Annals of Library and Information Studies
Vol. 60, March 2015, pp. 19-26

A credit based information literacy course module for science undergraduates: an assessment

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Received 30 July 2014, revised: 22 January 2015

The Library of the University of Colombo offers an Information Literacy (IL) course module for the first year science undergraduates as a credit based optional course. This study was done among the seventy five students who followed the IL course module in 2011. Actual IL skills acquired by students from the course, students' perceptions towards IL awareness levels and their readiness to apply IL skills during the next academic period were assessed. Actual IL skills acquired by the students were measured by their assignment marks and a user survey was conducted to assess the students' perceptions towards IL awareness levels. All the students completed the course successfully and earned one credit by exceeding the pass mark level while 23 students passed with honours and 46 passed with satisfactory grades. Students' perceptions towards the IL awareness show a significant improvement for the majority of the IL attributes at the end of the course. The highest awareness level shown for the attribute "library skills" followed by "mind mapping technique" and "internet searching techniques". Students identified this IL course module as the best place to acquire IL skills and they ensured that they apply IL skills during their next academic period. The faculty identified this as a very useful and important module for science undergraduates and suggestions were made to make this compulsory for all undergraduates of the faculty of science. An advanced IL module for the third and fourth year students was also recommended.

Keywords: Information literacy (IL); credit based; science undergraduates; first years; Sri Lanka

Introduction

Academic librarians in the higher education sector all around the world, add value to the teaching and learning missions of their institutions through IL instruction. They believe that IL instruction helps to improve the quality and the relevancy of learning of undergraduates. According to Oakleaf[1], in the present climate of accountability, librarians face heightened pressure to demonstrate value.

Having IL competencies will certainly improve the quality of university students academic work with abilities to efficiently complete standard undergraduate assignments and their research projects. The acquired IL competencies during their undergraduate period, will make them life-long learners capable of taking control of their own learning. Students will not pick up IL skills on their own; hence competencies have to be taught and practiced.

There are different information literacy courses introduced by the library and the university wants use an assessment tool to determine what concepts students understand and which areas need more instruction and practice. According to Oakleaf and Kaske[2], "without assessment, program weaknesses cannot be easily identified or corrected." Librarians also need to be accountable to their institutions, the universities[3]. Therefore assessing IL competencies of undergraduates is an important aspect of higher education in this information era.

The majority of the undergraduates who enter the university do not possess skills of using information for their academic purposes. Students who enter the university with less experience in information use, need extra support from the library staff, to reap the full benefits of the advanced information resources available in the university library[4]. Requirement of continuous user education programmes for undergraduates is also evident from service quality assessments conducted by the University of Colombo[5]. To fulfill this need, an IL course module was implemented initially for the Law undergraduates of the University of Colombo in 2009 with nine IL topics[4]. It was expected that with an improvement of IL skills "the students actively engage in learning with a goal of completing the assignment rather than offering the modules in isolation to their academic work"[4].

The same IL curriculum filled with subject related contents was adopted for the faculty of Science with

fourteen IL topics (Annexure I) identified by the curriculum development committee of the Faculty of Science. The Faculty of Science accepted it as a one credit, thirty hours, optional course (enhancement course) spanned across the second semester of the academic year and the target group was the first year undergraduates. Two senior professors, including the director of undergraduate studies of the faculty were appointed as the faculty advisors and senior academics of the Library were selected as resource persons to conduct the course. The course commenced in the Faculty of Science, University of Colombo in 2010. It was named the "Information skills development programme".

Annexure 1

EC 1004: Information Skill Development Programme (1Credit, 30 Hours)

Faculty of Science, University of Colombo

Topic & contents

1. How to write successful assignments in the faculty of Science - I
   - Types of assignment given in the faculty
   - Objectives of these assignment
   - Their expected learning outcomes
   - Weightage of the marks given to assignment in a particular subject
   - Parts of assignments (Abstracts, introduction, body, conclusion, references, format of submission and deadlines etc.)
   - Significance of reading and information gathering for successful assignment writing
2. How to write successful assignments in the Faculty of Science – II
   - Use of brain storming and mind mapping techniques to analyze the assignment topic
3. Understanding your Library
   - Introduction to the library in general (including rules and regulations)
   - Introduction to the specific material relevant to the faculty (books, Journals and E-Resources)
4. How to find the information for your assignment from the library
   - Using the OPAC to locate material
5. Effective reading for academic use - I
   - Parts of book and their purpose
   - Parts of a journal and their purpose
   - Extracting information from Dictionaries and Encyclopedias, Thesaurus, Glossaries
6. Using the E-resources – I
   - Introduction to Internet Explorer/Fire Fox
   - Introduction to full text databases subscribed by the library with more emphasis on the one relevant to the faculty
   - Searching, saving and printing, making a note of the citation details
7. Using the E-resources – II
   - Advanced searching of the databases (Special reference to Science related databases)
8. Using Internet as an academic tool
   - How to find information via Internet, e-books and other Internet resources
9. Evaluation of print/ non print information sources
   - Reflect on own information sources for assignment
10. Effective reading for academic use - Academic reading techniques
    - Note taking vs. note making
11. Analytical and critical writing skills avoiding plagiarism
12. How to write successful literature reviews
13. Citation style of the faculty
    - Specific citation method used by the faculty, Insertion of foot notes and end notes.
14. Making effective presentation
    - 3P model including evaluation criteria used for the evaluation of presentations by the faculty.
15. Evaluation of the programme

Writing successful assignments, academic reading skills, information seeking and searching techniques, evaluation of information sources, effective reading for academic use, analytical and critical writing skills, avoiding plagiarism, literature review writing, citation styles of the faculty and making effective presentations were included in the science faculty IL module. Students were given hands-on experience with all necessary facilities throughout the course. They were assessed by continuous assignments and a final submission of a literature review and a presentation. This is the first credit bearing IL course offered in a state university of Sri Lanka and the success of this course was highlighted by Wijetunge and Manatunge[4] stating: "Nevertheless this same IL framework (*implemented in the faculty of law*) adopted in another faculty *(faculty of Science)* of the same university *(university of Colombo)* and offered as a credited module has become very successful and being offered continuously".

This study was planned to verify the efficacy of the IL course module conducted in the Faculty of Science by measuring actual IL skills acquired by the students who followed the course, their perceptions towards the IL awareness levels and their readiness to apply IL skills during the academic period.

Literature review

IL competencies provide undergraduates with a framework for gaining control over how they interact with information in the environment. The American Library Association (ALA) Presidential Committee on Information Literacy defined *information literacy* as a set of abilities requiring individuals to locate, evaluate, and effectively use needed information[6].

The key characteristic of this information era is that it is information abundant and information use is intensive. According to Bundy[7], IL is thus required because of the ongoing proliferation of information resources and the variable methods of access. Hence, individuals face a wide range of information sources in their studies, in the workplace, and in their lives. Achievement of a high IL level has become even more challenging as society has grown increasingly dependent upon electronic communication and technologies.

Today information is available through government, community resources, organisations, manufacturers and service providers, media, libraries, and the internet, as well as in print and digital formats. Increasingly, information comes unfiltered specially when digital information resources are considered. According to Bundy[7], this raises questions about authenticity, validity, and reliability. In addition, information is available through multiple media, including graphical, aural, and textual. These create special challenges in finding, managing, evaluating and using information in an ethical and legal manner. This situation is more complicated by the uncertainty of the quality and expanding quantity of information. Only the abundance of information and high technology create more informed citizens without a complementary understanding and capacity to use information effectively[7]. Further IL not only promotes success during an individual's academic career, but it also helps him or her to subsequently be competitive in the world market and to become a lifelong learner[8].

Today, as university students become more and more dependent on the Internet for their research needs, IL skills are as important as reading and writing[9,10]. Breivik's presentation of a comprehensive IL model and program, in the late 1980s, marked the serious beginnings of the initiative in academics. Furthermore, Breivik has presented in other sources the issue in terms of the learning process, specifically as an essential skill in lifelong learning rather than a matter of library instruction, making the topic a matter of general importance to the curriculum even while keeping it grounded in the library profession[11]. However, Breivik[12] indicates that most IL instruction does not promote critical-thinking skills. Moreover, other researchers find that university students are not yet as information literate as they are supposed to be. They lack searching skills, do not have critical information evaluation skills, and cannot use information for problem solving or decision making. According to Israeli Academic librarians' perceptions on IL, librarians see little or no need to revise the traditional definition of IL, even though they expand it while including Web 2.0 and digital-literacy characteristics within its scope. In addition, respondents think that it is more a library role than a faculty role to teach IL, and they view positively the possibility of integrating Web 2.0 platforms into IL courses[13].

The Queensland University of Technology Library in Australia, advices students by stating that IL, has become an essential element for citizenry in this world. Becoming information literate during university studies means one is learning how to learn, or becoming lifelong learners with transferable

research and learning skills[14]. Similarly RMIT (Royal Melbourne Institute of Technology) University of Australia believes that the acquisition of information skills is a key competency for students of any level, and the efficiency and effectiveness of the educational process within any subject is significantly enhanced by the incorporation of an appropriate information skills component[14].

According to Hansson and Rimsten[15], the Swedish Higher Education Act has a clause which effectively says that all Swedish university graduates should be information literate and this is very useful in influencing a university that IL is important. However the nature of the national educational system influences an institution's IL strategy with economic, social and technical factors in one country. Furthermore there should be an overall institutional (college or university) strategy to implement IL and it is helpful if the institution acknowledges IL by stating that it is an attribute of graduating students, or adopts it as a skill which has to be developed through every course of study[15].

Some universities have already accepted IL competencies as an essential part of their curricula and have embedded IL skills into their teaching and learning policies. For example, the University of Aukland's *Teaching and Learning Policy* states that: "Academic staff is responsible for ensuring that IL skills have been embedded in the curricula, teaching, learning and assessment processes. Academic staff, librarians and learning support providers are partners in providing opportunities for students to achieve the ANZIIL standards in the context of their disciplines" [15].

Johnston, Boon and Webber have investigated the conceptions of IL, and teaching IL, as held by academics in four disciplines: marketing, english literature, chemistry and civil engineering. According to them, the conceptions of IL were different for each discipline, although they also had things in common. Furthermore even within a discipline, the aspects emphasized and progressed through a course differ depending on the conception that a particular academic has of the discipline and the IL skills appropriate to the discipline[15].

IL concepts and writings in Sri Lanka go back to the year 2002. As cited in Wijetunge and Manatunge[4] the first IL initiative in Sri Lanka emerged at the International workshop conducted by the National Institute of Library and Information Sciences (NILIS) with the support of the IFLA/ALP in 2004. Thereafter several IL programmes at different levels were implemented in Sri Lankan universities but there are no records of continuous credit based courses. Hence this credit bearing IL course implemented by the Library of the Faculty of Science, University of Colombo can be taken as the first such programme.

Objectives of the study

- To evaluate the actual IL skills acquired by the first year science undergraduates of the university of Colombo;
- To explore the students' perceptions towards the IL awareness levels prior to the course and at the end of the course; and
- To investigate the students' readiness to apply IL skills during following academic period

Methodology

A three pronged methodology was followed to fulfill the three objectives of the study.

1 ***To evaluate actual IL skills acquired by students***

Actual IL skills acquired by the students were tested by five formative assignments and a literature review writing, as the final assignment. The assignment topic for the year 2011 was "nanotechnology and its applications" and all the assignments were based on that topic. Five formative assignments of the course were; (i) creating a mindmap based on the assignment topic, (ii) understanding your assignment (work sheet 1) , (iii) understanding your library (worksheet 2), (iv) preparing a reference list by selecting information sources and (v) group presentation. The final assignment was a literature review on the assignment topic.

Students' performances were evaluated by the marks that they acquired for all assignments. Fifty percent of the total marks were given for the five formative assignments and the rest was given for the literature review writing. Students' final results released according to the standard course evaluation criteria of the faculty and final grades were categorized as given in Table 1.

2 ***To explore the students' perceptions towards the IL awareness levels***

Students' perceptions towards the IL awareness levels were measured by conducting a user survey among the course participants. All seventy five students who followed this course were considered.

Printed questionnaires were distributed among the students in two turns, at the very beginning of the IL course and at the end of the IL course as a pre-test and a post-test. Fourteen IL attributes that are covered by the course module (Table 2) were identified and listed in the both questionnaires. Students were asked to rate each attribute according to their own awareness level on a five point numerical scale prior to the IL course as the pretest. Again students were asked to rate the awareness levels at the end of the course as the post test. Students' perceptions toward IL awareness levels were measured by calculating mean score for each attribute.

3 *To explore students' readiness to practices IL skills*

Students were asked to mark their readiness to use IL skills during the following academic period, by selecting one option out of four; very likely, likely, sometimes and never. Possible places that the students acquired IL skills were also questioned. Five places were identified as possible places to learn IL skills and students were asked to select the places that they used to learn IL skills; (i. school, ii. university orientation programmes, iii. other lectures/ courses in the university, iv. other lectures/courses outside the university and v. IL course offered by the library).

Table 1—Marks and grades categories

Marks	Grade
70-100	Honours
50-69	Satisfactory
40-49	Pass
Below 39	Unsatisfactory

Table 2—IL attributes

01	Brain storming technique
02	Mind-mapping technique
03	Library skills (OPAC and other skills)
04	Academic reading techniques
05	Access to E- resources
06	Internet searching techniques
07	Advanced searching with Boolean operators
08	Other Internet resources
09	Evaluation of information sources
10	Academic writing techniques
11	Literature review writing
12	Citation styles
13	Acknowledging information sources
14	Presentation skills

Finally students' and staff comments regarding the course were collected.

Analysis

Students' performances in IL skills were measured by the assignment marks. Marks obtained by students for five formative assignments are shown in Figure 1. Around 76% of the total students acquired marks over 70% for the assignment 1, creation of the mind map. For the assignments, "understanding your assignment" and "understanding your library", majority of the students have scored marks over 50. Assignments on "selecting references" and "presentation skills" also were accomplished by students with high marks.

Marks acquired by students for the final assignment, *"literature review writing"* on the assignment topic "Nano-technology and its applications" is shown in Figure 2. Sixty students achieved the pass mark for the literature review writing by exceeding 40 marks. Around 23% of the total students have completed it exceptionally by receiving marks over 70. Majority of the students (42.67%) were in the satisfactory level (marks between 50-69) and another 17.3% of the students belong to the unsatisfactory level with marks less than 40.

Final results of the students for the IL course (formative assignments + literature review) are presented in the Figure 3. All the students, who completed the course, acquired one credit for IL course module by exceeding the pass mark 40. Majority of the students (61.33%) belong to the satisfactory grade. Twenty three students (30.67%) acquired Honours by exceeding 70 marks.

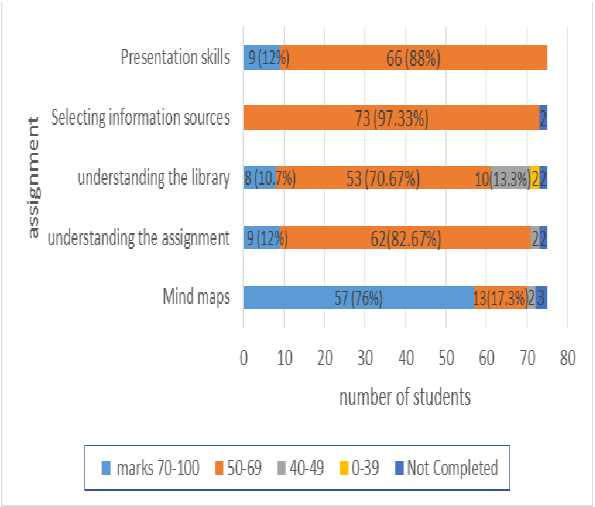

Fig. 1—Marks acquired in formative assignments

Students' perceptions towards the IL awareness levels

Pretest results show low levels of students' perceptions, towards the IL awareness (below 50%) for most of the attributes (Fig. 4).Very low awareness levels were seen for evaluation of information sources (22.5%), access to e- resources (22.6%), literature review writing (24.3%), citation styles (26.3%), acknowledging information sources (26.4%), academic reading techniques (28%) and library skills (28.3%). Only three attributes show high IL awareness levels. They were presentation skills, internet searching techniques and brain storming techniques. Their percentages were 64.9%, 64.3% and 56.9% respectively.

Post-test results show high levels of students' perceptions towards IL awareness levels. They show the highest awareness level for the attribute library skills (96.3%) followed by the mind mapping technique (92.48%) and the internet searching techniques (86.9%). Comparatively low awareness levels after the course shown for four attributes; academic reading techniques, literature review writing, citation styles and acknowledging information sources using citations.

Learning IL skills

The possible avenues of learning IL skills were identified and compared. The results show that majority of the students acquired IL skills from the IL course module offered by the library (Fig.5). Skills that they have acquired up to some extent from schools and other courses were presentation skills and internet searching techniques. None of the students was aware of access to e- recourses till they followed the IL course. Other IL skills they acquired prominently from the IL course were citation styles (97.33%), acknowledging information sources (96%), evaluation of print and non-print information sources (90.67%), literature review writing (89.33%), mind mapping technique (88.57%), advanced searching with Boolean operators (86.67%) and academic reading techniques (86.11%).

Students' readiness to apply IL skills during following academic period

The results of students' readiness to apply IL skills in following academic period reveal that they will apply IL skills very likely or possibly during following academic years. Percentages are 52% and 48% respectively (Table 3).

This is further confirmed by the comments made by the students and the academic staff of the Faculty of Science. Students identified this as a very useful course to learn IL skills with academic reading techniques, academic writing techniques, note taking

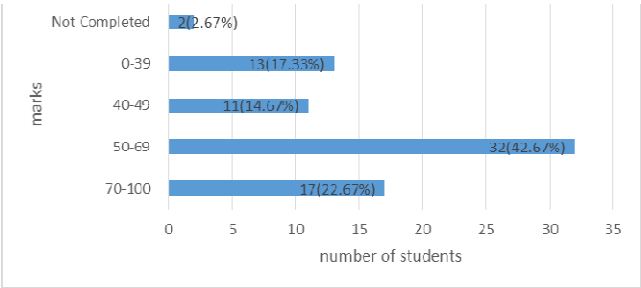

Fig. 2—Marks acquired for literature review writing

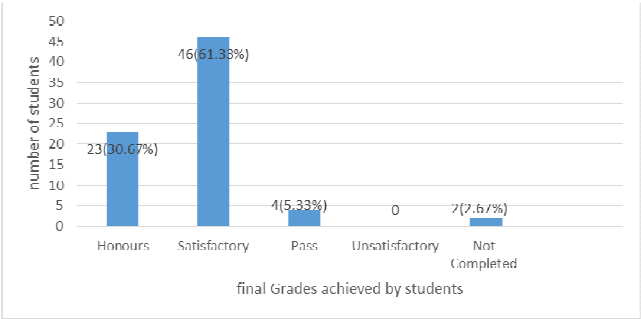

Fig.3—Final results of students.

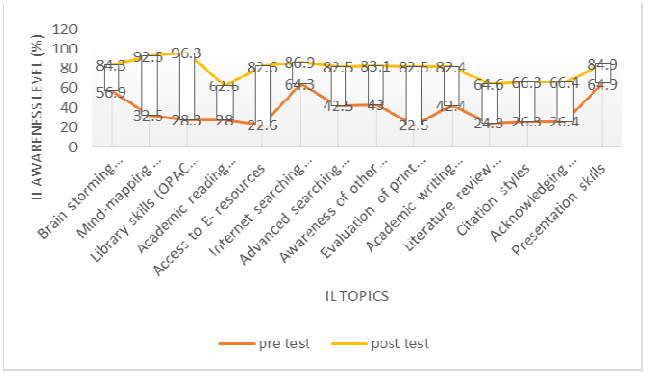

Fig. 4—Students' perceptions towards IL awarness levels.

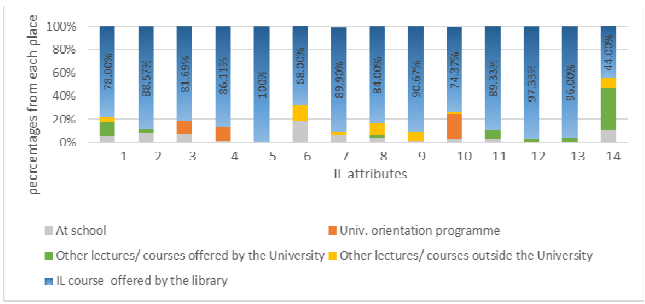

Fig.5—Acquisition of IL skills

Table 3—Students' readiness to apply IL skills during following academic period

How likely students apply IL skills	No. of students	Percentage
Very likely	39	52%
Possibly	36	48%
Not sure	--	--
unlikely	--	--
Total	75	100%

and note making methods including mind maps, internet searching techniques, evaluation methods of information sources, and the library skills. Usefulness of this course was more elaborated from the comments made by students;

"I wasn't honestly, familiar with the Internet. I didn't know how to use a data traveler and download articles from Internet. Now I am familiar with necessary information skills for my academic work. I think I'm fortunate. Thanks you a lot".

"I have never thought about evaluation of information sources. Other most important part for me is how to avoid plagiarism and use of reference guides. Now I really understand how to improve the quality of my assignments and score high marks for them".

"Mind mapping and brain storming were the best sessions carried out and it helped a lot in academic work. And also the note taking methods helped to concise heavy topics onto a single paper".

Students have also requested for more time allocation to practice internet searching and e-resources. Also they have requested continuous guidance and the support from the library for their studies during the next academic period.

Director of the undergraduate studies of the Faculty of Science who also worked as the academic advisor of the course, identified this as a very beneficial course for the undergraduates. Further she suggested to make this course compulsory for all undergraduates of the faculty and to introduce an advanced literacy module for the third year special degree students of the faculty with two credit values. Tthe requirement of continuous workshops for the academic staff and the postgraduate students of the faculty was also emphasized.

Discussion

The actual literacy skills acquired by the students are described by the assignment marks. By scoring good marks for all five formative assignments; creating mind-maps, understanding your assignment, understanding your library, selecting information sources and presentation skills, students show that they acquired IL skills satisfactorily from the given course module. Marks scored for the literature review writing show that around 80% had reached the pass mark level while the others failed to achieve that. This reveals that the difficulties faced by the first year students when acquiring advanced IL skills that embedded in the module. These were academic writing, literature reviewing, applying citation styles and preparing reference lists. The overall marks and grades acquired by students for both the formative and final assignments reflect that they have successfully completed the course with sufficient IL skills.

Students' perceptions towards the IL awareness levels revealed that the IL awareness was very low among the first year Science undergraduates prior to taking the IL course module. Comparing the pretest and the post-test result, it show that students awareness of IL skills increased significantly after they participate in the course. Difficulties shown by the first years when acquiring advanced IL skill reveals that they are still at low levels of learning domains. This is best explained by the Bloom's taxonomy learning domains that was explored by Benjamin Bloom[16,] an American educational psychologist in 1956[16].

It is found from the study that over 80% of students acquired IL skills from the IL course module. It reflects the importance of this course and should be made compulsory for all the students in the faculty. Students, who participated in the IL course, have commented the course as being useful.

Conclusions

This paper revealed the success of the information literacy module offered by the library of the University of Colombo, Sri Lanka. The students' actual IL skills were reflected by their assignment marks. All the students who completed the course were able to exceed the pass mark level and earned one credit each. Students' perceptions towards IL awareness revealed that there was a significant improvement of IL awareness at the end of the course. This course module was identified as the best place in the university, for the students to acquire IL skills. Their readiness to practice these skills during following academic period was also evident. The faculty identified this as a very useful and important

module included in the science curriculum. Suggestions were made to make this compulsory for all undergraduates and to introduce an advanced literacy module for the third and fourth year students. This would enhance further research on the efficacy of the IL learning programmes.

References

1 Oakleaf, Writing information literacy assessment plans, *Communications in Information Literacy,* 3(2) (2009) 80-90.

2 Oakleaf M and Kaske N, Guiding questions for assessing information literacy in higher education, *portal: Libraries and the Academy*, 9(2) (2009) 273-286.

3 Furno C and Flanagan D, Information literacy: getting the most from your 60 minutes, *Reference Services Review*, 36(3) (2008) 264-271.

4 Wijetunge P and Manatunge K, Empowering 8® in practice: information literacy programme for law undergraduates revisited, *Annals of Library and Information Studies,* 61(1) (2014) 24-32

5 Somaratna S D and Peiris C N, Service quality in University of Colombo libraries: an assessment, *Annals of Library and Information Studies, 58*(2)(2011)170-183

6 American Library Association (ALA), Information Literacy Competency Standards for Higher Education, (Chicago; Illinois), 2000. Available at http://www.ala.org/acrl/ standards/ informationliteracycompetency (Accessed on 12 May 2013).

7 Bundy A, *Australian and New Zealand information literacy framework. Principles, standards and practice,* 2nd edn, (University of South Australia; Australia), (2004). Available at: http://www.literacyhub.org/documents/InfoLiteracyFramework .pdf (Accessed on 10 June 2014)

8 Brown C and Krumholz L R, Integrating information literacy into the science curriculum, *College & Research Libraries*, 63(2) (2002), 111-123.

9 Abell A, Armstrong C, Boden D, Town S, Webber S and Woolley M, Defining information literacy for the UK, *Library & Information Update,* 4(1–2) (2005) 22–25.

10 Buschman J, Information literacy, 'New' iliteracies and literacy *Library Quarterly* 79 (1) (2009) 95–118.

11 Marcum J W, Rethinking information literacy, *The Library Quarterly*, 72(1) (2002) 1-26.

12 Breivik P S, 21st century learning and information literacy, *Change: The Magazine of Higher Learning,* 37 (2) (2005) 21–27.

13 Aharony N and Bronstein J, Academic librarians' perceptions on information literacy: The Israeli perspective, *portal: Libraries and the Academy,* 14(1) (2014) 103-119.

14 Bundy A, *Information literacy: the key competency for the 21st century*, In proceedings of the paper presented at Annual conference of the international association technological university libraries. Pretoria, South Africa, 1-5 June, 1998. Available at: http://files.eric.ed.gov/fulltext/ ED434662.pdf (Accessed on 06th May 2014).

15 Webber S, Information literacy in higher education, *Informacijska Pismenost med teorijo in prakso: vloga visokošolskih in specialnih knjižnic: Zbornik prispevkov,* 9(20) (2006).

16 Bloom B S, *Taxonomy of educational objectives. Vol. 1: Cognitive domain*, (New York: McKay) (1956).