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An empirical assessment of information literacy competency of social science researchers: a gender perspective

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The study is an empirical assessment of Information Literacy Competency (ILC) levels of social science researchers concerning 'information need', 'information access', 'information evaluation', 'information use' and 'information use ethics'. Various techniques of differential and statistics have been used to assess the ILC levels and find out the significant differences. The findings indicate that the ILC varied between males and females on selected concepts. The study highlights the reasons and suggests measures for improvement of ILC.

Keywords: Information access; information evaluation; information literacy competency, information need, information use

Introduction

Information Literacy (IL) is information about information and the source of information. It is considered as a "set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information".[1] It is a set of skills and abilities which enables the information seekers to determine and articulate information needs, identify and locate appropriate information locations and sources to meet the needs, analyze and evaluate its suitability and reliability and then ethically use information. It also enables information users to make informed judgments and produce new information. It "is the adoption of appropriate information behavior to identify, through whatever channel or medium, information well fitted to information needs, leading to the wise and ethical use of information in society."[2] Thus, IL has become a core instructional pedagogy in higher education. It is empowering and essential for engaged citizenship[3]. It encourages and facilitates life-long learning and has become a basic human right in the digital world[4].

Competency refers to a cluster of related skills, attitudes, knowledge and other specific attributes of individuals or groups of individuals essential in a specific work environment. It is a set of attributes that correlates with the performance and can be measured using well-accepted standards. Competency studies illuminate knowledge, skills, abilities, and behaviors that are required for success in a profession[5]. Its measure helps to assess and determine the performance levels of individuals or groups of individuals. An empirical study refers to a study based on the measurement of a particular phenomenon. In such a study, results are obtained from experience and not from belief or theory. Hypothesis testing is done with experimentation.

Review of literature

IL as a new method of learning was primarily developed to handle the burgeoning of electronic information content. Zurkowski (1974)[6] was the first to use the term "information literacy" as part of an analysis of the structure of the information industry to describe the information literate individual having necessary "techniques and skills". These skills are of utmost importance given strategic value and use of information in academics and research. As the society is rapidly changing and the volume of information is growing, a higher level of Information Literacy Competency (ILC) is vital for the researchers to access the body of knowledge contained a wide variety of information sources and formats.

There has been a greater emphasis on IL curricula, standards, models and teaching in the last two decades. The library and information professionals have actively contributed to these areas. However, regular assessment of learning outcomes is vital for education and training programs because it serves as

catalyst for improvement and its success. In all areas of higher education, assessment has become the focus of activities. Authorities no longer assume but demand students' learning evidence and proof to apply skills in practical situations. "There has been a shift in emphasis from inputs and outputs … to users and outcomes."[7] A similar shift in IL assessment has been discussed by Cameron, Wise, and Lottridge[8]; Zald and Gilchrist[9] and Oakleaf[10].

Maybee, *et al*. [11] portrays that "learning outcomes may be enabled or disabled through the ways that students engage with information." A well planned and executed assessment process not only assist the learners to identify improvements in learning and areas for further developments but also contributes to the learning process itself. The literature is replete with studies assessing information literacy instruction. Scholars have employed multiple methods and tools for ILC assessment such as pre- and post-tests[12]; surveys and questionnaires[13]; assessment of student artifacts[14] etc.

Pinkley and Hoffmann[15] outline the evolution of IL assessment process at California State University Library with a specific focus on 2013 assessment project. The primary goal of the assessment process has been to find the value of the library in translating the IL assessment findings in actionable results and improve library IL services. Julien, Gross, and Latham[16] conducted an online survey of academic librarians engaged in providing IL instruction in US to get an insight into their practices and challenges. The focus of the study was pedagogical methods used; target audience; inclusion of technology in instruction; assessment and evaluation methods used; common challenges faced; and collaboration among faculty, administration, and librarian. It aimed to provide the best practices in these areas.

The study of Foo, Majid and Chang[17] used a "38-item multiple-choice question assessment instrument based on the i-Competent" IL model to assess the students' IL skills in terms of "defining information tasks, selecting information sources, seeking information from sources and synthesizing and using information." Similarly Ngo, Pickard and Walton[18] focused on investigating IL capabilities using a multiple-choice questionnaire in Vietnam. The questionnaire was based on the IL competency-level assessment toolkit of USA. It has served as a tool for real-time assessment of IL and measures students' IL in terms of developing search strategies, evaluating information sources and using information ethically. The findings revealed that students' IL has not been well equipped and there are gender differences in IL capabilities.

ILC assessment is necessary to explore how information literate individuals identify what current programs need to be improved[19]. It provides the "impetus to understand students' skills, identify areas of strengths and weaknesses, help formulate appropriate pedagogical changes and intervention program, as well as provide accountability of such an initiative" [20]. In India, there have been certain studies to assess the ILC level of researchers in science discipline. A need has been felt to plan and execute an ILC assessment plan and define a process based on international standards for social science researchers in India. The present study is an attempt in the same direction.

Objectives of the study

- To assess researchers' ILC level across gender for information need, access, evaluation, use and use ethics;
- To identify reasons for IL incompetency, if any and suggest measures to improve it.

Research hypothesis

The differences are not significant in the ILC level of researchers across gender for 'information need'; 'information access'; 'information evaluation'; 'information use' and 'information use ethics'.

Scope of the study

The present study is part of a larger study. It was conducted among the social science researchers enrolled for Ph.D. program in the Department of History, Political Science, Economics, Sociology, Geography, and Law at University of Delhi (DU), Jawaharlal Nehru University (JNU), Jamia Millia Islamia (JMI) and Indira Gandhi National Open University (IGNOU). The study population consisted of 3443 researchers belonging to the selected universities. The questionnaires were distributed among 960 researchers based on a stratified random sampling method. The sampling was stratified by institution, discipline, and gender. A sample size of 511 was decided on 95% confidence level and 4% confidence intervals using the online sample size calculator of Creative Research System[21] of American Marketing Association. Total of 520 responses complete in all respect were received from the selected 960 researchers.

Methodology

Plenty of tools have been developed to assess IL skills and competency at the organizational, national and international levels[22]. Depending on specific conditions and context, investigators have selected appropriate assessment methods like multiple-choice tests by Chang et al[19], Soleymani [23], Foo, Majid and Chang[17] and Ngo, Pickard and Walton[18]; self-assessment of IL by Walsh[24]. The self-assessment method is criticized for the overestimation of actual performance by respondents.

This study has used a questionnaire method to collect relevant data. 'Information Need'; 'Information Access'; 'Information Evaluation'; 'Information Use' and 'Information Use Ethics' were the key concepts identified from each of ACRL Standards[1] I to V respectively. Each of these key concepts was transformed into a set of ten questions to empirically test the ILC level of respondents. The standards have been used because ACRL's transition from the standards to the Framework for Information Literacy for Higher Education[25] is still relatively recent; much of the literature on outcomes-based information literacy instruction is tied to the standards.

Various techniques of descriptive and inferential statistics were applied for the analysis of the data. The descriptive statistics included frequency distribution, percentage, bar graph, etc and was aided by computing mean, standard deviation and range. Inferential statistics consisted of tools like One-way ANOVA and F-ratio. The responses were manually evaluated and 2 marks were allotted to each correct answer. The ILC level of respondents was measured using the Performance and Competency Scale[26] given in Table 1.

Profile of respondents

The total study sample consisted of 288 (55.4%) males and 232 (44.6%) females. The breakup of the total 520 respondents included 78 (63.9%) males and 44 (36.1%) females from DU, 74 (61.7%) males, and 46 (38.3%) females from JMI, 62 (43.7%) males and 80 (56.3%) females from JNU and 74 (54.4%) males and 62 (45.6%) female researchers from IGNOU. The distribution of respondents is given in Fig. 1.

Analysis

Information need

Determining the extent of and articulating information need; identifying the form and format as well as places and sources for precise and relevant information needed is quite essential to successfully operate in the digital information environment. The

Table 1 — Performance and competency scale

Marks (%)	Performance Grading	Competency Level
91 and above	Outstanding (O)	Outstanding
81 to 90	Excellent (E)	Excellent
71 to 80	Very Good (A)	Very Good
61 to 70	Good (B)	Good
51 to 60	Fair (C)	Baseline
41 to 50	Below Average (D)	Minimal
Below 40	Failed/Not Responded (F)	Very Low

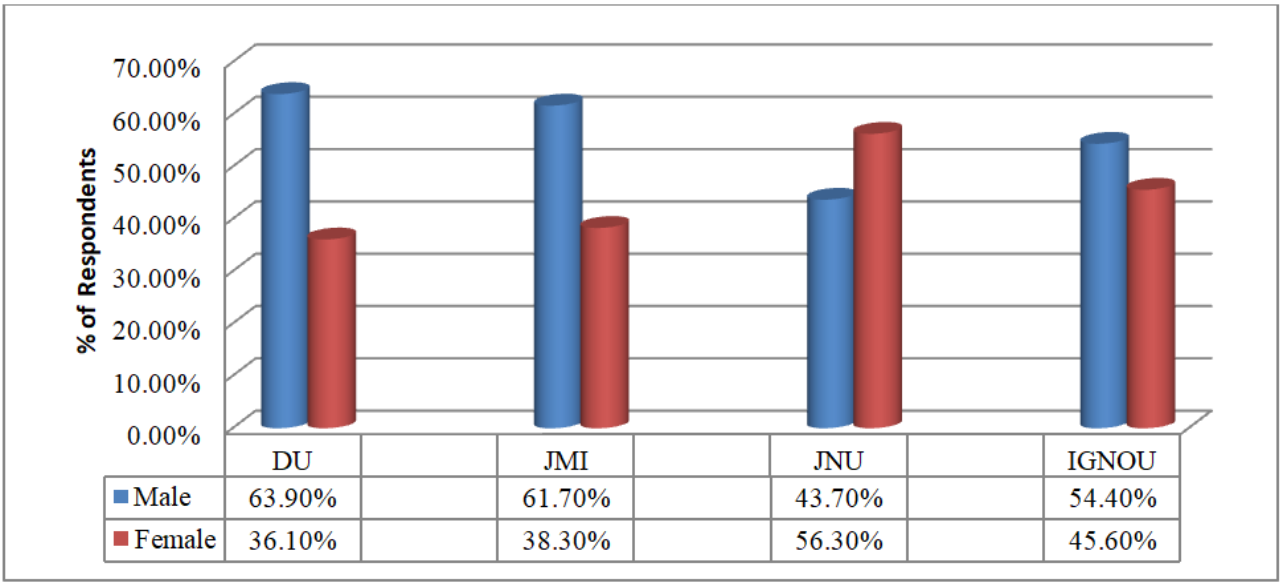

Fig. 1 — Profile of respondents

details of test performance on queries related to 'Information Need' are presented in Fig. 2. On the competency scale, overall 77.7% of the respondents (41.9% males and 35.8% females, consisting of 20.8% 'Outstanding', 24.6% 'Excellent', 16.2% 'Very Good' and 'Good') were found competent in ILC to determine the extent and articulate the information needed. They have been found capable to use different synonymous keywords and provide the right context for their information requirements. The rest 22.3% of the respondents (13.5% male and 8.8% female respondents consisting of 10.8% 'Baseline', 7.7% 'Minimal' and 3.8% 'Very Low') were found lacking in similar competency in IL.

The responses on 'Information Need' reflect different mean scores for male and female researchers under study. Female researchers scored a higher mean score of 16.31 compared to male researchers with a mean score of 15.31. The overall mean score is 15.75. The mean score and mean plots suggest that female researchers possess higher ILC concerning their 'Information Need' compared to male researchers. One-way ANOVA was performed to examine the difference in ILC level of male and female researchers. The results indicate there were significant differences.

$F(1, 518) = 10.246$, $p = 0.001$

To sum up, the mean score of responses of the respondents on 'Information Need' across gender is different and statistically significant at 0.05 level. Hence, the hypothesis "There will be no significant difference in the ILC level of researchers across gender for Information Need" stands rejected.

Information access

Researchers are the high consumers of information. Today, there is no dearth of information but the researchers need to possess information handling skills to access relevant information from multiple sources that are available in different forms and formats. In terms of information access, the test performance of both male and female respondents was found very poor. Details are presented in Fig. 3. Overall 53.8% of the

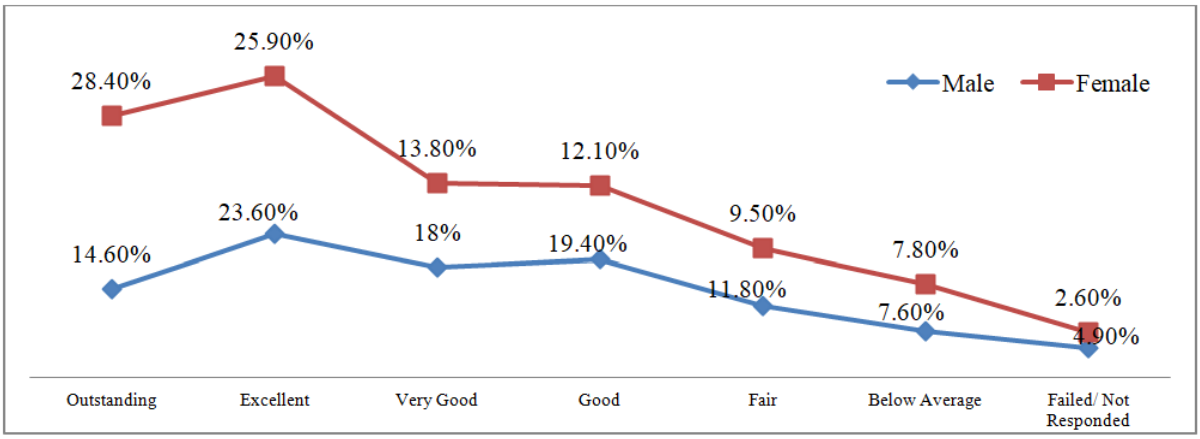

Fig. 2 — Performance assessment of ILC on information need

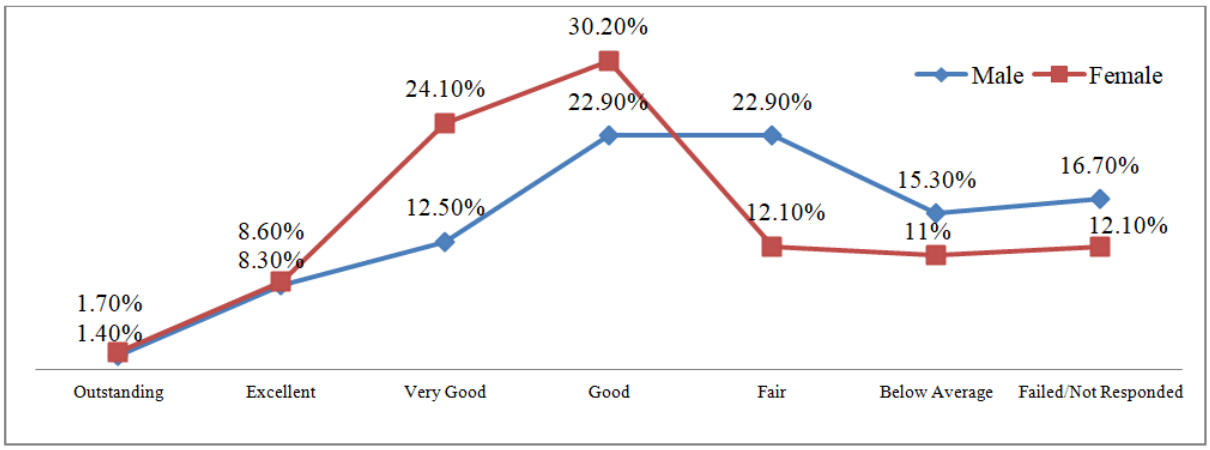

Fig. 3 — Performance assessment of ILC on 'information Access'

respondents (28.8% females and 25.0% males, consisting of 1.5% ‘Outstanding’, 8.5% ‘Excellent’, 17.7% ‘Very Good’ and 26.2% ‘Good’) were found IL competent to access needed information effectively and efficiently. They were capable to identify the right information source and refine search results using multiple limiters. The rest 46.2% of the respondents (30.4% males and 15.8% females, consisting of 18.1% ‘Baseline’, 13.5% ‘Minimal’ and 14.6% ‘Very Low’) were not having similar ILC for ‘Information Access’.

The female researchers have scored a higher mean score of 13.36 compared to the male researchers with a mean score of 12.42 on queries related to ‘Information Access’. The overall mean score is 12.84. The mean score and mean plots reveal that female researchers possess higher ILC for ‘Information Access’ compared to male researchers. One-way ANOVA was performed to examine difference between ILC levels of male and female researchers. The results indicate there were significant differences.

$F(1, 518) = 9.956, p= 0.002$

To sum up, the mean score of responses on queries related to ‘Information Access’ has been found different and statistically significant at 0.05 level. Hence, the hypothesis “There will be no significant difference in the ILC level of researchers across gender for Information Access” stands rejected.

Information evaluation

Critical evaluation of information and its sources to identify and establish authenticity and reliability is essential in the networked digital world. Fig. 4 depicts the test performance grades for responses to the queries on ‘Information Evaluation’. On the competency scale, overall 66.9% of the respondents (36.9% males and 30.0% females, consisting of 8.1% 'Outstanding', 18.8% 'Excellent', 18.1% 'Very Good' and 21.9% 'Good') were found IL competent to evaluate information and its sources critically. These researchers were able to identify peer-reviewed information and its sources and shuffle out the questionable information. The rest 33.1% of the respondents (18.5% male and 14.6% female respondents consisting of 13.8% ‘Baseline’, 8.5% ‘Minimal’ and 10.8% ‘Very Low’) were found lacking similar ILC.

n queries related to information evaluation, female researchers have scored a higher mean score of 14.35 compared to a mean score of 14.07 of male researchers. The overall mean score is 14.19. The mean score and mean plots suggest that female researchers possess slightly higher ILC skills compared to male researchers. One-way ANOVA was performed to examine the difference of ILC level across gender. The results indicate there was no significant difference.

$F(1, 518) = .659, p= 0.417$

The mean score of female respondents is 14.34 and that of male respondents is 14.07. Thus, female respondents reportedly have a higher mean score. However, the p-value of 0.417 is statistically not significant. Thus, the difference in means of ILC between the male and female respondents is statistically not significant. Hence, the hypothesis “There will be no significant difference in the ILC level of researchers across gender for information evaluation” is accepted and it is concluded that the

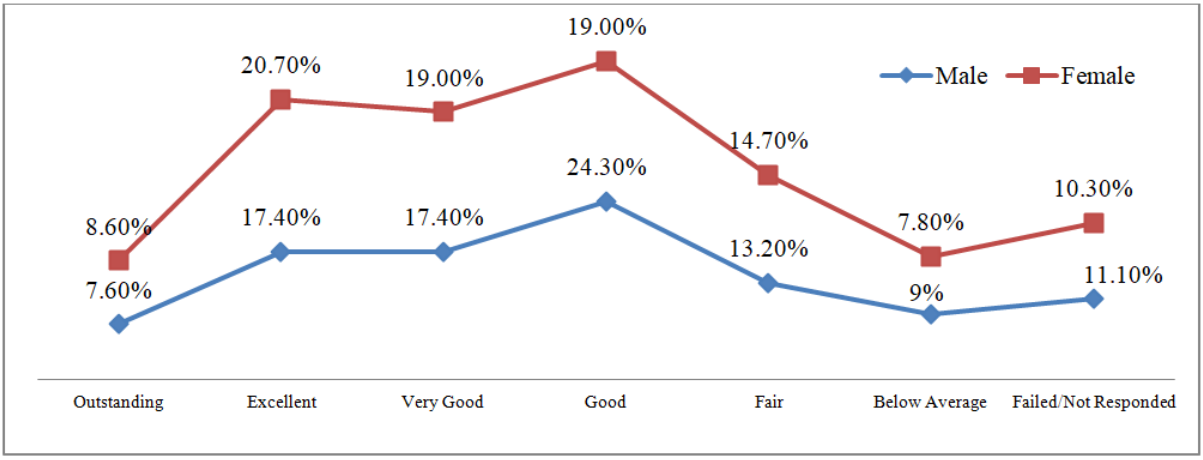

Fig. 4 — Performance assessment of ILC on information evaluation

difference in mean score of ILC between the two groups of the respondents is by chance.

Information use

Understanding the information available in multiple forms and formats as well as from various sources is the need of the hour. The users of information, especially, the researchers should have the necessary skills to effectively use the information to accomplish a specific purpose. The details of test performance on 'Information Use' are presented in Fig. 5. Thus, on the competency scale overall 76.2% of the respondents (39.6% males and 36.5% females, consisting of 20.4% 'Outstanding', 28.5% 'Excellent', 15.8% 'Very Good' and 11.5% 'Good') were found competent in ILC to comprehend information available in different forms and formats and use the same to accomplish a specific purpose. The rest 23.8% of the respondents (15.8% males and 8.1% females, consisting of 10.8% 'Baseline', 6.5% 'Minimal' and 'Very Low') were not having relevant ILC.

Female researchers have scored a higher mean score of 16.33 compared to male researchers with a mean score of 15.14 for responses of the respondents on 'Information Use'. The overall mean score is 15.67. The mean score and mean plots suggest that female researchers possess higher ILC skills for 'Information Use' compared to male researchers. One-way ANOVA was performed to examine the difference in ILC level across gender. The results indicate there were significant differences.

$F(1, 518) = 181.560, p= 0.001$

To sum up, the mean score of responses of the respondents on 'Information Use' skills is different and statistically significant at 0.05 level. Hence, the hypothesis "There will be no significant difference in the ILC level of researchers across gender for information use" stands rejected.

Information use ethics

A higher level of ILC is vital to properly use abundant information and manage it in the ICT enurement with software for similarity detection software and stringent legal provisions. The test performance details on 'Information Use Ethics' are

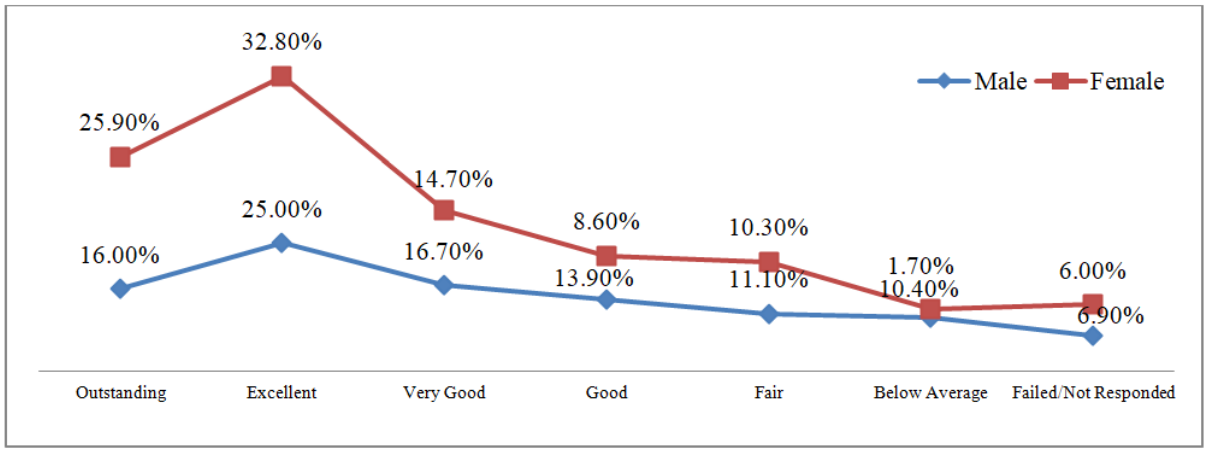

Fig. 5 — Performance assessment of ILC on information use

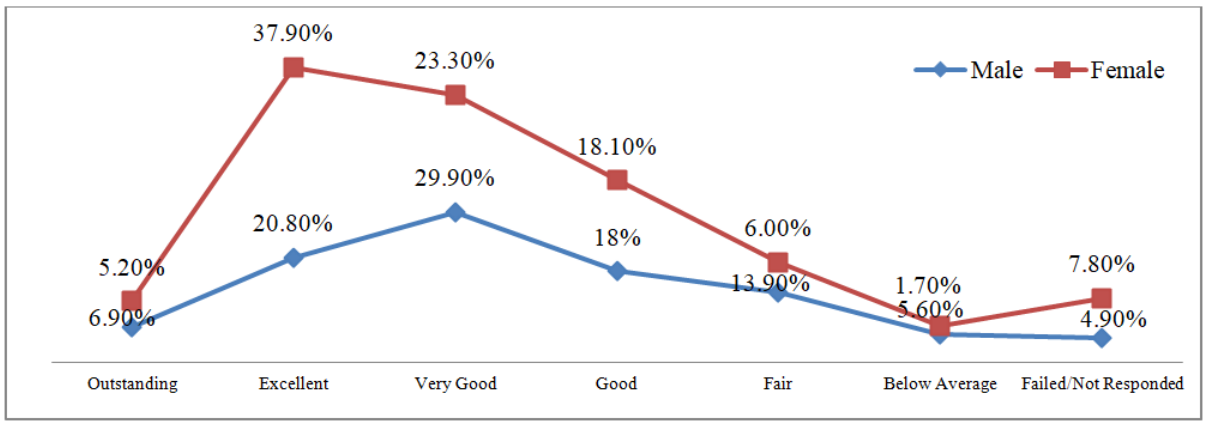

Fig. 6 — Performance assessment of ILC on information use ethics

given in Fig. 6. Overall 79.6% of the respondents (41.9% males and 37.7% females, consisting of 6.2% 'Outstanding', 28.5% 'Excellent', 26.9% 'Very Good' and 18.1% 'Good') were found competent in ILC to use information ethically and legally. They were competent to use information and idea from different sources by properly quoting summarizing and paraphrasing with proper citation. The rest 20.4% of the respondents (13.5% males and 6.9% females, consisting of 10.4% 'Baseline', 3.8% 'Minimal' and 6.2% 'Very Low') were found lacking similar IL competency.

The mean score of responses on 'Information Use Ethics' reflects that female researchers have a higher mean score of 15.55 compared to the male researchers with a mean score of 15.00. The overall mean score of researchers is 15.25. The mean score and plots suggest that female researchers possess slightly higher ILC skills for 'Information Use Ethics' than male researchers. One-way ANOVA was performed to examine the difference in ILC level across gender. The results indicate there was no significant difference.

$F(1, 518) = 39.113$, $p= 0.056$

The mean score of ILC skills among female respondents is 15.55 and that among male respondents is 15.00. Thus, female respondents reportedly have a higher mean score. However, the p-value of 0.056 is not statistically significant. Thus, the difference in means of ILC skills between the male and female respondents is statistically not significant. Hence, the hypothesis "There will be no significant difference in the ILC level of researchers across gender for information use ethics" is accepted and it is concluded that the difference in the mean score of ILC skills between the two groups of respondents is by chance.

Findings

The major findings are:

- The female researchers have displayed a higher level of ILC compared to male researchers.
- About eighty percent were IL competent on the aspect of '*Information Use Ethics*' followed by 77.7% on '*Information Need*', 76.2% on '*Information Use*', 66.9% on '*Information Evaluation*' and only 53.8% on '*Information Access*'.
- Gender-wise IL competency reveals that 41.9% of male respondents were competent on both '*Information Need*' and '*Information Use Ethics*' followed by 39.6% on '*Information Use*', 36.9% for '*Information Evaluation*' and only 25.0% on '*Information Access*'. The maximum 37.7% of female respondents were IL competent on '*Information Use Ethics*' followed by 36.5% for '*Information Use*', 35.8% for '*Information Need*', 30.0% for '*Information Evaluation*' and only 28.8% for '*Information Access*'.
- It was found that 46.2% of researchers were found lacking in ILC on '*Information Access*' followed by 33.1% on '*Information Evaluation*', 23.8% on '*Information Use*', 22.3% on '*Information Need*' and 20.4% on '*Information Use Ethics*'.

Discussion

The findings indicate the inefficiency of researchers and negligence on part of all stakeholders. Badke opines that "the most glaring error in higher education's current struggle for relevance is our being blind to the fact that our students do not know how to do research, and we are not doing enough to help them."[27] The faculty belief that students just acquire IL skills through "osmosis"[28], without any need to teach it to them is the most important reason for IL not being part of mainstream higher education agenda[29]. There remains a need to teach students IL skills. It should be enacted through a series of complex interactions about how and why it manifests within a specific context[30]. Therefore, it is suggested that university libraries across India should undertake multiple activities regularly to develop IL skills and enhance existing competency levels.

The focus and content of existing IL programs and courses should be restructured. The ACRL's new framework could be used as a good starting point for IL instruction by the universities, which is "based on a cluster of interconnected core concepts, with flexible options for implementation, rather than on a set of standards or learning outcomes, or any prescriptive enumeration of skills"[25]. Previous studies have shown that IL instructions integrating into teaching and learning process is more effective[31-32]. Curriculum-integrated instruction is more effective than library instruction[33]. Embedding IL into the subject-specific curriculum in which the students have chosen to invest their time[34] is a more sensible option. It will contextualize IL integration and help students to constantly enhance their skills that are assessed throughout their academic careers. Many a time,

incorporating IL into the curriculum becomes challenging. Some common challenges include lack of understanding about IL, no space in the curriculum, equating IL with computer literacy, and misconception of millennial students[35]. Universities should start a credit-based and curriculum embedded IL course at the undergraduate and postgraduate levels. IL skill content should necessarily be included in Ph.D. course work under UGC guidelines. The students would better appreciate the value of IL training only if it is part of a credit-bearing course and formally assessed. "Once a subject has achieved credit-bearing status, students are likely simply to accept that it has some weight."[1] Learning requires students to use information creatively and reflectively. For the learning of students in an ever-changing information environment, the IL coursework should essentially be designed to encourage students to become aware of how they use information as part of learning.[36]

An earmarked, full-time IL Unit/ Center/ Cell with well-qualified staff and suitable infrastructure for hands-on training should be developed and maintained by each university. Student numbers have increased across many institutions worldwide without a corresponding increase in staffing, and online delivery has been seen as both an efficient and sustainable method of instruction[37]. Online tutorials have been identified as the most common method for promoting IL in UK[38]. University libraries may fruitfully utilize this platform and provide 'Online Information Literacy Tutorials' facilitating IL skill learning in a 24X7 environment. Every library professional may not possess a higher level of IL competency. Libraries may encourage academic champions[39] and impart training and education to such professionals through the 'Training the Trainer Program'. Academic librarians may also be encouraged "to enhance their understanding of information literacy and pedagogy by attending a mixture of continuing professional development events and formal teaching courses aimed at both academics and librarians".[40]

Collaboration between library an teaching faculty is inevitable for successful implementation of all IL activities. Academic librarians have an educational role to play[41]. They should advocate and further promote IL agenda across campus and explain its importance to students by addressing the "what's in it for me" attitude. The best approach to improve students' use of the library and its information resources is to work with faculty. However, faculty/librarian collaboration for IL activities is not so easy. In her study, McGuinness concluded that much "of our knowledge of faculty attitudes towards, and perceptions of, information literacy development, have been shaped primarily by second-hand accounts of their behavior."[28] The researcher opined that librarians should approach faculty members in their environment to promote IL more widely. They need to target discipline-specific educational workshops, conferences, and publications like journals for the purpose. It is not advisable to approach faculty with a "one size fits all" IL plan or package. For a successful "library instruction program, the needs, attitudes, and preferences of the faculty concerned should be well known and taken into consideration before embarking on any new plan of action in this area."[42]

Collaborative approaches to promote library usage in teaching, learning, and research are not new but have been limited in scope. Commitment from leaders and managers is necessary at all levels within a university to ensure the success of IL[43]. A close collaboration among librarians, teaching faculty, and administrators is essential "to redesign instruction sessions, assignments, courses, and even curricula; to connect information literacy with student success initiatives; to collaborate on pedagogical research and involve students themselves in that research; and to create wider conversations about student learning, the scholarship of teaching and learning, and the assessment of learning on local campuses and beyond"[4]. The collaborative approach to impart IL skills should be institutionalized[44]. All "people-based initiative(s)" have potential risk to sustainability[45]. Researchers and practicing librarians have developed multiple strategies for a collaborative approach to IL including embedding a librarian in the classroom[46], collaborative curriculum development and/or teaching[47], faculty-led IL instruction supported by a librarian with required resources[46] and have adopted models embracing a combination of two or more such strategies.

Further research may be conducted on and around the assessment of ILC in a specific subject or target group; development of more detailed and comprehensive ILC scale; Planning and implementation of IL programs for schools and colleges; and more important areas of collaboration between teaching faculty and library professionals for IL activities.

Conclusions

Information literacy helps in critical information analysis and balanced decision making paving the way for knowledge creation, learning, and innovation[48]. Being information literate is a vital and necessary competency particularly among the new generation students. They need to know why, when, and how to use the information and its tools and think critically about the information and the sources of information available. The research findings clearly indicate that proper planning and implementation of multiple IL activities for developing information skills and enhancing the competency is the need of the hour. The findings may fruitfully be applied to structure and restructure IL plans and activities to inculcate the required information skills among researchers to reap the benefits of new information environment. All the stakeholders including librarian, faculty and administration should closely collaborate in effective designing and efficient implementation of IL activities.

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