mac Neymar test and Mann-Withney test. P value < 0.05 was significant.

3 Results:

121 students over a total of 129 were registered on the platform. 112 students (92%) followed the lectures and the whole process: pre-test, post-test and the filling of the questioner. Because of technical problem, 6 students repeated the pre and post-test for a second time.

The mean age of students was 25.16 ± 1.5 years (range from 22 to 33 years) (table 1). There was 61 females and 61 males with a sex ratio of 1:1.

 J Health Inform Afr. 2019;6(1):1-8. DOI: 10.12856/ JHIA-2019-v6-i1-135

The mean mark of the students on pre-test was 43.32 over 100. The mean mark of post-test was 69.69 over 100 (table 2) P= 0.0001^{E}-21. The occasion was given to some students to repeat the pre-test (6 students) and post-test (9 students) (table 3).

The mean mark was respectively 66.88% and 87.20% for second essay pre-test and post-test.

70% of the students followed both the face to face presentation and the on-line lectures but 30% of students followed only the online courses. The difference was significant between the 2 groups during the pretest but the difference was not significant on the post-test (table 4). The ABP was more visited during the weekend (figure 1) and evening with a pic from 3 to 6 PM and 10 PM through midnight (figure 2).

According to the questionnaire, generally the students had a good opinion of the platform (87%), nevertheless 12.5% wanted a download lecture support because of unavailability of internet connection (low bandwidth). The audio/ video support lecture was also difficultly available because of unavailability of connection.

The lectures were judged very pertinent and helpful for the formation with a direct impact on redaction of thesis research (90.1%). The lack of interactivity with the teacher was also the negative aspect of the platform (54.5%). Many students wanted a direct discussion with the platform's teachers.

The test's difficulties (pre and post tests) were judged fair by students (72. %) but 18.8% found the tests very strong.

The platform was very welcome in general with an average of 7.03 ± 0.93 on a scale of 10 (the lowest note was 5 on 10 and the best note 9 on 10). 36.6% of all students gave a note of 7 on 10 to the platform. Of all students 90% were favorable for integration into medical curriculum.

According to the questionnaire, the obstacles to e-learning in this population of students were the unavailability of internet connection, the unstable and low bandwidth quality (79.5%), the lack of time (42.9%), the financial cost (34.8%) and the un-familiarity to new technologies (7.1%).

The lecture on Evidence based medicine and the methodology of research were more visited with a total of 12275273 minutes (mean: 1301.29 min per page) (table 6) compared to logistic regression (total time 3203 min), "planification familiale" (total time 12396), "pre-éclampsie" (1399 min) and others. Inside the site, some lectures were more visited than the others (figure 6).

Table 1. Repartition of students by the age:

Age	Number	Percentage
[22-25[	40	35.7
[25-30[	**70**	**62.5**
[30-35[	2	1.8
Total	112	100

Table 2. Pre-tests marks (first and second essay)

Marks of 1st pretest essay over 100	Number	Percentage (%)	Marks of the 2nd Pretest essay	Number	Percentage (%)	P value
<10	2	1.8				
[10-20[	7	6.3				
[20-30[	17	15.3	< 30	1	16.7	
[30-40[	**27**	**24.3**	[30-40[	1	16.7	
[40-50[	**28**	**25.2**				
[50-60[	18	16.2				**0.2627**
[60-70[	5	4.5	[60-70[	1	16.7	
[70-80[	5	4.5	[70-80[	1	16.7	
>=90	2	1.8	>=80	2	33.3	
Total	111	100%	Total	6	100	

 J Health Inform Afr. 2019;6(1):1-8. DOI: 10.12856/ JHIA-2019-v6-i1-135

Table 3. Post-tests marks (first and second essay)

Marks of the 1st essay post-test notes over 100	Number	Percentage (%)	Marks of the 2nd essay post-test notes	Number	Percentage (%)	P value
<20	1	1				
[20-30[	1	1				
[30-40[	4	3.9				
[40-50[	8	7.8				
[50-60[	17	16.7	[50-60[	1	11.1	**0.6233**
[60-70[	**29**	**28.4**	[60-70[	1	11.1	
[70-80[	20	19.6	[70-80[	1	11.1	
[80-90[	10	9.8	[80-90[	4	44.4	
>=90	12	11.8	>=90	2	22.2	
Total	102	100	Total	9	100	

Table 4. Comparison of tests notes in relation to face to face presentation:

	Tests	Means	Standard deviation	P Value
Face to face presentation	Pretest of students present	44.91	16.13	
	Pretest of students absent	35.10	13.24	**0.0023**
	Post-test of students present	68.71	15.94	
	Post-test of students absent course	61.55	16.01	**0.0696**

Learners' activity on ABP site:

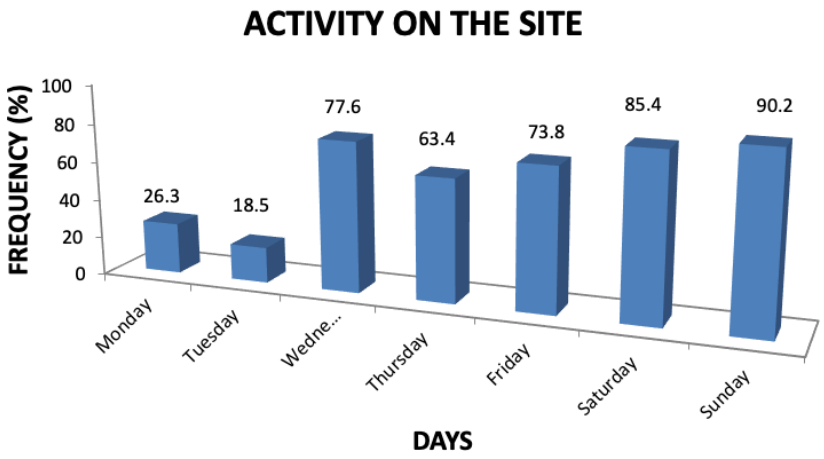

Figure 1. Activities on the site in relation to week days:

 J Health Inform Afr. 2019;6(1):1-8. DOI: 10.12856/ JHIA-2019-v6-i1-135

Table 5. Lectures using by the students

Lectures	Sessions	Frequency of use N (%)	Mean time/page (min)	Total time (min)
EBM and methodology of research	Introduction au cours ABP	75 (6.5)	676	50701
	Description du Module 1	50 (4.3)	548.9	27446
	Introduction à EBM	**135 (11.6)**	**1081.8**	**146050**
	Formuler une question de recherche clinique (PICO)	64(5.5)	3405.2	217931
	Les types d'études	**125 (10.7)**	**1825.7**	**228219**
	La recherche bibliographique sur internet	**100 (9.5)**	**1337**	**133708**
	La recherche sur Pubmed	45 (3.9)	1738.5	78249
	Accéder au texte intégral	43 (3.7)	1920.9	82599
	Evaluer la qualité des études	56 (4.8)	638.7	35769
	Gradation de la preuve	41 (3.5)	1451.3	59502
	Résumé Module 1	22 (1.9)	13995	636.13
	Total Module 1	**701 (60.4)**	**1327**	**930238**
	Description Module 2	30 (2.6)	252.6	7578
	Assessing significance and similarity	34 (2.9)	708.7	24095
	Balancing benefit /harm and patient preference	**16 (1.4)**	**586**	**9376**
	Ecrire les recommandations	39 (3.4)	841.9	32836
	Total Module 2	119 (10.2)	620.8	73885
	Description Module 3	30 (2.6)	212.1	6362
	Introduction à la recherche	50 (4.3)	972.7	48637
	Protocole de recherche	28 (2.4)	2402	67265
	Ethique et recherche	51 (4.4)	1018.9	51966
	Gérer les références bibliographiques	16 (1.4)	4533.9	12486
	Total Module 3	195 (16.8)	1010.4	197004
	Vidéo Scientific writing workshop	60 (5.2)	674.5	40470
	Total Cours Pilote	1130 (97.3)	1301.3	12275273

Table 6. Others read lectures on ABP

Lectures	Frequency of use N (%)	Mean time/page (min)	Total time (min)
EBM and methodology of research	1130 (97.3)	1301.3	12275273
Logistic Regression	7(0.60)	457.6	3203
Planification Familiale	5(0.43)	2479.2	12396
Pré-éclampsie/Eclampsie	2(0.17)	699.5	1399
Recherche et expérience e-santé	3 (0.26)	72.7	218
Writing a scientific paper	2 (0.17)	230	460
VIH/SIDA	9 (0.78)	465	4185
Building clinical and research database	3 (0.26)	1135.3	3406
Total others courses	24 (2.7)	3609.6	25267

 J Health Inform Afr. 2019;6(1):1-8. DOI: 10.12856/ JHIA-2019-v6-i1-135

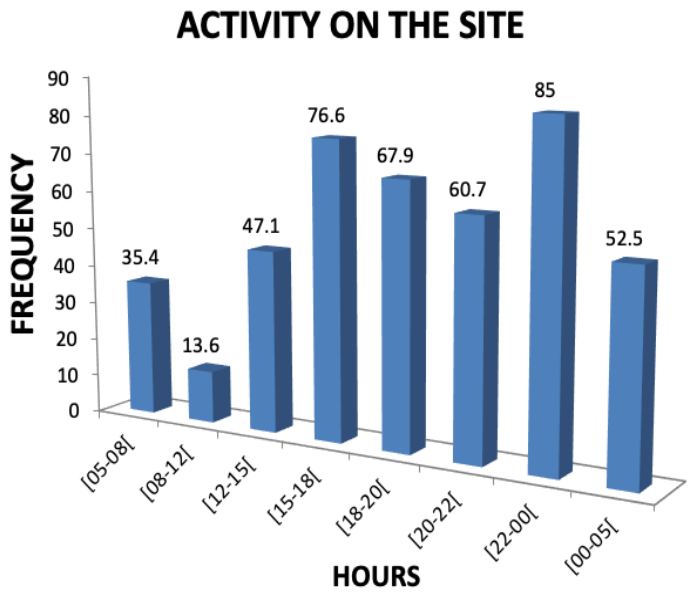

Figure 2. Activities on the site in relation to hours on the day

4 Discussion:

The needs in health education and research are increasing in Cameroon and in Sub-Saharan African countries in general. The number of medical faculties is increasing, both in the public and the private sectors; the number of medical students is increasing; the health cares are becoming complex and specialized but the human resources are not adapted quantitatively and qualitatively. This study showed that, under certain conditions, e-learning appears to be one of the solutions to this inadequacy [2-11]. 92% of registered students followed the lectures and the different steps of the process. The level of individual equipment (laptop, desktop, smartphone) of students is good in general [23].

The motivation of the learner is one of the key points for a successful online training. The motivation of the learners can be an end training certificate, a financial motivation, an honorific distinction, the integration of the program as part of their curricula, a direct application of the program in their ongoing activities or the periodic knowledge checks. In this cohort of students, the motivation was the direct impact of the training on the redaction and the defense of their thesis. This explains the high interest of students for the pilot course on research HIV-AIDS which develops the methodology of research. Then the knowledges were checked by a pre and post-tests. The presentation of the contains in an attractive manner by the responsible of each institution, the expertise of the lecturers and the familiarity of lecturers and trainees were also important elements for the adhesion of the learners. The lecturers were from south and they were elite in their environment. The lecturers were issued from the Faculty of Medicine and Biomedical Sciences of University of Yaoundé I (Cameroon), the Institute for health sciences of the " Université des Montagnes" and the Faculty of Medicine, Pharmacy and Odonto-Stomatology of Bamako [16,17]. The lectures were reviewed by a specialized team from the Institute for Tropical Medicine at Antwerp [16,17]. The lectures were prepared by an international collaboration between Cameroon, Mali and Ghana [16,17].

The structures of the lectures, the good quality of the presentations, the short duration of lectures, the bilingualism of the students may also explain the success of this program. Since Cameroon is bilingual, English was not a barrier.

The advantages of e-learning are the time flexibility and the personalization of the training period, the archiving of lectures and the opportunity of the repetition of the lectures [1,7,20,24-27]. The students who missed the face to face presentation catch up their delay at the post-test. Those who repeated the posttest improved their score.

The limitation of e-learning in our environment is the poor internet connection, the poor band width and the instability of the connection. This issued was partially solved by the use of a special software (Dudal)

 J Health Inform Afr. 2019;6(1):1-8. DOI: 10.12856/ JHIA-2019-v6-i1-135

for the emission and the broadcasting even with a low bandwidth (62kbt) [12,13,16,17,19]. The success of this program is an indicator that online training can be recommended in the Sub-Saharan African environment. Virtual or numeric library should be encouraged. The institutions should subscribe for journals, revues and books. The advantage is on space occupation, the maintenance and the flexibility of time for students who can work at home and at any time [1,7,20,25,26]. The lack of time for self-training was also a limitation. The institutions should give more time to students as prone by LMD (Licence-Master-Doctorat) system. Both institutions are in the LMD system.

5 Conclusion:

This study demonstrated that the unbalanced between the offer and the demand in qualified lecturers in the higher education especially in health education and research can be supply effectively by e-learning or distance learning, under certain conditions. The motivation of the learners are capital. The success of this program is an indicator that numeric or virtual library can be emphasized in our environment. The mains obstacles where the poor internet connection, the cost of the connection and the overload academic program.

Acknowledgment and authors' contribution:

We thank the nine partners involved in Africa Build which participate to the elaboration of ABP, the European commission for financing this activity.
Djientcheu VP designed this study, Tcheumagam K collected the data, M Ramirez did Google and ABP statistics, VP Djientcheu and Tcheumagam K wrote the article. The other authors made contributive review and critics of the article.

References:

[1] Marchalot M. Impact d'une formation supportée par une plate-forme informatique sur l'enseignement des bases fondamentales en Anesthésie-Réanimation [Thesis]. Medicine : Rouen ; 2012. 70 pages.
[2] Akoh B, Balde B, Amiss MB, Elletson H, Dadjinou P, Chango M et al. 9eme conférence internationale sur les TIC appliquées au développement, à l'enseignement et à la formation. Rapport e-Learning Africa 2013.
[3] Edouard Tamba. E-Learning : pour une intégration pédagogique des TIC dans l'éducation. Actualité sur le TIC et le développement durable. Cameroun TIC et développement 2009.
[4] Bagayoko CO, Traoré D, Touré B, Sacko A, Keita Y, Sangare M et al. E-Learning en santé publique au sein de la faculté de médecine, pharmacie et d'odontostomatologie (FMPOS) Mali [on line]. 2013 September [consulted on 7/6/2014]. Available on URL : http://africabuild.eu/fr/consortium/fmpos#main.
[5] Ouganda: Programme de formation e-Learning pour les sages-femmes défi-2 et défi-3. Rapport annuel AMREF 2012.
[6] Lamago MF. La formation continue à distance des enseignants au Cameroun : enjeux et nouveaux défis pour l'école normale supérieure 2009.
[7] Denef JF. Les nouvelles technologies de l'information et de la communication (NTIC) dans la formation médicale, au service de l'acquisition et du développement des compétences professionnelles. Pédagogie Med. 2001;2:42-50.
[8] Ricard JD, Lejoyeux M, El-Ghoneimi A, Matheron S, Maillard D, Crikx B, Dreyfuss D. Utilisation des nouvelles technologies de l'information et de la communication par les étudiants en médecine. Enquête de pratique et mise en situation. Pédagogie Med.2005;6:112-22.
[9] Marchand L. Pour une éducation médicale avec apprentissage en ligne. Pédagogie Med. 2002;3:180-87.
[10] Télémédecine et formation à distance en Afrique : l'exemple de Dakar. Médiation scientifique et culturelle [on line]. 2011 [consulted on 25/5/2014]. Available on URL: http://cursus.edu/article/5524/telemedecine-formation-distance-afrique exemple dakar/.
[11] Cameroun : l'université virtuelle nationale ouvre ses portes [on line]. 2010 September [consulted on 1/6/2014]. Available on URL : http://cursus.edu/article/5378/cameroun-universite-virtuelle-nationale-ouvre-enfin/.
[12] Bagoyoko C, Geissbuhler A. Télémédecine et formation médicale à distance en Afrique : exemple du RAFT, un réseau de collaborations impliquant hôpitaux, université, organisations internationales et la société civile. Rev Med Suisse. 2000;5:524-526.

[13] HUG : RAFT Réseau en Afrique Francophone pour la Télémédecine [on line]. 2000 [consulted on 20 may 2014]. Available on URL : http://raft.hcuge.ch/.
[14] Présentation du Projet panafricain des services en ligne [on line] 2014 May [consulted on 5/6/2014]. Available on URL : http://www.minpostel.gov.cm/images/favicon-minpostel.png/Présentation du Projet Panafricain des services en ligne_files/system.css.
[15] Chastonay P, Kayser B. www.universante.org : «e-learning» en santé publique. Un partenariat entre Beyrouth, Genève, Monastir et Yaoundé. Rev Med Suisse 2006;2:82-84.
[16] African Build Project [on line]. 2011 August [consulted on 9/5/2014]. Available on URL : http://africabuild.eu/fr/.
[17] Africa Build Portal [on line]. 2011 [consulted on 9/5/2014]. Available on URL : http://ochoa.dia.fi.upm.es/africabuildportal/.
[18] Horm F, Lamarche T. L'université médicale virtuelle francophone UMVF : rapport d'étude[on line]. 2005 [consulted on 25/5/2014]. Available on URL: http://www.ifresi.univ-lille1.fr/SITE/2 Recherche/22 Programmes/ ERTe/ERTe.htm
[19] Olivier Archambeau. L'Université numérique francophone mondiale (UNFM): une expérience pour un enseignement de qualité dans un environnement de pénurie. Hérodote [on line]. 2007 [consulted on 25 /5/2014] ;3(126):[24 Pages]. Available on URL : http://www.cairn.info/revue-herodote-2007-3-page-169.htm.
[20] Bodjrenou AJ, Kouawo AC, Moumouni H, Darboux R. Evaluation de l'impact de la mise en ligne d'un programme d'histologie-embryologie sur les performances aux examens d'étudiants en première année d'études médicales au Niger. Pédagogie Med. 2008;9:181-4.
[21] Hattab NM , Lahmiti S, Abdelaziz BA, Saidi H, T Fikry. Internet et étudiants en médecine à Marrakech. Ann Med Afr. 2010;9(2):68-72.
[22] Ladner J, Nadir B, Abdelaziz A, Benmaïza S, Alaoua O. Internet use among medical students in Batna (Algeria), Rouen (France), Sousse (Tunisia). Sante Publique. 2010; 22(6):637-46.
[23] Djientcheu VP; Tcheumagam K; Ramirez M; Njajou O; Bello F; Nguifo JE, et al. Is the medical educative environment suitable for Telemedicine and e-learning in Cameroon? FMSB journal. 2014.
[24] Mancini J, Giorgi R, Gaudart J, et al. Dispositif pédgogique de formation à la lecture critique d'articles scientifiques utilisant une plate-forme numérique: impact sur les Performances des étudiants à l'examen sommatif. Pédagogie médicale. 2009;10:131-144.
[25] Bernier AM, Thierry Karsenti T. Enquête sur la perception de l'usage des TIC dans l'enseignement universitaire par les étudiants à l'Université de Montréal. Grandes conférences du CEFES [en ligne]. 2006 [consulté le 25/5/2014]. Disponible à l'URL www.profetic.org/Que-pensent-nos-etudiants-de-l/.
[26] Deci EL, Ryan RM. Self-determination theory and the facilatation of intrinsic motivation, social developpement and well-being. American Psychologist. 2000;55:68-78.
[27] Morgulis Y, Kumar RK, Lindeman R, Velan GM. Impact on learning of an e-learning module on leukemia: a randomised controlled trial. BMC Medical Education. 2012; 12-36

 J Health Inform Afr. 2019;6(1):1-8. DOI: 10.12856/ JHIA-2019-v6-i1-135