



Article

Assessment of Information Literacy Abilities: A Case Study of Pakistan

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Abstract: This study aimed to assess undergraduate students' Information Literacy (IL) abilities in Pakistan. A survey method was employed to collect the necessary data from the population. The participants consisted of students from the Capital University of Science and Technology (CUST), COMSATS University Islamabad, Bahria University (BU) Islamabad, and the Federal Urdu University of Arts, Sciences and Technology (FUUAST). The sample consisted of 200 students, randomly selected. A questionnaire was formulated and completed individually. The results produced an alarming result for the selected institutions, as about 52% of students reported that they never went to the library. A similar situation was found across the selected universities, though with BU surpassing other universities with respect to daily use of the library. The responses to the survey indicated students were in a poor position in terms of their ability to identify information sources. Furthermore, most item scores were less than two, indicating that students' recognition and understanding of information sources was in a dangerously precarious condition. The findings also indicated that students' ability to access and use information for assignments, tests, examinations, and the writing of research articles was extremely limited. This could have severe implications for their learning outcomes. According to our findings, students' ability to implement technical best practice in academic work and research was extremely limited, as was their knowledge of and practice in providing appropriate credit to original authors. On the other hand, the students' ability to use social media applications, such as Facebook, Instagram, and LinkedIn, was relatively strong. We recommend that university libraries should be more involved in the educational process. This study should contribute considerably to the organization of different IL programs in universities to promote, develop, and improve students' IL abilities.



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1. Introduction

The world today appears to be divided into two distinct groups: the developed and the developing. Pakistan is considered one of the world's developing countries by the United Nations. Developing countries are confronted with common issues, such as population growth, scarcity of the basic necessities of life—such as housing and medical care—as well as widespread illiteracy, low productivity, and a low standard of living [1]. The problems that we have been confronted with over the years include a high birth rate, primitive agricultural methods, a lack of modern industrial technology, a low level of literacy, and a scarcity of trained manpower, all of which are detrimental to socioeconomic development. The poor level of literacy in the country is a major contributor to all these issues. A better understanding of this alarming situation, as well as adequate opportunities for education at all levels and in new directions, are required. The literacy deficit needs to be defined in relation to the national and worldwide context in a way which recognizes the challenges faced and considers the changing situation over time. Although there have been literacy plans with particular objectives, the reported evidence is that they have not been effective.

Currently, researchers are paying close attention to the concept of IL. IL is currently the subject of a great deal of investigation. Research-oriented graduates who are well-versed in information literacy are highly sought after by researchers [2]. Students need to keep up with current research trends by applying IL skills. An information-literate individual can identify when and where they need information, locate, analyze, and apply that knowledge successfully. "Information-literate individuals are those who have learned how to learn" [3]. To be considered information-literate, a person must be able to recognize a need for information and assess its scope, retrieve content from various sources quickly and efficiently, evaluate documents and relevant sources, organize and save writings that have been collected or generated, incorporate essential information into a repository, use information effectively for learning and creation of new knowledge, develop solutions to problems, and communicate decisions [4]. Knowledge of IL can help students become lifelong learners [5].

Knowledge of IL is unquestionably important for academics and researchers in the current age. Students need to have access to this knowledge to be able to keep up with the latest research and knowledge. Numerous studies on information learning abilities have been conducted around the world [6–10]. However, there have been few studies in the fields referred to above [11–13]. A lack of literature on local faculty perceptions of students' IL skills, their value, as well as challenges and solutions in this context is a problem. Additionally, there is little research on the abilities of students in different programs. This research aims to fill that void.

The surveyed institutions spend a lot of time and money to ensure that their students receive the finest education possible. Training events, workshops and seminars are used by the institutions to ensure students have relevant skills which are consistent with their fields of study. However, often no evaluation of the current level of IL skills possessed by students is undertaken in this process. Therefore, the authors chose to evaluate the present IL abilities of students and the necessity for IL courses in light of this consideration. Students' present IL abilities, as perceived by teachers, were the focus of this study, which also sought to identify any areas of uncertainty that required examination in order to improve student performance. The study also aimed to find out what faculty members think about the value of and need for IL courses. In addition, this study sought to evaluate differences in IL abilities amongst undergraduate students enrolled in different programs in Pakistan.

1.1. Problem Statement and Motivation

Students who are well-versed in information literacy are better equipped to achieve their goals, broaden their horizons, and to take on a variety of roles in today's multicultural society. Students who are well-versed in information literacy are better able to find the data they need quickly and accurately. They can analyze and utilize information effectively and efficiently. Information literacy is essential if we are to raise the standard of academic inquiry and the depth of student understanding.

Although there is much literature available on information literacy worldwide, in Pakistan the concept is very limited [14]. Expressed in another way, students do not have the necessary abilities to survive in the modern world. Here, we consider some of the most pressing concerns and circumstances that affect today's college students. If you do not use your knowledge properly, you may not be able to compete in the professional world today. Any university's undergraduate students must be able to learn effectively. Social problems are solved by their research into the social implications of change. Their research is also a result of innovation. Undergraduate students must learn to read and write in order to be able to cope. Information literacy regarding recent developments in their academic fields is an important factor. In light of this, researchers are attempting to raise the literacy level of undergraduate students in Pakistani universities.

Students in Pakistan's universities need to be able to read, to be able to write, to understand concepts, to learn about their courses, and to complete assignments. Most

undergraduate students in Pakistan's universities lack the ability to learn new material. Many students are not aware of the benefits of utilizing internet resources to suit students' information needs [15]. A student's capacity to explore databases and write extensive essays at the undergraduate level may explain why some students at the University of Washington have this talent. Their university education provided the opportunity to learn how to use electrical and mechanical tools which they would otherwise not have been able to access.

A preliminary assessment by several academics found that in most Pakistani universities, undergraduate students do not receive formal instruction in information literacy [16]. Aside from a one-week orientation course given to all new students upon their arrival at the university, and the occasional use of textbooks by professors to educate students on how to conduct research, there was no formal information literacy instruction provided before students began their university studies. Because of this study, this study aims to examine the IL abilities of undergraduate students at Pakistani universities.

1.2. Aim and Objectives

To summarize what has been said so far: IL is still very limited in Pakistan and a lot of work requires to be done in the field of IL. This study sought to investigate the link between student IL and academic success at a university. Additionally, the research examined the information-related behaviors, sources used, and IL abilities of undergraduates.

The study's objectives were:

- To determine the ability of undergraduate students to evaluate potential sources of information.
- To measure the ability of undergraduate students in Pakistan to assess the purpose of accessing and using information sources.
- To assess the ability of undergraduate students regarding the recognition and ethical use of information.
- To assess student abilities in the use of information technology tools during their studies.

1.3. Paper Organization

The remainder of the paper is organized as follows: Section 2 provides details of the background and related work; Section 3 covers the research methodology; Section 4 comprises the results and discussion; finally, Section 5 presents the study conclusions.

2. Background and Literature Review

Academic performance is largely determined by a student's desire to learn. As a result, a mixed scaffolding, based on information literacy and incentives, should help students learn more effectively. Numerous studies have been undertaken on motivation [17,18], but only a small number have looked at its association with information literacy abilities [19].

The number of basic information abilities is vast, with search, evaluation, processing, and communication skills being the most important [20–24]. From a pedagogical standpoint, it is preferable to restrict the number of basic abilities to a smaller number of representative components. It is also important to understand sample variability, to assess whether there are significant disparities among students in terms of degrees, courses, gender, and age. Research has primarily focused on information evaluation, information source evaluation, information recognition, ethical use of information, and information literacy tool evaluation.

Students' evaluation of Internet information sources has long piqued the interest of information scientists and librarians. According to one study, students prefer convenience, tending to focus their research on the Internet, and frequently utilizing Google to search for information before turning to other sources [25]. Undergraduate students have access to a variety of information sources. There are primary, secondary, and tertiary sources [26]. Students' ability to use and access the various forms of information is dependent on their knowledge of these information sources. According to Wilkes and Gurney [27], electronic resources were the primary source of information for the vast majority of students (80% of

the total). According to research by Algudsi and Dousar [28], 98% of Kuwait University students said they used electronic resources for personal shopping, downloading movies and e-books, checking encyclopedias, and for rapid reference. According to a study by Singh [29], titled “*Assessing Indian Agricultural Sciences Graduates’ Knowledge and Information Literacy Skills*”, a substantial percentage of students (81%) cited Yahoo and Google as their primary sources for information.

The results based on students’ evaluation of information sources show that criteria are applied inconsistently when evaluating Internet information sources. According to the Project IL study, which surveyed students on their frequency of applying standard rating criteria (currency, author’s qualifications, and multiple opinions stated), most students claim to analyze Internet sources. Other research, however, indicates that students are conversant with standard evaluative criteria but apply them significantly less in reality than they claim [30]. According to some studies, when evaluating the quality or suitability of sources, students only look at one or two pages or skim the text [31]. Students also say that identifying a source’s author is crucial, but they do not consider the author’s qualifications when choosing information sources [32,33].

Lorenzen [34] found that without the assistance of their professors, students had difficulty making judgments about information source authenticity. When conducting research, students are expected to look for sources that are related to their research topic. As a result, it is not surprising that one study found that “relevance” was more significant than other factors for many students [35]. Finding terms in the title or lead paragraphs may be the strategy utilized to determine relevance, implying that students are not evaluating Internet sources properly. A crucial information literacy skill is evaluating the “quality” of an information source [36].

Recognizing an information requirement, on the other hand, is a crucial ability in achieving IL. As described by the Chartered Institute of Library and Information Professionals [37], the ability to properly determine a need is characterized as the ability to recognize when information is needed, as well as the type, extent, and nature of the information needed. Understanding the role of information, as well as the scope and nature of information necessary, is a pre-requisite for success in any undertaking. Similarly, the capacity to identify key concepts in the research process provides a road map for that research in terms of the sort of information and information sources required, as well as the scope of information required. Otherwise, due to a lack of direction, the research process may become arduous, resulting in abandonment or delay [38].

University students, in general, make effective use of the vast possibilities and facilities that digital information offers in terms of usage and transmission, taking advantage of the ability to use, edit, share, and disseminate work much more freely. However, their acts occasionally go beyond what is legal. The enormous ease with which infringement can occur is precisely the reason for current copyright amendments [39]. Several studies have considered this [40–42]; their findings suggest that such knowledge is scarce and that it is frequently marred by confusion or misunderstanding when it comes to basic issues. The information community, which has taken on a new function, has recognized the necessity for specific training. Their unique position as face-to-face intermediates between information sources and students qualifies them as the appropriate professionals to provide training and advice on these topics [43]. It is no surprise that ethical and legal standards are included in IL standards and frameworks, although putting them into practice is not easy. Most library students learn about the other four major criteria of IL: need, access, evaluation, and use. However, most are not educated about ethical and legal issues [44,45].

Information Literacy in Pakistan

In contrast to advancements made across the world, IL in Pakistan is still in its infancy [46]. A dearth of fundamental research (e.g., development of frameworks, models, and standards) on this subject is demonstrated by related publications [47]. IL guidance in Pakistan is very basic compared to what people there really need [48].

Mahmood [5] investigated the relationship between students' perceived IL skills and certain academic and demographic variables at Punjab University in Lahore. A questionnaire was used to collect data from 114 students who were selected through convenience sampling for a cross-sectional survey. For data analysis, descriptive and inferential statistics were used. Although these students were familiar with fundamental computer and internet skills, they were hesitant to use advanced search tools, such as the HEC digital library, online databases, indexes, abstracts, and the library OPAC. In addition, the study found a strong link between students' perceived IL skills and their field of study, degree program level, English language proficiency, and home computer access. Gender and socioeconomic status (rural/urban) had no bearing on pupils' general IL abilities. It was suggested that university libraries should establish comprehensive internet services for their patrons.

Rafique [49] investigated the IL abilities of University of Lahore faculty members. A survey questionnaire was used to collect data from 84 faculty members who were chosen through a simple random sampling process. The questionnaire used a 5-point Likert scale, ranging from strongly agree to strongly disagree, based on the UNESCO information literacy life cycle. According to the findings, many of the respondents thought they knew how to use library resources, search engines, HEC online databases, and the OPAC. Furthermore, while the mean scores against almost all the claims were more than 3.5, the study participants perceived themselves as basic-level information-literate individuals. These respondents were less comfortable with advanced level searching procedures and designing search strategies. The authors suggested that the Higher Education Commission and university administration should work together to establish and organize IL instruction programs.

At the University of Engineering and Technology, Lahore, Rafique and Mahmood [50] conducted a study of engineering students to determine their perceptions of IL skills. The ACRL IL criteria for science and technology were used to create the questionnaire, which was divided into five sections: conceptual definition, search method, evaluation, use and distribution of knowledge, and lifelong learning. A straightforward sampling procedure was used to choose the sample. The surveys were given to 500 students enrolled in various engineering programs. On a 5-point Likert scale, respondents were asked to score their impressions of ACRL-based IL statements (i.e., excellent, good, average, weak, and not at all). A total of 460 questionnaires (92%) were returned. For data analysis, descriptive and inferential statistics were used. Many of the students received a mean score of more than 3.5 for each item, indicating that they thought their abilities were "good". Based on English language proficiency and age, there were statistically significant disparities. There was no link observed between students' IL abilities and their gender or academic level. Task-based inquiries, rather than perception-based assessments, were suggested by the researchers as a means to assess students' real levels of IL skills.

According to Naveed and Sharif [51], new M.Ed. students at the AKU-IED were assessed for their information literacy needs, and the impact of the IL workshops attended was measured. The results suggested that the students' weak areas included concepts, such as call number, classification number, author mark, and ways to access the library collection, use of OPAC, databases, and full-text publications.

The IL skills of undergraduate and graduate students at one of Pakistan's leading university were assessed by Safdar and Idress [13]. In the survey, most participants showed a lack of proficiency in information literacy. Nevertheless, most respondents believed that information literacy training was useful in meeting their academic and research requirements.

As a result of the above literature review, it is possible to conclude that research on IL is being undertaken all over the world. There is a paucity of research on this problem in the context of developing countries, particularly Pakistan. It is also evident, from the review, that students have difficulty in identifying, gaining access to, managing, and evaluating their academic and research content in order to meet their educational and research needs. This scenario highlights the importance of information literacy abilities

among undergraduate students, which can be seen in this situation. In this context, there is little doubt that the function of education and professional work in libraries is extremely important. The findings of the review also demonstrate that research on students' IL and necessary measure in the context of Pakistan is quite restricted. This circumstance emphasizes the importance of bridging the gap and indicates that further research in this area is needed so that an accurate image of this critical part of national growth can be presented. As a result, institutions, students, staff, and library professionals may be better able to assess the IL abilities of their students and the efforts that will be required in this regard.

3. Research Methodology

3.1. Population

This study used a case study methodology to achieve its objectives. For the data collection, four major universities in capital cities were selected. The selection of these universities was based on the number of students as well as their status of being comprehensive universities. We obtained information on several indicators, such as number of students, disciplines, public vs. private status, and origin of students enrolled in those universities. This ensured sufficient variability in the dataset. The study population consisted of undergraduate students from the Capital University of Science and Technology, COMSATS University Islamabad, Bahria University, and the Federal Urdu University of Arts, Sciences, and Technology. Students at these Pakistani universities had equal opportunity to participate in this research. After identification of the institutions, students were selected randomly from these universities. The researchers visited several locations in the universities to randomly select the required number of students. The data was collected between 15 October 2021, and 20 November 2021. However, we acknowledge that this dataset did not include information on postgraduate students and, thus, may not be comprise a representative sample for the region.

3.2. Construction of Questionnaire

The data collection process was carefully designed. The questionnaire was divided into several sections. The first section was for the respondents' demographic information. In the demographic section, respondents were asked questions about their name, university name, current academic status, and age.

In the second section, questions were included to assess the undergraduate student's ability to evaluate information. This section included five statements aimed at assessing students' ability to evaluate information. Each of these statements was measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). The third section of the questionnaire included eight questions regarding identifying potential sources of information. These responses were also obtained using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). In the fourth section, seven questions were asked to test the ability of the undergraduate students regarding recognition of information. As for previous items, these items were also measured on a five-point Likert scale. The ability to assess the purpose of accessing and using information sources was examined in part 5 of the questionnaire. This component was measured using five statements, with responses being obtained on a five-point Likert scale. Queries regarding the ethical use of information were examined in the sixth part of the questionnaire, in which five questions were asked to measure students' responses on a five-point Likert scale. In the final section, we assessed undergraduate students' abilities to use information technology tools during their studies using seven statements scored on a five-point Likert scale.

3.3. Data Collection Process

The questionnaire employed in this study used closed-ended questions. Personal visits were used to distribute the questionnaires to participants. The collected questionnaires

were scrutinized, filtered, and analyzed. The data collected for this study was analyzed by applying a multiple linear regression model using SPSS v.20.

4. Results and Discussion

Table 1 shows the distribution by gender of students in different universities in the participant sample. It was evident from the results that, overall, there were more male students from the universities than female students. However, the gap was not large. COMSATS had the highest ratio of female students in the sample. However, these universities were all in the capital, so the situation in other cities might differ from that in our sample. Recently, the government has taken many steps to increase female enrollment in higher education institutions, including removing quota limits and promoting merit-based admission rules.

Table 1. Distribution by gender of students in different universities.

University	Gender		Total
	Female	Male	
CUST	19 (0.39)	30 (0.61)	49
COMSATS	27 (0.53)	24 (0.47)	51
BU	21 (0.42)	29 (0.58)	50
FUUAST	24 (0.48)	26 (0.58)	50
Total	91 (0.46)	109 (0.55)	200

Note: Figures in parentheses indicate percentages.

The distribution by province of students in different universities in our sample data is shown in Table 2. Economically, Punjab is the most prosperous province in the country and has the largest population, while Baluchistan and GB are the least developed provinces. The results of our analysis generally indicated that in the capital city of Islamabad, most enrolled students belong to the Islamabad Capital Territory (ICT) and Punjab, while fewer students were enrolled from other provinces. Overall, more than 50% of student participants in all universities belonged to ICT and Punjab, while only 6% of them belonged to GB, which is the least developed province. This is an alarming situation considering that the least developed territories are most in need of skilled human resources. More than 20% of students belonged to KPK, which is a province bordering ICT.

Table 2. Distribution by province of students in different universities.

University	Measure	Province					
		ICT	Punjab	KPK	Sindh	Baluchistan	Gilgit-Baltistan
CUST	Frequency	20	13	8	4	2	2
	Percentage	41%	27%	16%	8%	4%	4%
COMSATS	Frequency	10	13	12	6	10	0
	Percentage	20%	25%	24%	12%	20%	0%
BU	Frequency	12	16	12	5	3	2
	Percentage	24%	32%	24%	10%	6%	4%
FUUAST	Frequency	14	10	9	6	4	7
	Percentage	28%	20%	18%	12%	8%	14%
Total	Frequency	56	52	41	21	19	11
	Percentage	28%	26%	21%	11%	10%	6%

Students' native language can also have an impact on their academic performance, especially in Pakistan. For example, if a student's native language is Urdu, it is easier for them to understand the educational resources that are mostly presented in Urdu. However,

the native language varies from province to province, while the medium of instruction in most of the schools is either English or Urdu. Hence, students who have Urdu or English as their native language are at an advantage. The results related to the distribution of students according to their native language in different universities are shown in Table 3. About 23% of students in the sample data reported that Urdu was their native language, with COMSATS having the highest number of such students. However, more than 70% of student participants spoke a native language other than Urdu. In the sampled data, Punjabi was the second most spoken native language. However, speaking Punjabi did not confer any advantage in the academic environment since none of the schools in Punjab offered courses in the Punjabi language.

Table 3. Distribution of students according to native language in different universities.

University	Measure	Language					
		Urdu	Punjabi	Pashto	Sindhi	Balochi	Saraiki
CUST	Frequency	17	15	9	4	2	0
	Percentage	34.7%	30.6%	18.4%	8.2%	4.1%	0.0%
COMSATS	Frequency	9	12	12	7	10	1
	Percentage	17.6%	23.5%	23.5%	13.7%	19.6%	2.0%
BU	Frequency	9	15	12	6	4	2
	Percentage	18.0%	30.0%	24.0%	12.0%	8.0%	4.0%
FUUAST	Frequency	11	8	10	6	4	3
	Percentage	22.0%	16.0%	20.0%	12.0%	8.0%	6.0%
Total	Frequency	46	50	43	23	20	6
	Percentage	23.0%	25.0%	21.5%	11.5%	10.0%	3.0%
							12
							6.0%

Table 4 shows the distribution of students according to the discipline of studies they are enrolled in. It can be seen from the results that about 44% of the students were enrolled in humanities and social sciences in these universities, while 56% were enrolled in scientific disciplines, such as natural sciences, formal sciences, and applied sciences. While the researchers have ensured random data collection to avoid any biases, these results show that the percentage of students in the hard sciences was as high as that for social sciences and humanities.

Table 4. Distribution of students according to their discipline of studies.

University	Measure	Department				
		Humanities	Social Sciences	Natural Sciences	Formal Sciences	Applied Sciences
CUST	Frequency	12	13	6	7	11
	Percentage	24.5%	26.5%	12.2%	14.3%	22.4%
COMSATS	Frequency	4	15	10	11	11
	Percentage	7.8%	29.4%	19.6%	21.6%	21.6%
BU	Frequency	11	15	6	7	11
	Percentage	22.0%	30.0%	12.0%	14.0%	22.0%
FUUAST	Frequency	5	13	10	12	10
	Percentage	10.0%	26.0%	20.0%	24.0%	20.0%
Total	Frequency	32	56	32	37	43
	Percentage	16.0%	28.0%	16.0%	18.5%	21.5%

Many studies have shown that owning educational resources or increasing access to technological resources to students can improve their learning outcomes. The computer is one such tool that is required to fulfill academic tasks, especially at university level.

The results in Table 5 show the distribution of students according to their possession of a computer. Our results show that about 89% of students in our sample owned a computer. This may be as a result of recent laptop schemes of the government of Pakistan which aimed at awarding free laptops to students enrolled in universities.

Table 5. The distribution of students according to the possession of a computer.

University	Measure	Students Having a Computer		Total
		No	Yes	
CUST	Frequency	9	40	49
	Percentage	18.4%	81.6%	100.0%
COMSATS	Frequency	8	43	51
	Percentage	15.7%	84.3%	100.0%
BU	Frequency	2	48	50
	Percentage	4.0%	96.0%	100.0%
FUUAST	Frequency	2	48	50
	Percentage	4.0%	96.0%	100.0%
Total	Frequency	21	179	200
	Percentage	10.5%	89.5%	100.0%

However, owning a computer does not necessarily mean that it will be used productively by students. This is indicated by our results (Table 6). The results show that the percentage of students using the computer for entertainment purposes only was very high (about 66%) compared to those who used it for educational purposes (only 5.6%). This is an alarming situation because, despite the large-scale efforts of the government to increase access to technology to higher education students, the use of such technology for its intended purpose is still very low. When we compared the results across various universities, we found that there were hardly any variations among students in terms of using a computer for educational purposes.

Table 6. Distribution of students according to the purpose of using a computer.

University	Measure	How Students Use Computer				Total
		Entertainment	Education	Web Browsing	Others	
CUST	Frequency	21	4	15	0	40
	Percentage	52.5%	10.0%	37.5%	0.0%	100.0%
COMSATS	Frequency	25	1	15	2	43
	Percentage	58.1%	2.3%	34.9%	4.7%	100.0%
BU	Frequency	33	2	13	0	48
	Percentage	68.8%	4.2%	27.1%	0.0%	100.0%
FUUAST	Frequency	40	3	2	3	48
	Percentage	83.3%	6.3%	4.2%	6.3%	100.0%
Total	Frequency	119	10	45	5	179
	Percentage	66.5%	5.6%	25.1%	2.8%	100.0%

In addition to a computer, the library is one of the main sources for accessing educational resources. During the survey, the researchers observed that all universities in the sample had well-established libraries with online access to research-related resources as well as huge book catalogues. In addition, all universities had a computer laboratory attached to the library. However, our results indicated the frequency of students using a library was very low (Table 7). The students reported that their daily use of the library was very low (only 4%), while their weekly use was a little higher (7%), but still very low overall. About 36% of students reported going to the library once a month only. An alarming result

here was that about 52% of students reported that they never went to the library. The university-based comparison also revealed a similar situation, with BU surpassing other universities with respect to the daily use of the library.

Table 7. The distribution of students according to the frequency of using the library.

University	Measure	Frequency of Using Library				Total
		Daily	Weekly	Monthly	Never	
CUST	Frequency	2	5	26	16	49
	Percentage	4.1%	10.2%	53.1%	32.7%	100.0%
COMSATS	Frequency	1	4	20	26	51
	Percentage	2.0%	7.8%	39.2%	51.0%	100.0%
BU	Frequency	4	4	20	22	50
	Percentage	8.0%	8.0%	40.0%	44.0%	100.0%
FUUAST	Frequency	1	1	7	41	50
	Percentage	2.0%	2.0%	14.0%	82.0%	100.0%
Total	Frequency	8	14	73	105	200
	Percentage	4.0%	7.0%	36.5%	52.5%	100.0%

Students' ability to evaluate information sources required to complete academic tasks is demonstrated in Table 8. The scale used was made up of five items, as described in the Table. The responses were obtained using a Likert scale ranging from 1 to 5 (5 being strongly disagree and 1 being strongly agree). According to the findings, the students' ability to evaluate the authenticity and reliability of information, the expertise of an individual author, their ability to identify a motive for information, and their ability to evaluate the recency of information were all very low as shown in Figure 1.

Table 8. Student's ability to evaluate information sources.

How Students Evaluate the Information	N	Mean	Std. Deviation
I am able to evaluate the authenticity of the information source	200	2.17	1.05
I am able to evaluate the reliability of the information	200	2.27	1.05
I am able to check the expertise of the author in his/her field	200	2.24	1.06
I am able to identify the motive of information	200	2.29	1.08
I am able to evaluate the recency of information	200	2.15	0.98

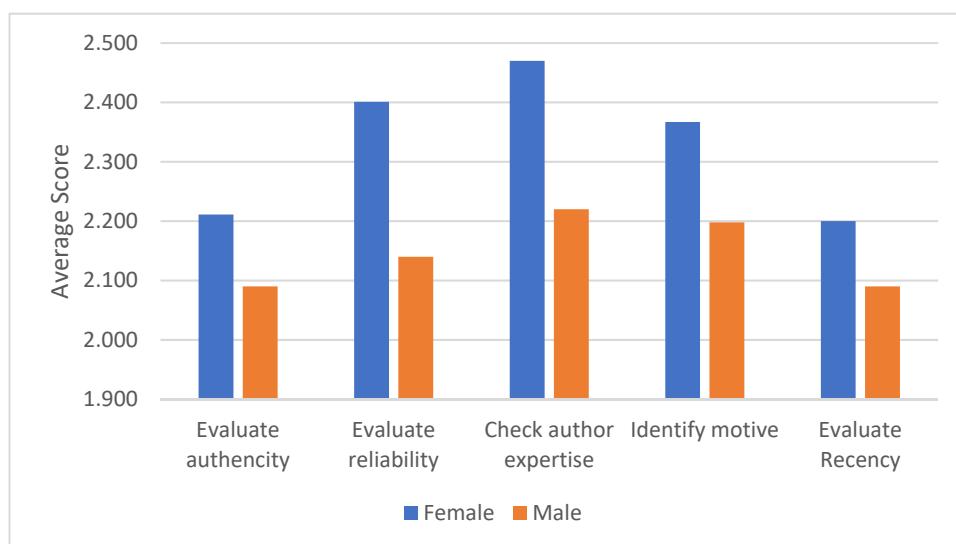


Figure 1. Differences by gender in students' ability to evaluate information sources.

It is necessary for students to identify potential sources of information, such as books, encyclopedias, databases, magazines, library catalogs, and online resources in order to complete their academic assignments. As shown in Table 9, student responses to the survey indicate that they were in a poor position in terms of their ability to identify information sources. Students' ability to recognize academic journals, magazines, library catalogs, and dissertations as potential sources of information was extremely low according to our findings. However, while their ability to identify books, encyclopedias, and online resources (search engines) as potential sources of information was higher than average, it was still far below the level of excellence that is desirable as shown in Figure 2.

Table 9. Student's ability to identify potential sources of information.

How Students Identify the Potential Sources of Information	N	Mean	Std. Deviation
When I look for information, I can use books as a potential source.	200	2.34	1.114
When I look for information, I am able to use encyclopedias	200	2.50	1.139
When I look for information related to my studies, I use academic journals.	200	1.89	0.822
I am able to use databases as a potential source of information.	200	1.57	0.654
When I look for information, I can use magazines as a potential source of information.	200	1.58	0.652
I am familiar with the library catalog.	200	1.54	0.656
When I look for information, I can use thesis and dissertations as potential sources of information.	200	1.60	0.681
When I look for information, I can use search engines like Google, Bing and Ask, etc.	200	3.50	1.089

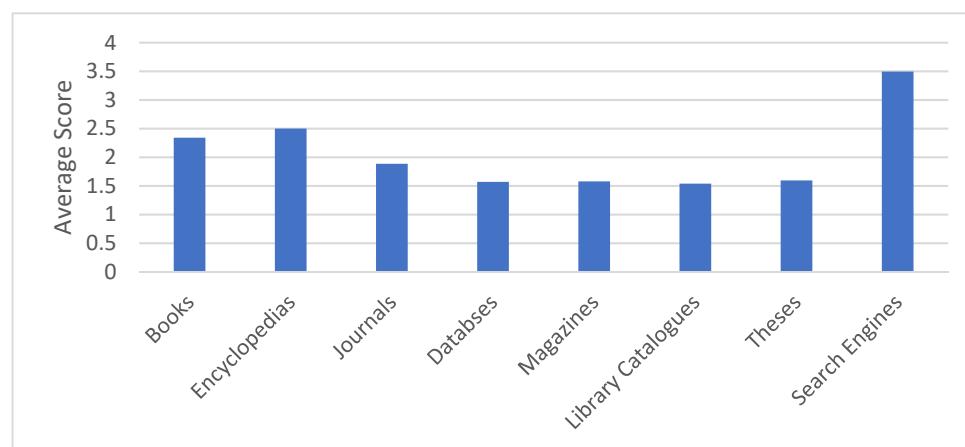
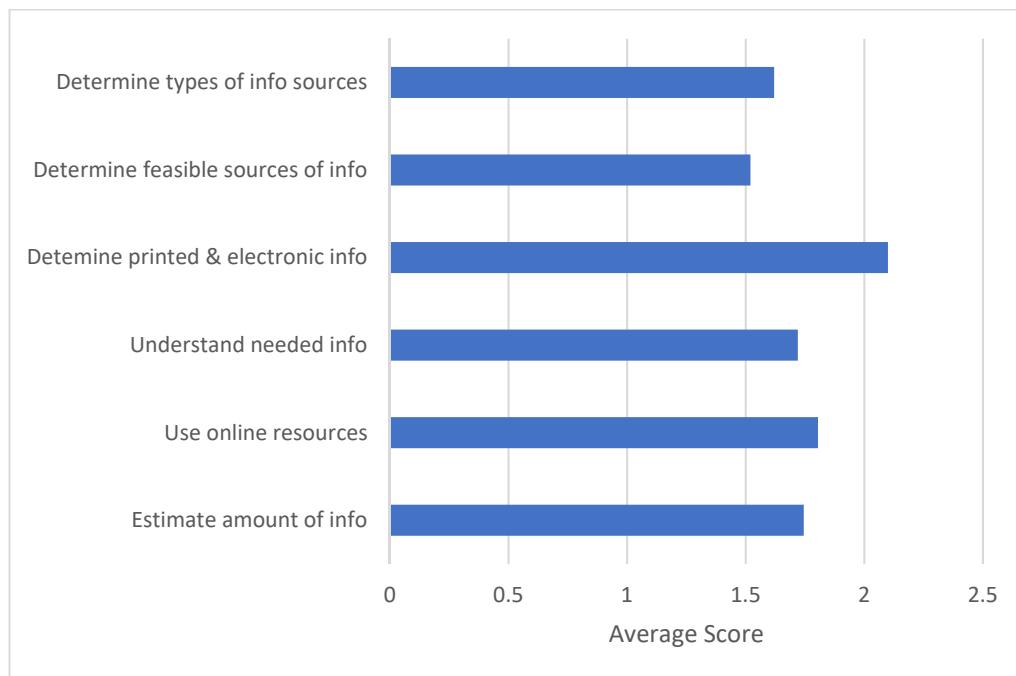


Figure 2. Students' responses on their ability to identify potential sources of information.

Along with the ability to identify information sources, students must also be able to recognize and understand these sources of information. Examples include estimating the amount of information required, using online resources to recognize needed information, comprehending the needed information, determining the feasible sources of information required, and determining the type of information sources that are appropriate to complete a required task. When students responded to the six items on a Likert scale (1–5), we were able to assess their ability to recognize and comprehend the information they had learned as shown in Table 10. The findings revealed that, in general, the student's ability to recognize and comprehend the required information was extremely limited as shown in the Figure 3. Most item scores were less than two, indicating that students' recognition and understanding of the information sources was in a dangerously precarious condition.

Table 10. Students' ability to recognize and understand sources of information.

How Students Recognize and Understand Sources of Information	N	Mean	Std. Deviation
I am able to estimate the amount of information needed for a particular task.	200	1.75	0.750
I am able to use online resources for the recognition of needed information.	200	1.81	0.806
I am able to seek assistance from others in order to grasp the information I needed.	200	1.72	0.863
I am able to determine when I need printed or electronic sources of information.	200	2.10	0.982
I am able to determine feasible sources for the needed information.	200	1.52	0.601
I am able to determine the types of information resources that are appropriate for my information requirements, such as primary and secondary sources.	200	1.62	0.734

**Figure 3.** Students' responses to their ability to understand and recognize information sources.

Students must be able to determine the purpose of accessing and using information sources in order to be effective users of that information. The ability to access and use information sources for university assignments, tests, and examinations, writing research articles, gaining general knowledge, or for entertainment, may be included in this description. The students performed extremely poorly on all indicators, apart from accessing sources of general knowledge and entertainment, which was consistent with our previous findings. The findings in Table 11 indicate that students' ability to access and use information for assignments, tests, examinations, and the writing of research articles was extremely limited as shown in Figure 4. This could have severe implications for their learning outcomes.

Table 11. Students' ability to access and use information for various purposes.

How Students Assess the Purpose of Accessing and Using Information	N	Mean	Std. Deviation
I am able to access the information source for university assignments	200	1.74	0.767
I am able to access the information source for university tests and examinations	200	1.89	0.971
I am able to access the information source for research articles.	200	1.48	0.567
I am able to access the information source for general knowledge	200	3.11	1.551
I am able to access the information source for entertainment	200	3.29	1.568

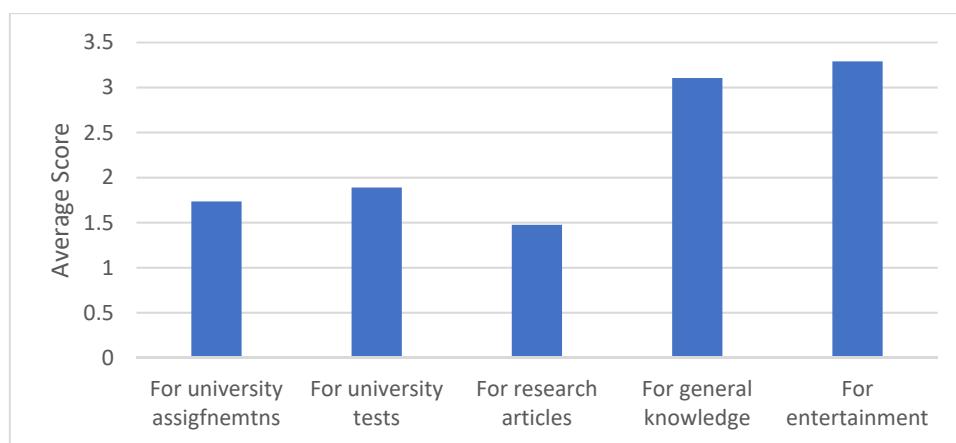


Figure 4. Students' responses to their ability to access information for different purposes.

The responsible and ethical use of information is a major concern in the academic community today, and has been for some time. It concerns best practice in academia, protecting others' rights, and promoting innovative and new ideas by avoiding practices such as plagiarism and other forms of intellectual property infringement (IP). We also looked at the students' ability to cite their papers in the proper format, to create bibliographic records of books and journals, and to use citation tools, such as EndNote, Mendeley, and Zotero to help them with their research. Table 12 shows the results of the study. According to the findings, students' ability to technically implement best practice in academic work and research was extremely limited, as was their knowledge of and practice in providing proper credit to original authors, both of which were also extremely limited as shown in Figure 5.

Table 12. Ethical use of information sources.

How Students Ethically Use Information	N	Percent	N
I'm able to paraphrase a given paragraph to avoid plagiarism	200	1.44	0.537
I'm able to cite a research paper with different styles (APA, Chicago, Harvard, etc.).	200	1.39	0.508
I'm able to create bibliographic records for different materials (articles, books, thesis, web pages, etc.).	200	1.35	0.499
I'm able to use citation tools for citation (Endnote, Mendeley, Zotero, etc.)	200	1.34	0.496
I am able to give credit to authors of image/video	200	1.38	0.506

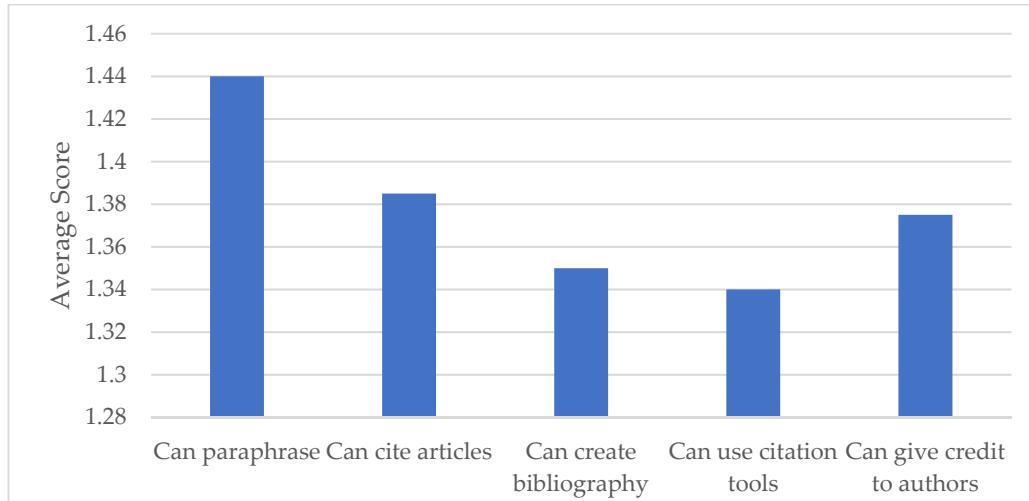


Figure 5. Students' responses to ethical use of information sources.

One of the most important factors that affects students' access to, use of, and identification of information sources is the technological skills that they have at their disposal.

These may include their ability to use a computer, word processing software, presentation software, social media, e-data bases, and data analysis software, amongst other tools. This was one of the items we included in our survey, which was scored on a Likert scale ranging from 1 to 5, with 5 representing strong agreement and 1 representing strong disagreement. Table 13 presents the results of the analysis. The results showed that students' ability to use a computer was relatively strong, but their ability to use word processing and presentation software was significantly less so. In addition, their ability to use data analysis software and programming languages was extremely limited. Students reported that their ability to access and search e-databases was extremely limited. Students' ability to use social media applications, such as Facebook, Instagram, and LinkedIn, on the other hand, was relatively strong as shown in Figure 6.

Table 13. Students' ability to use information technology tools.

How Students Use the Information Technology Tools During the Studies	N	Percent	N
I am able to use a laptop, personal computer.	200	3.51	1.494
I am able to use word processing software such as MS Word.	200	1.67	0.857
I am able to make presentations in PowerPoint.	200	1.62	0.748
I am able to use social media applications such as LinkedIn, WeChat, Instagram, Facebook, etc.	200	4.14	0.941
I am able to access and search e-books, e-journals, and e-database, etc.	200	1.45	0.608
I am able to use other tools like data analyzing tools: SPSS and MATLAB etc.	200	1.38	0.554
I am able to use programming languages: C, C++, Python, and Java, etc.	200	1.36	0.576

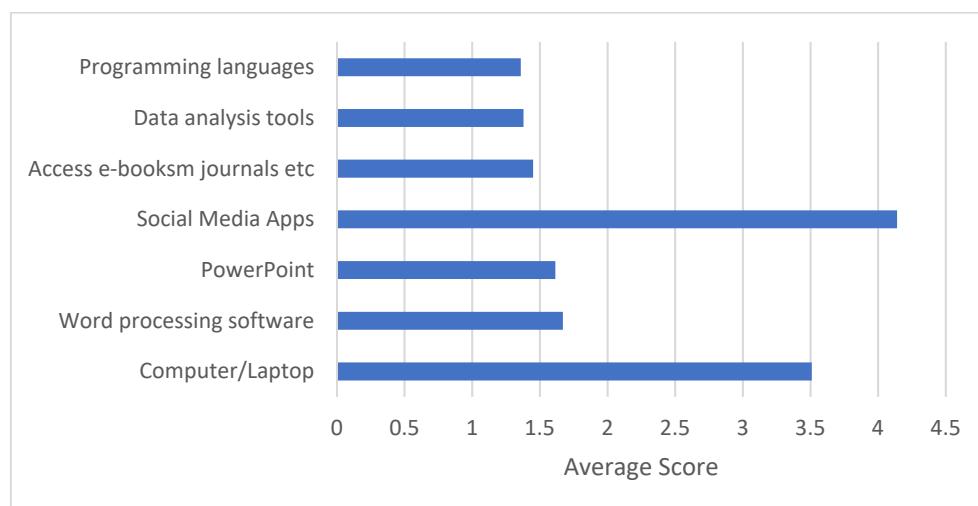


Figure 6. Students' responses to their ability to use information technology tools.

Findings and Discussion

We used multiple linear regression analysis to estimate different factors that affected students' IL, such as their ability to evaluate, recognize, understand, access, and use different information sources. We used each separate aspect of information literacy as the dependent variable and students' demographic and other characteristics as the control variables. Table 14 summarizes the findings. The findings showed that gender had a negative relationship with students' ability to evaluate information sources on the basis of reliability and recency of information. According to the variable's definition, this result implied that female students overtook male students in terms of information source evaluation. Following this, the findings showed that a student's university had an impact on their ability to evaluate information. The base category, in this case, was FUUAST. The findings showed that, when compared to FUUAST, students' ability to evaluate information sources improved when they were enrolled in CUST and BU. Students' ability to evaluate information, on the other hand, decreased when they were enrolled in COMSATS. This

finding has a wide range of implications. It demonstrates that, even in the capital city, universities provide learners with different opportunities to evaluate information sources, with some universities performing better than others. It implies that instituting reforms in universities has the potential to improve the situation. Furthermore, we can see that students' ability to evaluate information varied depending on the province from which they came. ICT was used as the base category in this case. The findings showed that, compared to ICT, the provinces of KPK, Sindh, Baluchistan, and GB all had a significant negative relationship with students' ability to evaluate information. This finding implies that students from less developed provinces had lower ability to evaluate information sources, necessitating targeted training programs for such students. On the other hand, Punjab had a positive relationship with student information evaluation, indicating that economically advantaged students performed better in terms of information source evaluation. Furthermore, the findings suggested that when students owned a computer, their ability to evaluate information tended to improve. Following this, we find that students' fields of study could have an impact on their ability to evaluate information. According to the findings, students enrolled in the humanities and social sciences had lower ability to evaluate information sources compared to students enrolled in the applied sciences. This has serious implications because we previously found that most students enrolled in the sample universities were studying social sciences or humanities. The frequency with which students used the library affected their ability to evaluate information. Daily frequency was used as the base variable in this case. The results showed that, when compared to students who visited the library daily, students who never visited the library had significantly lower ability to evaluate information. This finding suggests that universities should encourage students to visit libraries in order to improve their ability to evaluate information sources.

The dependent variable in the very next model in Table 14 was students' ability to identify information. The findings indicated that students' age and gender had no effect on their ability to identify information. Student enrollment in a different university, however, had an impact on ability to identify information. According to the findings, students from CUST, COMSATS, and BU had lower ability to identify information sources than students from FUUAST. This finding necessitates yet another university-wide reform to improve the situation. In terms of geographical differences, we found that students from KPK, Sindh, and GB had lower ability to identify information sources than students from ICT. Once again, we see that students from less developed areas require more attention to their information literacy. Furthermore, we found that students majoring in social sciences and humanities had lower ability to identify information than students majoring in applied sciences. There was no significant relationship between natural sciences and formal sciences and students' ability to identify information sources. In contrast to previous findings, we found that students' ownership of a computer had no effect on their ability to identify information sources. Finally, the frequency with which students visited the library affected their ability to identify information sources; we found that students who never visited the library had lower information identification ability than those who visited the library every day.

We found that students' age and gender had no significant relationship with their ability to recognize and understand information sources. However, there were inter-university effects. For example, we found that students enrolled in CUST and COMSATS had a lower ability to recognize and understand information than those enrolled in FUUAST. Here, too, we found similar inter-regional differences. We found that students from less developed areas (e.g., KPK, Sindh, and Baluchistan) had lower ability to understand and recognize information sources than students from more developed areas (e.g., ICT). Furthermore, the results showed that students enrolled in social sciences and humanities had lower ability to understand and recognize information sources than students enrolled in applied sciences. The findings also showed that owning a computer improved students' ability to understand and recognize information sources. In contrast to previous findings,

we found that students' ability to understand and recognize information sources was unaffected by the frequency of library visits.

Table 14. Regression results of factors affecting student information literacy.

Variables	Evaluate Information		Identify Information		Recognize Information		Access Information		Ethics in Information		Use Info Tech	
	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.
Age (Years)	-0.029	0.19	-0.193	0.305	-0.014	0.935	-0.073	0.666	0.172	0.231	0.169	0.074
Gender (0 = female, 1 = male)	0.022	0.001	-0.146	0.755	-0.057	0.893	0.214	0.611	-0.202	0.570	-0.334	0.081
University ^a												
CUST	0.001	0.001	-1.924	0.008	1.580	0.015	1.639	0.012	-0.730	0.185	-0.691	0.343
COMSATS	-0.11	0.25	-2.337	0.001	1.608	0.009	3.875	0.000	-0.509	0.324	0.287	0.675
BU	0.34	0.0001	-2.014	0.003	0.389	0.521	1.828	0.003	-0.123	0.810	1.682	0.014
Province ^b												
Punjab	0.333	0.0001	0.111	0.860	-0.093	0.069	0.760	0.178	0.138	0.772	1.209	0.057
KPK	-0.124	0.04	-0.284	0.675	1.645	0.008	-0.786	0.198	0.420	0.417	0.632	0.357
Sindh	-0.224	0.003	-2.495	0.005	-0.585	0.456	-0.710	0.365	-0.094	0.888	1.307	0.139
Baluchistan	-2.59	0.0001	-2.385	0.009	-0.455	0.056	-0.292	0.720	-0.227	0.042	-0.547	0.050
GB	-0.654	0.151	-0.584	0.012	-0.555	0.092	-1.568	0.130	-1.334	0.029	-0.627	0.090
Department ^c												
Humanities	-0.234	0.0002	-0.248	0.046	-0.201	0.071	-0.105	0.079	-0.174	0.066	0.292	0.007
Social Sciences	-0.251	0.01	0.442	0.095	-0.484	0.007	-0.879	0.032	-0.163	0.041	-0.023	0.072
Natural Sciences	0.223	0.231	0.016	0.983	-0.500	0.473	0.477	0.493	-0.306	0.604	0.396	0.613
Formal Sciences	0.124	0.41	-0.170	0.821	0.196	0.771	0.572	0.396	-0.366	0.522	-0.553	0.466
Have computer?	0.001	0.001	2.507	0.0203	-1.602	0.036	0.694	0.061	0.221	0.732	1.433	0.095
Frequency library ^d												
Weekly	-0.121	0.201	-1.233	0.395	-0.230	0.860	-0.774	0.052	-1.749	0.114	-1.307	0.373
Monthly	-0.114	0.152	-0.223	0.053	0.655	0.545	-0.138	0.098	-0.273	0.766	-1.722	0.059
Never	-0.342	0.0001	-0.004	0.098	1.103	0.306	-0.276	0.097	-0.063	0.945	-1.759	0.047
Constant	12.021	0.0001	24.524	0.000	10.180	0.000	10.821	0.000	11.012	0.000	11.022	0.000
R ²	0.29		0.234		3.120		0.242		0.241		0.331	
F-value	2.34	0.001	2.237	0.004	2.136	0.006	3.209	0.0001	2.136	0.001	2.411	0.000

Notes: ^aThe base category for the variable university is "FUUAST". ^bThe base category for the province is "ICT". ^cThe base category for the variable of department is "applied sciences". ^dThe base category for the variable of library frequency is the "daily frequency".

In terms of accessing and using information sources, regression analysis results showed that students' age and gender had no effect on this variable. Their enrollment in various universities, on the other hand, had a significant relationship with this variable. Surprisingly, we discovered that students from CUST, COMSATS, and BU had increased access to information sources, despite the fact that previous relationships indicated that their ability to understand and identify information sources decreased if they attended these universities. Unlike previous findings, we found that inter-regional differences in student ability to access and use information had no effect. This means that students had equal access to information sources regardless of where they lived. However, the findings were consistent with previous findings in that students' ability to access and use information was influenced by the discipline they were studying. We found that students of social sciences and humanities had less access to information sources (or did not use them on purpose) than students of applied sciences. We also found that owning a computer had

a positive and significant impact on their access to and use of information. Furthermore, the importance of library visits was demonstrated by the finding that students who visited the library weekly, monthly, or never had a lower ability to access information sources than those who visited the library daily.

The findings of the study revealed that the majority of the students who participated in the survey lacked IL abilities, because they had never had any formal information literacy education. This outcome was anticipated and unsurprising, given that academic institutions in Pakistan, particularly schools and colleges, had historically made little provision for imparting information literacy instruction in instructional programs [52]. The IL education offered by university libraries is embryonic or in its infancy, and lags well behind the norms set by developed world institutions, with the mainstream of these offering no formal IL education [53–55]. A significant proportion of IL education that is now available is incapable of supporting students in the development of foundational information abilities. Previous studies [56,57] have also obtained comparable results—respondents possessed insufficient IL skills and needed to develop in this area. Possibly as a result of this, scholars have recommended the importance of IL skills among students [58]. The findings demonstrated that there was little variation in students' responses to the majority of the claims about their IL abilities. These findings are also consistent with earlier research findings, which showed that there was little variation between the different student class levels in terms of their IL abilities. A number of previous research [59,60] came to the same conclusion, namely that there was a difference in IL abilities between students who received IL education and those who did not receive IL education. It is reasonable that a trained individual can outperform a non-trained individual in certain situations. Therefore, training should be seen as a critical component in the development of students' IL abilities.

5. Conclusions

The aim of this study was to assess undergraduate students' information literacy abilities in Pakistan. To collect the required data from the population, a survey method was used. The participants consisted of Capital University of Science and Technology (CUST), COMSATS University Islamabad, Bahria University (BU) Islamabad, and Federal Urdu University of Arts, Sciences and Technology (FUUAST) students. The sample consisted of 200 students, randomly selected. A questionnaire was formulated and completed individually.

The results included the alarming result that about 52% of students from the selected institutions reported that they never went to the library. Comparison across the universities revealed a similar situation, though with BU surpassing other universities with respect to daily use of the library. The responses to the survey indicate that students were in a poor position in terms of their ability to identify information sources. Furthermore, most of the item scores were less than two, indicating that students' recognition and understanding of information sources was in a dangerously precarious condition. The findings further indicated that students' ability to access and use the information for assignments, tests, examinations, and the writing of research articles was extremely limited. This could have severe implications for their learning outcomes. According to the findings, students' ability to technically implement best practice in academic work and research was extremely limited, as was their knowledge of and practice in providing proper credit to original authors, both of which were also extremely limited. Students' ability to use social media applications, such as Facebook, Instagram, and Linked In, on the other hand, was relatively strong.

We recommend that students be educated with appropriate instruction through a program that meets their needs. The Higher Education Commission (HEC) and the institutions must organize conferences, workshops, and seminars to educate students on the importance of IL and to raise awareness among faculty and students. Additionally, during practical visits, we noticed that the majority of the libraries were not adequately developed and that their internet facilities and contemporary services were not available

to the students in question. In order to effectively teach and encourage students to use libraries, we strongly recommend that significant efforts be made to address these issues.

Finally, the authors acknowledge that, despite our best efforts, there are several limitations to this study. First, the data was only collected from undergraduate students. Future studies may include postgraduate students as well to compare the outcomes between undergraduate and postgraduate students. Second, future studies should use more advanced econometric techniques, such as structural equation modeling, to analyze the influence of different factors on the outcomes considered in this study, because the SEM technique enables analysis of several variables simultaneously.

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