

## Mapping Information Literacy Outcomes and Learning Experiences of Health Sciences Undergraduate Students

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### **Abstract**

This study assessed whether first year undergraduate students are applying the research skills taught in an information literacy (IL) module in course IT 100 to their work in other classes and for anything unrelated to classes at the Muhimbili University of Health and Allied Sciences (MUHAS) in Tanzania. A total of 275 students took part in a printed questionnaire survey which was distributed to all second year undergraduate students at MUHAS, a return rate of 77.2 percent. The study demonstrated that students continue to use the skills gained during the IL course both in other classes and for purposes unrelated to the class. However, there was low use of scholarly databases and the library catalogue for academic and non-academic activities. These findings show a need to address some issues concerning the information literacy module (IT 100.2), such as an increased emphasis on teaching topics related to search strategies, information sources, and evaluation of resources as a practical and useful skill. The study findings further showed that issues related to facilities (internet connectivity and electrical power) will also need to be addressed. This study is based on self-reports by first year undergraduate students, which may not be a precise predictor of their actual health information competencies and their actual use of skills in courses other than IL and for anything unrelated to the class. Further research is needed to validate differences between students' self-reports of their IL competence with their actual competence as measured by a strenuous post-test.

### **Keywords**

information literacy; health information literacy; information literacy skills; information literacy competencies; university; Tanzania

### **Introduction**

Information literacy (IL) is essential for personal empowerment, economic development, and is of equal relevance to enabling lifelong learning (Idiodi, 2005). In higher learning institutions, IL is essential for enabling students to “learn more effectively, to develop the creative thinking and to produce a high quality academic material of a course of study” (Salleh & Halim, 2011: 506). The growing size and complexity of library collections in the middle 20<sup>th</sup> century and the information

explosion of the late 20<sup>th</sup> century gave birth to the concept of information literacy (Idiodi, 2005). In general, the dominance of internet-based information, search engines, and the common concept that anything is available through Google bring challenges to instruction librarians (Daugherty & Russo, 2011). Further, the quality, authenticity, validity and reliability of some of the online resources cannot be assured (Association of College & Research Libraries, 2000). These uncertainties are among other factors that make information literacy relevant in the academic setting.

“To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (American Library Association, 1989). IL instruction enables users to effectively identify and select information, use relevant search techniques to evaluate, organize and synthesize information thus obtained into a meaningful state (Idiodi, 2005). IL instruction is thus important in enabling students to acquire relevant skills to master content and to control their investigation and learning inquiry. In this sense, it is essential for undergraduates to acquire these IL skills to effectively control their course-related activities and develop lifelong skills.

In recognition of this fact, most universities, at the global level in particular, have introduced IL courses into their undergraduate programmes. However, African studies show that implementation of IL is still slow in Africa. For instance, a study on information literacy education in library schools in Africa found that only a few offer IL as a stand-alone course in their curricula (Baro & Keboh, 2012; Baro, 2011). In Tanzania, research shows that IL is still very new in the university curricula although some IL rubrics are being practised (Lwehabura & Stilwell, 2008; Lwoga, 2012).

The Muhimbili University of Health and Allied Health Sciences (MUHAS) is one of the universities in Tanzania that has offered an IL module in the information and learning technology course (IT 100) in all first year undergraduate programmes since the 2011/12 academic year. This course is delivered by academic librarians on campus, usually through lectures, tutorials, seminars and practical sessions. The course materials are usually delivered through the university learning management system by using Moodle software. The lectures provide the information base while the practical sessions are conducted to a group of between 70 and 100 students to encourage participation and hands-on learning. This IL course is only taught to first year undergraduate students. The library therefore uses other ways to distribute IL knowledge to students and faculty, such as the university learning management system, online tutorials, subject guides, social media, printed leaflets and posters on campus, and IL workshops to continuing undergraduate and postgraduate students and faculty.

The IL module that is taught in all first year undergraduate programmes covers mainly the following topics: overview of IL, search strategies, open access issues, overview to evidence-based practice, critical analysis of information sources and scientific papers, plagiarism and copyright issues, and citation and reference management. There are various measures to assess students' information literacy competencies when they are undertaking the module, including attendance, participation and examination. However, it is not easy to evaluate whether students are applying those skills taught from the IL module in other areas of academic or non-academic activity. Therefore, this study aimed to assess the effects of the

information literacy module (IT 100.2) training to academic- and non-academic-related activities among second year undergraduate students at MUHAS. In particular, the study aimed to determine the following:

1. The utilization of information literacy skills for works in other courses among undergraduate students, and
2. The application of information skills in other contexts among undergraduate students.

### ***Literature review***

There is a growing amount of literature on the long-term effects of IL instruction (Daugherty & Russo, 2011). Although most IL assessment studies have focused on the assessment of IL competencies through a pre-test/post-test form of learner assessment (Cannick et al., 2007; Craig & Corral, 2007; Dennis, Murphey, & Rogers, 2011; Hsieh & Holden, 2010; Johnson et al., 2011; Roter et al., 1998; Shanahan, 2007), some authorities have argued the limited value of this approach. The pre-test/post-test studies are limited to short term retention of skills taught from the IL instruction course (Wang, 2006).

On the long-term effects of IL, studies have assessed the effects of library instruction programmes by surveying students' perception of their IL competencies and their ability to perform tasks related to information research. For instance, Wong et al. assessed students perception following a library instruction programme in Hong Kong and found that most of those who had received instruction found it helpful, and they retained and used the skills learned (Wong, Chan, & Chu, 2006). A national study of the outcomes of IL instruction at Canadian business schools also indicated a wide range of positive outcomes, including specific skill development and increased confidence; however, expected transferability of those outcomes beyond the walls of the educational institution remains doubtful (Julien et al., 2009). Thus, even if students acquire IL skills through informal IL instruction, those skills are useful to carry out their studies.

Research studies have also assessed the effects of formal IL training, which is integrated in other courses, by surveying students' attitudes on IL instruction. For instance, in a study at the University of Hawaii at Manoa, Lebbin found that IL instruction was useful, and students used the skills they learned in a variety of other courses apart from the IL-related classes (Lebbin, 2005). Other studies (Johnson et al., 2011; Shanahan, 2007) revealed similar findings: that students were comfortable searching online literature and conducting a critical analysis of a scientific paper after attending the IL course. Daugherty and Russo (2011) also assessed the effects of IL formal training from a stand-alone IL course on students' academic and non-academic activities. This study was conducted at Louisiana State University and found that students continue to use the materials and skills taught in the course throughout their college careers for both course work and personal research (Daugherty & Russo, 2011). The literature indicates that IL instruction is important for lifelong learning, and it positively impacts students' academic and non-academic life.

Studies show that the use of multiple assessment techniques in IL courses can help to gauge the effects of IL training more effectively. For instance, Wang (2006)

assessed the differences in citation use and grades between students who took a library credit course and students who did not. The study found that the student group that took a library credit course cited more scholarly resources, produced fewer incomplete citations, and received higher grades for its papers and courses. Additionally, the survey results revealed that the students' acquisition of bibliographic research and citation skills was directly attributable to the library credit course, whereas their counterparts tended to rely on informal sources (Wang, 2006). Ganley, Gilbert, and Rosario (2013) used a triangulated approach including thesis review, and student and faculty survey responses and found that not all students (n=164), even at the senior level, had satisfactory IL skills. The results from the senior students' theses revealed that they were most likely not skilled in IL and had an inflated opinion of their own IL abilities (Ganley et al., 2013). Another study at the Washington State University Honors College used student surveys, research blogs, case studies, library instruction sessions, homework problem sets and exams to assess IL competencies, and the results helped to improve informed adjustments to the course syllabus and completing activities on time (Johnson et al., 2011). Samson (2010) assessed IL learning outcomes using writing portfolios and research paper bibliographies and found that first-year and capstone students demonstrated the ability to locate and evaluate information in support of their research. It is obvious that use of multi-methods to assess IL competencies can enable librarians and faculty to gain a complete picture of the lasting effects of IL instruction and improve the delivery of IL programmes.

Other studies have assessed the effects of IL instruction by investigating factors affecting student learning outcomes of IL training in higher learning institutions. For instance, Stamatoplos and Mackoy (1998) investigated the effects of IL instruction by measuring patron satisfaction and learning in the USA. The study found that satisfaction appeared to be related to student perceptions of information accessibility, staff competence and helpfulness, computer usefulness and ease of use, and skill level for using libraries. Another study by Detlor et al. (2011) also revealed that salient factors of the learning environment, IL program components, and student demographics may affect IL student learning outcomes. The literature suggests that the lasting effects of IL can also be assessed by determining potential factors following IL instruction, and this will help to improve the delivery of IL training.

On the whole, the literature specifies that there are different modalities of assessing IL programmes. Most IL assessment studies show that IL programmes have a lasting positive impact on students' learning and personal life. The importance of assessing the lasting impact of IL programmes is well recognized; in depth understanding is required on the effects of these programmes in the Tanzanian context. This study thus seeks to assess the outcomes related to IL programmes among first year undergraduate students at MUHAS in Tanzania.

## ***Methodology***

An exploratory survey was conducted to determine whether first year students were applying information literacy skills only in class or whether they were employing their newly-acquired information-seeking abilities in other contexts at MUHAS. This survey was conducted to second year undergraduate students with previous formal

training of the IL module in course IT 100 (information and learning technologies) in their first year in 2011. The study allowed a lapse of 11 months between the delivery of instruction and the survey of the effects of IL instruction among second year undergraduate students. Various studies have assessed students with previous formal IL training, and they allowed varied time between the delivery and assessment of instruction. For instance, Wong et al. (2006) allowed a lapse of four to eight weeks between the delivery and assessment of instruction at Hong Kong University of Science and Technology.

Based on similar research elsewhere, this study adopted a questionnaire to survey the students' application of IL skills in class and in other contexts, including basic descriptive statistics such as percentages and presentation of data through assorted graphs and tables (Daugherty & Russo, 2011; Julien et al., 2009; Lebbin, 2005; Wong et al., 2006). The self-administered questionnaire comprised three closed-ended sections (See Appendix 1). Printed copies of the questionnaire were distributed to all second year undergraduate students at MUHAS (n=356). On the whole, a total of 275 students took part in the survey, with a rate of return of 77.2 percent. The first part of the questionnaire included questions related to demographic data, including gender, and age. The second part included questions related to the use of information literacy skills and resources taught in the IL module for works in other courses offered to first year undergraduate students. The third part of the questionnaire aimed to determine the use of IL skills in other works outside the academic environment.

## Results

Table 1 shows that male respondents accounted for 66.5 percent (n =183) while females accounted for 33.5 percent (n =92). Most respondents were aged between 19 and 25 (82.2 percent: n =226), followed by those respondents with ages between 31 and 35 (7.6 percent: n=21). A majority of students were enrolled in the doctor of medicine programme (51.3 percent; n=141) (See Table 1).

Table 1: Demographic details

		Frequencies	Percentages
Gender	Male	183	66.5
	Female	92	33.5
Age	19-25	226	82.2
	26-30	20	7.3
	31-35	21	7.6
	36-40	7	2.5
	41 and above	1	0.4
Degree programmes	Doctor of Medicine	141	51.3
	Bachelor of Pharmacy	46	16.7
	Bachelor of Nursing	28	10.2
	Bachelor of Environment Health Management	30	10.9
	Doctor of Dental Surgery	17	6.2
	Bachelor of Science Radiation, Therapy and Technology	5	1.8
	Bachelor of Medical Laboratory Sciences	8	2.9

## Application of IL skills in courses other than IT 100.2

The study findings indicated that a large number of students (65.8 percent, n=181) had used IL skills taught in the IL module (IT 100.2) in other courses. Generally, most students had used Google search operators (59.6 percent, n=164), one keyword searching, and Boolean operators (44.4 percent, n=122) to search information for courses other than IT 100.2, as shown in Table 2. Google search operators are symbols or words in addition to the search term in the Google search box. One keyword searching is the use of a concept, phrase or word of a given topic to find matching literature containing one or more words specified by the user in an online database or search engine. Boolean operators are words (AND, OR, NOT or AND NOT) used as conjunctions to combine or exclude keywords in a search, resulting in more relevant documents (Alliant Libraries, 2013).

Table 2: Use of search techniques to search for information related to academic courses or school

	<b>Frequencies</b>	<b>Percentages</b>
Google search operators	164	59.6%
One keyword searching	122	44.4%
Boolean operators	122	44.4%
Phrase searching	119	43.3%
Truncation or wildcard	92	33.5%
Advanced searching	90	32.7%
Browsing the database	89	32.4%
Use of synonyms	83	30.2%
Physical navigation of library	44	16.0%

Students were asked to list problems in using IL skills in other coursework. Slow internet connectivity (60.4 percent, n=166) was the major challenge faced by students when using IL skills. Other difficulties included forgetting the skills taught (37.8 percent, n=104) and lacking time to practice skills learned in the IL module (37.5 percent, n=103) (see Table 3).

Table 3: Difficulties in using IL skills

	<b>Frequencies</b>	<b>Percentages</b>
Slow internet	166	60.4%
Forgetting the skills taught	104	37.8%
Lacking practice of skills	103	37.5%
Narrowing the search	91	33.1%
Unreliable electrical power	91	33.1%
Locating material	72	26.2%
Credibility of the sources	72	26.2%
Struggling with the databases	67	24.4%
Finding physical material	64	23.3%

Further assessment was done to determine the types of online resources used by students in other classes. Search engines (69.8 percent, n=192) had high use among students, followed by the library website (32.7 percent, n=90). Other e-resources that were used by students included the MUHAS repository (23.3 percent, n=64), library 2.0 services (22.5 percent, n=62), the library catalogue (22.2 percent, n=61), and indexes and/or databases (16.4 percent, n=45). A further assessment was done to determine the types of indexes or databases used by students. Most students used Google Scholar (50.5 percent, n=139), followed by HINARI (43.6 percent, n=120) as shown in Table 4.

Table 4: Type of indexes and databases used by undergraduate students

	<b>Frequencies</b>	<b>Percentages</b>
Google Scholar	139	50.5%
HINARI	120	43.6%
PUBMED	65	23.6%
Free medical books	63	22.9%
Free medical journals	60	21.8%
Cochrane	48	17.5%
African journals online	41	14.9%
British medical journals	34	12.4%
PUBMED Central	34	12.4%
Agora	33	12.0%
Biomed Central	31	11.3%
Scirus	27	9.8%
OpenDOAR	21	7.6%
CABI Global health	20	7.3%
DOAJ	16	5.8%

On the use of information resources, three quarters of the students used print books (70.2 percent, n=193) when using the previously identified information resources taught in the IT 100.2 module. Other types of information resources used by students included print journals (42.5 percent, n=117), web documents (38.9 percent, n=107), scholarly documents (37.1 percent, n=102) and research reports (28 percent, n=77).

When asked to indicate whether they faced any difficulties using the information resources taught in the IL module (IT 100.2) in other academic courses, one third of students agreed (39.7 percent, n=108) or strongly agreed (7.7 percent, n=21) that they experienced some difficulty in using online resources. About 35.7 percent (n=97) of students disagreed or strongly disagreed that they faced difficulties, while 16.9 percent (n=46) were neutral regarding the matter. The difficulties that students experienced in using online information resources were related to slow internet connectivity and forgetting the skills taught in module IT 100.2, as shown in Table 5.

Table 5: Difficulties using the information resources taught in the IL module in other academic courses

	<b>Frequencies</b>	<b>Percentages</b>
Slow internet connectivity	172	62.5%
Forgetting the skills learned in the IT 100 information searching module	110	40.0%
Unreliable electrical power	97	35.3%
Difficulty in finding relevant resources for my information needs	96	34.9%
Trouble selecting relevant search terms and creating an effective search statement	91	33.1%
Inability to identify full-text resources	69	25.1%

Most students acknowledged that they were successful in finding information for their coursework (77.9 percent, n=211). The majority of respondents acknowledged that the use of IL skills enabled them to find information (76 percent, n=209) and reduce time that they would use to search for information (67.3 percent, n=185), as shown in Table 6.

Table 6: Benefits of using IL skills among students

	<b>Frequencies</b>	<b>Percentages</b>
Increased ability to find information (i.e., developed their searching skills)	209	76.0%
It enables me to reduce time that I would use to search information	185	67.3%
It enables me to accomplish my assignments more efficiently	172	62.8%
Understanding plagiarism issues	169	61.5%
Information is easier to find	159	57.8%
Increased ability to evaluate the reliability and accuracy of the information I find	150	54.5%
It provides useful information for my research project/assignment	142	51.6%
Developed strategies for planning my searching	130	47.3%
It enhances the quality of my research project/assignment	129	46.9%
Knowledgeable about what information is available through library-provided databases	117	42.5%
Better grades following information searching training	114	41.5%

### Applications of IL skills outside of academic classes

Three quarters of respondents used IL skills for other purposes unrelated to academic courses or school (70.5 percent, n=194). Most used Google search operators (60 percent, n=165), the one keyword searching technique (39.6 percent, n=109), and Boolean operators (38.9 percent, n=107) to search for information unrelated to academic courses or school, as shown in Table 7.

Table 7: Use of search techniques to search for information unrelated to academic courses or school

	<b>Frequencies</b>	<b>Percentages</b>
Google search operators	165	60.0%
One keyword searching	109	39.6%
Boolean operators	107	38.9%
Phrase searching	86	31.3%
Advanced searching	82	29.8%
Truncation or wildcard	73	26.5%
Use of synonyms	68	24.7%
Browsing the database	64	23.3%
Physical navigation of library	40	14.5%

Over half of students used search engines to locate information for activities unrelated to their classes or school (56 percent, n=154). Other online resources that were used by students for non-academic purposes included the library website (26.5 percent, n=73), the MUHAS repository (24 percent, n=66), the library catalogue (22.5 percent, n=62), library 2.0 services (22.2 percent, n=61), and indexes and databases (19.6 percent, n=54). Students mainly used Google Scholar (42.2 percent, n=116) and HINARI databases (38.2 percent, n=105) for other activities unrelated to their classes or school, as shown in Table 8.

Table 8: Types of information resources used for non-academic activities

	<b>Frequency</b>	<b>Percentage</b>
Google Scholar	116	42.20%
HINARI	105	38.20%
Free medical books	56	20.40%
PUBMED	53	19.30%
Cochrane	47	17.10%
Free medical journals	46	16.70%
African journals online	37	13.50%
AGORA	32	11.60%
PUBMED Central	27	9.80%
Scopus	25	9.10%
British medical journals	25	9.10%
Biomed	24	8.70%
Scirus	23	8.40%
CABI	21	7.60%
OpenDOAR	20	7.30%
DOAJ	18	6.50%

Three quarters of students (70.5 percent, n=194) acknowledged that they were successful in finding information they were seeking for activities unrelated to classes or school. Students were asked what type of information they were searching for in the previously mentioned information sources. Most students searched for information related to social/entertainment issues, environmental, and nutrition/diet issues (see Table 9).

**Table 9: Type of information searched for non-academic activities**

	<b>Frequencies</b>	<b>Percentages</b>
Economic	92	33.5%
Exercise	103	37.5%
Political	115	41.8%
Technological issues	119	43.3%
Nutrition/diet	121	44.0%
Environmental	139	50.5%
Social/entertainment issues	163	59.3%

## ***Discussion***

The results revealed a number of issues that need to be addressed. The findings showed that students continued to use online searching techniques for their academic assignments eleven months after the IL training. Most students used the one keyword searching technique, Boolean operators, phrase searching, and truncation or wildcards. Similarly, other scholars (Daugherty & Russo, 2011; Julien et al., 2009; Person, 1981; Wang, 2006) also reported that a majority of students used IL skills in other courses. Indications are that students are developing IL skills necessary for independent and lifelong learning and important for their future careers, as highlighted in the literature (Shanahan, 2007). The present study findings also indicated that few students physically visited the library to access information resources, which shows that they are missing opportunities to learn IL skills from the librarians, as observed in previous studies in Singapore (Hoffmann & LaBonte, 2012).

Study findings showed that few students had problems in using IL skills in other coursework, which shows that most students understood what they learned in the IL module (IT 100.2), and they utilized those skills for their academic activities. Barriers related to slow internet connectivity and unreliable electrical power were cited by some students. This finding shows a need to improve the internet connectivity on campus and seek other alternative sources of power. The study findings also showed that some students forgot the IL skills taught and lacked time to practice what they learned in the IL module. Further, other students did not know how to narrow a search, to assess the credibility of some online sources, or how to locate information materials. The variety of user interfaces and search facilities in different databases inhibits users from searching and locating information materials easily. Similarly, a survey of four universities in Tanzania revealed that, although they had access to and use of various e-resources both for academic and non-academic work, students still lacked adequate knowledge and skills in some aspects, including searching and evaluation (Lwehabura, 2008).

In information retrieval, most students preferred using search engines and the library website more than the library catalogue and indexes and/or databases to retrieve literature. The library website was also seen as the main tool to access information because it has annotated links to scholarly databases where students can access the required literature. The study findings also suggest that IL instructors need to put a major emphasis on the use of scholarly databases/indexes and the library

catalogue to enhance use of these resources for academic activities on campus. The survey further showed that databases such as HINARI and Google Scholar were the popular indexes and/or databases among students.

Similar to previous studies (Daugherty & Russo, 2011), most students did not experience any difficulties regarding the use of e-resources. However, a number of obstacles were mentioned by some students, including slow internet connectivity and unreliable electrical power. Other problems were inability to find relevant information, to identify full-text resources, and to remember skills learned in course IT 100.2. These difficulties were similar to those related to the use of IL skills among students. It is thus important to address problems in relation to the inability to find relevant information and full-text resources when teaching the IL module.

In general, most students were successful in finding information for their coursework. The IL module enabled students to find information, reduce time that they would use to search for information, to access information that is useful for their research projects, and to understand plagiarism issues and accomplish course assignments. Similarly, other studies (Daugherty & Russo, 2011; Julien et al., 2009; Person, 1981; Wang, 2006; Wong et al., 2006) also found that most of those who had received IL instruction found it helpful, and they retained and used the skills learned. These findings show that the IL module is important in enabling students to control their own learning.

Contrary to previous studies (Daugherty & Russo, 2011) which found a low use of IL skills for non-academic reasons, a majority of students in this study indicated that they used IL skills (such as one keyword searching and phrase searching) for non-academic purposes. This finding further shows that students use skills taught in the IL module for personal as well as academic life. The survey results identified search engines to be the most popular tools for accessing information unrelated to academic activities among undergraduate students. The use of indexes and databases for non-academic purposes was generally low. Similar to findings on the use of IL skills for academic related activities, students mainly used Google Scholar and HINARI databases for anything unrelated to their classes. Most students were successful in finding information they were seeking for non-academic reasons, such as for social/entertainment, political, nutrition, economic, environmental, and technological issues. These findings suggest that the IL module plays an important role in supporting lifelong learning.

### ***Implication for practice***

The implications of the study findings are three-fold. First, although the findings showed that students continue to use search techniques both for academic and non-academic purposes, they make low use of library catalogues and scholarly databases. These findings show a need to address some issues concerning the IL module (IT 100.2), such as an increased emphasis on teaching topics related to search strategies, information sources and evaluation of resources as a practical and useful skill. Further, the findings necessitate the need for librarians to continuously promote use of e-resources among students to enhance usage of IL skills and e-resources in their institutions. Librarians should use different avenues to promote e-

resources including printed leaflets/brochures supplemented with library websites, learning course management systems, online tutorials, and social media. Further, librarians should partner with faculty to integrate IL into the curriculum at different levels of study. In the current survey, the IL module is only taught to first year undergraduate students. It would therefore be more significant if the IL course were taught at different levels of study so that students keep on strengthening their IL competencies as they move to senior levels, which will also enhance their usage of e-resources.

Secondly, the results showed that assessment of IL skill enabled the identification of gaps and problems that students face after the completion of the IL course. The questionnaire survey helped to determine the perceptions of students regarding their IL knowledge and competencies. It is therefore important for higher learning institutions, and especially librarians, to conduct timely and regular assessment of their IL sessions in order to address the problems on time and improve the delivery of IL courses to students.

Thirdly, the study findings emphasized the need to improve the ICT infrastructure (internet connectivity and electrical power), which inhibited most students in using e-resources. Currently, MUHAS is making efforts to increase internet bandwidth and to seek other alternative sources of electrical power; therefore, the situation is expected to improve in the near future. It is important for other institutions in developing countries to improve their infrastructure in order for IL instruction to have maximum impact in students' academic life.

## ***Conclusions***

The findings from this survey indicated that students appreciate the skills taught in the IL course, and they continue to use these skills for academic and personal activities. The study demonstrated that students continue to use the skills gained during the IL module; such skills included one keyword searching and Boolean operators. However, there was low use of scholarly databases and the library catalogue both for academic and non-academic purposes. The study findings further showed that issues related to facilities (internet connectivity and electrical power) will also need to be addressed. In general, first year undergraduate students may have a way to go, but this assessment indicates that they are making progress. The study findings further suggest that a careful and rigorous approach to assessment can provide the basis for appropriate corrective action.

This study is based on self-reports by undergraduate students, which may not be a precise predictor of their actual health information competencies and their actual use of skills in courses other than information literacy. Further research is needed to validate differences between students' self-reports of their IL competence and their actual competence as measured by a strenuous post-test, and evidence-based data that focuses on measuring actual performance of students through information skills tests. Further studies should use mixed methods in order to gain a deep understanding of the lasting effects of IL instruction among trainees. Other researchers should also conduct studies to assess factors that can enhance the

delivery of IL instruction, especially in developing countries where such studies are scant.

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## Appendix 1: Questionnaire for study participants

1. Degree programme:.....
2. Gender: 1=  Male 2=  Female
3. Age:.....
4. Did you use any of the skills (e.g., Boolean searching) you learned in IT 100: information searching module (Please select only one answer)  
1. =  Yes 2. =  No
5. Please select the skills you used (MARK ALL THAT APPLY)  
1=  One keyword searching 2= Boolean operators 3= truncation or wildcard  
4= Google search operators 5=  Advanced searching 6= browsing the database  
7= use of synonyms 8=  Phrase searching 9=  Physical navigation of library  
Others:.....
6. What difficulties that you experience when using the IT 100: information searching skills for other academic courses? (MARK ALL THAT APPLY)  
1= forgetting the skills taught 2= narrowing the search  
3=  locating material 4=  struggling with the databases  
5=  Slow internet connectivity 6=  Unreliable electrical power  
7=  Credibility of the sources 8=  lacking practice of skills  
9=  finding physical material Others:.....
7. Which information resources in IT 100: information searching module do you use in other classes? (MARK ALL THAT APPLY)  
1=  Indexes and scholarly databases 2= the library catalog  
3=  search engines e.g. Google 4=  library website  
5=  MUHAS Institutional repository 6=  library web 2.0 tools (library blog, facebook, twitter)
8. What type of indexes and databases used (MARK ALL THAT APPLY)  
1=  HINARI 2= PUBMED 3=  Cochrane  
4=  AGORA 5=  CABI Global health 6=  Google scholar  
7= scirus 8=  scopus 9=  jstor  
10=  Wiley online library 11=  biomed central 12=  free medical journals  
13=  jstor 14=  British medical journals 15=  African journals online  
16=  Emerald 17= DOAJ 18= SAGE  
19= Free medical books 20= OpenDOAR 21=  PUBMED Central  
Others:.....
9. What type of information do you look for while using the previously identified information resources taught in IT 100 course? (MARK ALL THAT APPLY)  
1. =  scholarly documents 2. =  books 3. =  journals 4. =  research reports  
5= web document 6= Others:.....
10. Do you experience any difficulty when using the information resources taught in IT 100 information searching module in other academic courses?(Please select only one answer)  
1. =  Strongly disagree 2. =  Disagree 3. =  Undecided 4. =  Agree 5. =  Strongly agree
11. What are those difficulties that you experiences when using the information resources taught in IT 100 information searching module in other academic activities? (MARK ALL THAT APPLY)  
1= trouble selecting relevant search terms and creating an effective search statement  
2=  difficulty in finding relevant resources for my information needs  
3=  forgetting the skills learned in the IT 100 information searching module  
4=  inability to identify full-text resources  
5=  Slow internet connectivity  
6=  Unreliable electrical power  
7= Others:.....
12. Are you successful in finding information for your coursework? 1. =  Yes 2. =  No
13. What are the benefits of course IT 100? (MARK ALL THAT APPLY)  
1=  increased ability to find information (i.e., developed their searching skills)  
2=  It enables me to reduce time that I would use to search information

- 3=  increased ability to evaluate the reliability and accuracy of the information I find
- 4=  Understanding plagiarism issues
- 5=  It enables me to accomplish my assignments more efficiently
- 6=  It enhances the quality of my research project/assignment
- 7=  It provides useful information for my research project/assignment
- 8=  better grades following information searching training, in large part on assignments requiring the use of library information resources
- 9=  information is easier to find
- 10=  knowledgeable about what information is available through library-provided databases
- 11=  developed strategies for planning my searching
- 12= Others.....

**14. Have you used IT 100; information searching module skills for anything unrelated to academic courses or school?**                      1. =  Yes                      2. =  No

**15. Please select the skills you used for anything unrelated to academic courses or school? (MARK ALL THAT APPLY)**

- 1=  One keyword searching                      2=  Boolean operators                      3=  truncation or wildcard
- 4=  Google search operators                      5=  Advanced searching                      6=  browsing the database
- 7=  use of synonyms                      8=  Phrase searching
- 9=  Physical navigation of library
- Others:.....

**16. Which information resources in IT 100: information searching module do you use for anything unrelated to your classes or school? (MARK ALL THAT APPLY)**

- 1=  indexes and databases                      3=  search engines e.g. Google
- 2=  The library catalog                      4=  library website
- 5=  MUHAS Institutional repository                      6=  library web 2.0 tools (library blog, facebook, twitter)

**17. What type of indexes and databases used for anything unrelated to your classes? (MARK ALL THAT APPLY)**

- 1=  HINARI                      2=  PUBMED                      3=  Cochrane
- 4=  AGORA                      5=  CABI Global health                      6=  Google scholar
- 7=  Scirus                      8=  Scopus                      9=  Jstor
- 10=  Wiley online library                      11=  biomed central                      12=  free medical journals
- 13=  Jstor                      14=  British medical journals                      15=  African journals online
- 16=  Emerald                      17=  DOAJ                      18=  SAGE
- 19=  Free medical books                      20=  OpenDOAR                      21=  PUBMED Central
- Others:.....

**18. Were you ultimately successful in finding the information you were looking for non-academic purposes?**                      1. =  Yes                      2. =  No

**19. What type of information were you trying to find that not for academic purposes? (MARK ALL THAT APPLY)**

- 1=  social/entertainment issues                      5=  environmental
- 2=  political                      6=  technological issues
- 3=  nutrition/diet                      7=  exercise
- 4=  economic
- Others: .....

**20. Provide any additional comments related to course IT 100**

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