# Development of Information Literacy over an Undergraduate Degree Programme - Comparison of First- And Final-Year Students

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Abstract

*By obtaining two samples from first-year and fourth-year student cohorts from an engineering degree programme in Sri Lanka, the study investigated whether the fourth-year cohort possesses more IL capability compared to the first-year cohort, which was developed over the degree programme when both cohorts were not exposed to IL instruction. 409 first-year and 109 fourth-year engineering undergraduates responded to the survey questionnaire. Quantitative methods were used to analyse the data.It was found that some improvements in IL were visible over the degree programme. Still, mean values for possession of skills and confidence in the use of each IL dimension seem insufficient. Irrespective of their level of study both cohorts showed a willingness to undergo formal IL instruction if they were provided such. Students entering the university face challenges in their information search, retrieval, and use. Therefore, there is a need for empirical analysis of entry-level university students and final-year passing out undergraduates on how they have acquired IL over a course of a degree.*

Keywords

First-year; final-year; information literacy; information literacy instruction; undergraduates

Electronic access

The journal is available at www.jalis.in

**Journal of Advances in Library and Information Science**
ISSN: 2277-2219 Vol. 10. No.4. 2021. pp.218-228

## Introduction

Information literacy (IL) is a set of generic skills essential for academic success and lifelong learning. Our context of the study is university undergraduates. Insufficiency in IL makes a negative effect on academic, personal, and professional advancements among undergraduates due to difficulties in effective and efficient mechanisms in accessing, retrieving, and using relevant information. When students leave the university education they should have developed IL to become successful independent learners, having the capacity to acquire information, apply information with confidence in different roles and contexts throughout his/her lifetime to achieve educational, social, occupational, and economic goals (Clark and Catts, 2007; Lloyd and Williamson, 2008; Lwehabura, 2016).

The literature suggests that students commence university education with limited IL, and this is common for students from both developed and developing countries (Russell, 2009; Gabridge et al., 2008; Lwehabura, 2016). Previous studies on first-year students report that students commencing first-year university education were unprepared to meet the needs of the undergraduate degree programme (Russell, 2009); there are significant gaps in IL when students make a transition from high school to university (Gabridge et al., 2008). Hence, students entering the university face challenges in their information search, retrieval, and use. This suggests the need for an education model where studentsare equipped with IL for degree programme success and to take responsibilities beyond. Therefore, there is a need for empirical analysis of entry-level university students and final-year passing out undergraduates on how they have acquired IL over a course of a degree. In this context, this paper presents the results of an investigation conducted on two engineering undergraduate cohorts in Sri Lanka. One cohort is engineering undergraduates who just commenced university education and in their first year, identified as the *first-year cohort*. The other is engineering undergraduates who are in the final year (4th year) of the degree progrmme, identified as the *fourth-year cohort*. Both cohorts had not undergone any formal IL instruction during the degree programme. Therefore, it is of interest to understand whether the fourth-year cohort possesses more IL skills compared to the first-year cohort, which was developed over the degree programme. The specific objectives of the study were to investigate 1) whether IL of students commencing the first-year undergraduate programme

and final-year passing out undergraduates vary with their level of study, when both student cohorts had not been exposed to any formal IL instruction during the degree programme, 2) whether each student cohort identifies the importance of receiving IL instruction as part of academic instruction during the university education, and 3) whether individual and family-related characteristics were associated with IL of students.

Our study expects to make novel contributions, which are valuable for academics, researchers, practitioners, and policymakers. First, universities are faced with the challenge to inculcate IL considering it as a lifelong learning requirement (de Arenas et al., 2014). This implies the importance of understanding the extent to which students are information literate when they enter the university and when they leave the university. Previous studies suggest that undergraduates develop IL over a degree programme. It is very rare to find studies conducted in developing countries and it is even rare to find evidence of having academic IL instruction at universities. Sri Lanka does not have national-level IL strategies, standards, policies, or models to enhance it at any level of education. In this context, we investigated how far students develop IL over a degree programme by conducting a cross-sectional comparative study of first-year and final year undergraduates as a user-focused study. Second, there is a growing concern for universities to produce graduates who are information literate, which is a requirement of lifelong learning. Information literacy is a vital generic skill for all undergraduates across all countries and disciplines. However, studies conducted on undergraduates in Asian developing countries are rare to be found. Further, the literature repeatedly identifies the importance of understanding IL skills across study disciplines. Like all other disciplines, IL skills are important for engineering undergraduates to complete their course assignments, research projects, and written work successfully. Previous studies emphasise the need of conducting discipline-specific studies and assessing IL skills at the level of the discipline (Catts, 2005; Clark & Catts, 2007; Folk, 2014; Price et al., 2011). In this regard, it is rare to find studies conducted on IL of undergraduates in the engineering discipline. Therefore, the findings presented in this paper are of value. Third, knowing whether students develop IL over a degree programme is important for librarians to have a sense of who these undergraduates are and to customize IL instructional programmes by their level of study to better serve them. Fourth, we included individual and socio-demographic characteristics to understand whether these influence IL skills. In this regard, previous studies such as Whitmire (2001) stated the importance of considering sex as a factor in IL skills, and Catts and Lau (2008) emphasised the importance of considering family patterns among other social factors as predictors of IL skills. In addition to the sex of the undergraduate, we included several variables, such as the role of mother, i.e., housewife or in paid employment, having siblings, and having grandparents or any other relatives living with family. We identify these can demonstrate certain Asian cultural patterns and may add value to our study since this nature of information in the IL literature is rare. Having all these in mind this study has been undertaken to provide useful information for academics, practitioners, and policymakers alike for informed decision-making.

## Literature review

### *Information literacy*

Information literacy encompasses one's ability to identify information needs, locate, evaluate and organize information, and create, use and communicate information appropriately (UNESCO, 2003). According to UNESCO (2003), IL is a prerequisite to participate in the information society and can be considered as a part of the basic human right of lifelong learning. The American Library Association (ALA) (1989) defined information literacy (IL) as: "a set of abilities requiring individuals to recognize when information is needed and to locate, evaluate, and use effectively the needed information" (p. 3). A higher education-specific definition of IL is given by the Society of College, National and University Libraries (SCONUL, 2004), where IL encompasses library user education or formal instruction in the area of transferable skills on the use of information in the context of learning, teaching, and research in higher education. Hence, IL as a concept that includes both information skills (Clark and Catts, 2007) such as accessing needed information, evaluating information and its sources, managing information, applying information, and using information ethically and legally as well as information behaviour (Pinto and Sales, 2007) such as organization and planning, problem-solving, capacity for analysis and synthesis, computer literacy, information management skills, and decision-making. Therefore, IL in the higher education context denotes a wider concept than that is described in general, and IL is a necessity for the successful completion of course work and research projects of an

undergraduate degree programme. Still, since IL is considered a generic skill, it is believed to be transferable to other contexts and aspects of everyday life (Lloyd, 2005, p. 83). Previous studies showed that in situations of not having IL instruction, undergraduates demonstrate insufficient knowledge in identifying information needs, they have problems in evaluating information, and have difficulties in completing research work (Petermanec and Šebjan, 2017). Further, even though students were aware of the basics of copyright, they rarely use them in practice (Petermanec and Šebjan, 2017). Overall, when IL instruction is unavailable, it can have important negative consequences on the performance of students in their undergraduate programmes. In this regard, Lwehabura (2016) provides evidence that students identifying priority areas for IL instruction as information search techniques and evaluating Internet information. Furthermore, it is reported that undergraduates exposed to IL instruction tended to rate positively on the effectiveness, importance, and impact of IL instruction for their degree programme performance (Petermanec and Šebjan, 2017).

***Information literacy over an undergraduate programme***

Today, universities are under immense pressure to measure and report IL as a graduate attribute during the firstyear of the commencement of undergraduate degree programme, and also to provide evidence that improvements occurred in IL over the course of a degree (Barrie, 2007; Yager et al., 2013). When IL instruction is available, faculty and library staff will utilise resources and best practices to enhance and evaluate the IL skills over the degree programme. In the situations like Sri Lanka, even though IL instruction is not available, our interest was to evaluate any improvements in IL skill possession and confidence in the use over the degree programme by studying two undergraduate cohorts. This is in line with the theoretical arguments in IL research about user-focused studies (Wilson, 1981). We believe that the findings of our study will be valuable since in providing students with effective IL instruction, an understanding of student requirements are essential. Without knowing students' perspectives designing IL instruction would lead to an inappropriate pedagogic strategy (Webber and Johnson, 2000).

The literature suggests that undergraduates across different undergraduate education levels across disciplines should possess IL that corresponds to their undergraduate education level (Lwehabura, 2016). The literature further suggests that first-year students at the commencement of their degree programmes have general IL skills, and have a shallow understanding of the importance of IL in their lives (Clark and Catts, 2007; Seamans, 2002). Furthermore, it is suggested that unlike fourth-year students who are exposed to a large amount of discipline-specific knowledge, first-year students are not exposed to information sources exclusive to the discipline concerned (Clark and Catts, 2007). Based on the above reviewed literature, it is proposed:

H1: Fourth-year cohort may have developed IL over the course of the degree compared to the first-year cohort.

***Information literacy and individual and family-related characteristics***

Our review of the literature led to reveal, on the one hand, that investigating the influence of individual characteristics on IL is not much popular. On the other hand, IL research is not much popular in the non-Western context. However, some previous studies emphasised the importance of taking into account individual and family-related characteristics in IL research (such as Catts and Lau, 2008; Latham and Gross, 2013). We investigated six individual and family-related characteristics in the study to examine whether these are associated with the possession of IL in undergraduates. The individual characteristics were age, sex, the existence of siblings, and Z Score achieved in the university entrance examination. Catts and Lau (2008) state "information and the skills to use it are needed in every society, but the ways that a citizen may identify and express information needs are affected by family patterns, language, and religion, among other social factors" (p.24). Building on these arguments, we included two family-related characteristics. These were whether respondents had grandparents or any other relatives living with them during their school days who influenced them, and the role of mother, i.e., in a paid employment or housewife. Therefore, it is proposed:

H2: Individual and family-related characteristics are associated with IL skills

**Method**

***Population and sample***

The survey was conducted in one of the state universities in Sri Lanka. A random sample of undergraduate students of first-year and final-year engineering undergraduate degree programme participated. Table 1 provides data on the population and sample. The first-year cohort was just entered the degree programme with three months of the university experience. Therefore, they were assumed

to have general IL skills, and have not yet been exposed to information sources exclusive to the study discipline. The fourth-year cohort was in the middle of their final year, and they were assumed to have been exposed to a higher volume of information sources exclusive to the study discipline. Both cohorts voluntarily respond to the anonymous survey questionnaire in the classroom setting. The paper-based survey was administered to each group of students on only one occasion. The survey was distributed at the end of a class and requested respondents to leave the completed survey at a designated place in the classroom. The questionnaire took approximately 15 minutes to complete. The survey was in the English language, which is one of the national languages of the country, and the only language for academic instruction at the university. Further, all forms of resources provided by the university library for the degree programme are in the English language.

**Table 1.** Population and sample

| Year | Population | Sample received | % represented |
|---|---|---|---|
| First-year cohort | 706 | 409 | 58 |
| Fourth-year cohort | 588 | 174 | 30 |

***Measures***

*IL skills.* We used two instruments to evaluate IL skills of undergraduates, where one instrument is called *information skills* (Clark and Catts, 2007) while the other is called *information behaviour* (Pinto and Sales, 2007). Although both information skills and information behaviour scales sought responses in similar IL areas, the two scales differ based on the purpose of measurement. Specifically, the measure of information skills sought responses for the perceived level of IL possession while the measure of information behaviour sought responses for the perceived level of general competence achieved. The details of the measures are as follows.

*Information skills*. The 20-item scale of Clark and Catts (2007) was used. The scale assessed IL in five areas, namely, skills to access needed information, evaluate information and the information-seeking process, manage information, apply information, and use information ethically, legally, and respectfully. Items were on a Likert-type scale ranging from always (4), often (3), sometimes (2), and never (1). The scale used is given in Appendix 1.

*Information behaviour*. The 20-item information behaviour scale of Pinto and Sales (2007) was used. The scale inquires general competence related to needs of, access to, processing of, and use of information. The scale assessed the degree of success achieved in organization and planning, capacity for analysis and synthesis, computer literacy, information management, and decision-making. Items were on a Likert-type scale ranging from very high (4), high (3), low (2), and very low (1). The scale used is given in Appendix 1.

Since both undergraduate cohorts were not exposed to IL instruction, we also inquired their willingness to undertake such an instructional programme if provided.

*Individual and family-related characteristics*. We collected information on six characteristics. Data on age and number of siblings were collected on a ratio scale (years). Sex was coded as female (0) and male (1). We collected Z Score achieved by each respondent in the university entrance examination. We also inquired whether respondents had grandparents or any other relatives, who influenced them, living with them during school days (yes [1] or no [0]), and the role of mother, i.e., in a paid employment (1) or housewife (0). These characteristics of the respondents are shown in Table 2.

**Table 2:**Individual and socio-demographic characteristics

| socio-demographic characteristics | First-year cohort | Fourth-year cohort |
|---|---|---|
| Z Score in university entrance examination: | | |
| Mean | 2.2 | 2.2 |
| Std. Deviation | 0.4 | 0.4 |
| Age: | | |
| Mean | 20.92 | 23.80 |
| Std. Deviation | 1.24 | 0.78 |
| Minimum | 19 | 21 |
| Maximum | 21 | 23 |
| Sex (%): | | |
| Male | 71.7 | 84.0 |
| Female | 28.3 | 16.0 |
| Siblings: | | |

| | | |
|---|---|---|
| Mean | 1.73 | 1.79 |
| Std. Deviation | .87 | 1.35 |
| Minimum | 0 | 0 |
| Maximum | 4 | 4 |
| Mode | 1 | 1 |
| During school days, grandparents or any other relatives lived with your family, who had an influence on you? (%): | | |
| No | 48.1 | 52.3 |
| Yes | 51.9 | 47.7 |
| Mother's role (%): | | |
| Housewife | 55.4 | 59.6 |
| In paid employment | 44.6 | 40.4 |

***Methods of data analysis***

The measures were subjected to appropriate internal consistency reliability, factor structure, convergent validity, discriminant validity, and construct reliability. Principle component factor analysis with Varimax rotation was performed on the variables of information skills and information behaviour. As expected the factors yielded corresponded with Appendix 1. The independent sample t-test was used to understand the differences between the two cohorts. Regression analysis was used to identify how far information skills and information behaviour were influenced by individual and family-related characteristics.

**Results**

Table 3 shows the results of the first-year cohort and fourth-year cohort for information skills and information behaviour. The rank order based on mean scores is also shown in Table 3. The results suggest that both information skills and information behaviour of first-year and final-year cohorts' ranking order varies. The fourth-year cohort scored higher mean values for both information skills and information behaviour. Still, their means values are lower than the average mean value of 3, when 3 is considered as the middle point of the five-point Likert scale.

**Table 3:** Comparison of IL

| Information skills | | | Information behaviour | | |
|---|---|---|---|---|---|
| First-year cohort | Fourth-year cohort | | | First-year cohort | Fourth-year cohort |
| Mean (Rank) | Mean (Rank) | | | Mean (Rank) | Mean (Rank) |
| 2.73 (1) | 2.86 (2) | Apply information | Decision-making | 2.83 (1) | 2.94 (2) |
| 2.72 (2) | 2.96 (1) | Access needed information | Computer literacy | 2.77 (2) | 3.07 (1) |
| 2.65 (3) | 2.65 (3) | Use information ethically, legally and respectfully | Organization and planning | 2.68 (3) | 2.69 (5) |
| 2.59 (4) | 2.60 (4) | Evaluate information and information sources | Capacity for analysis and synthesis | 2.66 (4) | 2.76 (4) |
| 2.16 (5) | 2.27 (5) | Manage information | Information management | 2.66 (5) | 2.82 (3) |

A comparison of information skills between first-year and fourth-year cohorts is shown in Table 4. Skills on accessing needed information and applying information have significant differences between the two cohorts, where the fourth-year cohort scored significantly higher.

**Table 4:** Information skills

| Information skills | Fourth-year cohort | | First-year cohort | | *t* |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Access needed information | 2.96 | .53 | 2.72 | .59 | 4.83*** |
| Evaluate information and information sources | 2.60 | .56 | 2.59 | .57 | .344 |
| Manage information | 2.27 | .59 | 2.16 | .48 | .184 |
| Apply information | 2.86 | .57 | 2.73 | .58 | 2.603** |
| Use information ethically, legally and respectfully | 2.65 | .53 | 2.65 | .59 | .130 |

A comparison of information behaviour between first-year and fourth-year cohorts is shown in Table 5. Information management, Capacity for analysis and synthesis, and computer literacy have significant differences between the two cohorts, where the fourth-year cohort scored significantly higher. Overall, H1 is partially supported.

**Table 5:** Information behavior

| | Fourth-year cohort | | First-year cohort | | *t* |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |

| | | | | | |
|---|---|---|---|---|---|
| Computer literacy | 3.07 | .50 | 2.77 | .56 | 5.951*** |
| Capacity for analysis and synthesis | 2.76 | .41 | 2.66 | .49 | 2.587* |
| Information management | 2.82 | .55 | 2.66 | .45 | 2.763** |
| Decision-making | 2.94 | .73 | 2.83 | .72 | 1.699 |
| Organization and planning | 2.69 | .51 | 2.68 | .53 | .266 |

We inquired whether the first-year cohort and fourth-year cohort willing to undergo IL instruction. Results are shown in Table 6. As shown in Table 6, a large portion from both cohorts showed a willingness to attend IL instruction programmes.

**Table 6:** preference for IL instruction

| preference for IL | First-year cohort (%) | Fourth-year cohort (%) |
|---|---|---|
| Yes | 60.1 | 76.3 |
| No | 39.9 | 23.7 |

We conducted a series of regression analyses on each information skill to identify whether individual and family-related characteristics influence the skills. The results only where these characteristics significantly predict are shown in Table 7. Apply information is significantly influenced by age, where older students showing more skills than younger students.

**Table 7:** Effect of individual and socio-demographic characteristics on information skills†

| socio-demographic characteristics | Apply information | | | |
|---|---|---|---|---|
| | Beta | $R^2$ | Adj $R^2$ | *F* |
| Z Score | .051 | .063 | .050 | 4.818*** |
| Age | .211*** | | | |
| Sex | -.073 | | | |
| Siblings | -.050 | | | |
| Grandparents/ relatives lived | .010 | | | |
| Mother's role | .038 | | | |

Note: information skill components with significant results are shown†

We also conducted a series of regression analyses on each information behaviour to identify whether individual and family-related characteristics predict these. The results only where these characteristics significantly predict are shown in Table 8. Information management and organization and planning are significantly predicted by age and sex, where older students showing more skills than younger students, and where females showing the possession of the skill more than their male counterparts. Further, capacity for analysis and synthesis is significantly predicted by sex, where females possessing more skills than their male counterparts.

**Table 8:** Effect of individual and socio-demographic characteristics on information behaviour†

| | Information management | | | | Organization and planning | | | | Capacity for analysis and synthesis | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Beta | $R^2$ | Adj $R^2$ | *F* | Beta | $R^2$ | Adj $R^2$ | *F* | Beta | $R^2$ | Adj $R^2$ | *F* |
| Z Score | .002 | .054 | .039 | 3.785* | .024 | .026 | .012 | 1.897* | .076 | .029 | .016 | 2.133* |
| Age | .172*** | | | | .101* | | | | .030 | | | |
| Sex | -.178*** | | | | -.105* | | | | -.152** | | | |
| Siblings | -.093 | | | | -.072 | | | | -.006 | | | |
| Grandparents/ relatives lived | .007 | | | | -.025 | | | | -.039 | | | |
| Mother's role | .049 | | | | -.032 | | | | -.012 | | | |

Note: information behaviour components with significant results are shown†

We created Table 9 to compare the results presented in Tables 7 and 8. The item measures of each component of information skills and information behaviour are given in Appendix 1. Overall, H2 is partially supported.

**Table 9:** Summary – significant individual and socio-demographic characteristics

| | Information | Information |
|---|---|---|

| | skills | behaviour |
|---|---|---|
| | ◊ | Information management |
| Age | | √ |
| Sex | | √ |
| | ◊ | Organization and planning |
| Age | | √ |
| Sex | | √ |
| | ◊ | Capacity for analysis and synthesis |
| Sex | | √ |
| | Apply information | † |
| Age | √ | |

◊ equivalent information behaviour component is not significant, see Appendix 1

† equivalent information behaviour component is not significant, see Appendix 1

**Discussion and implications**

We investigated the IL of two undergraduate cohorts in Sri Lanka. The results showed that the level of possession and competence in IL of the two groups. First, results showed that both the possession of IL measured with informal skills scale of Clark and Catts (2007) and confidence in IL measured with information behaviour scale of Pinto and Sales (2007) showed that the fourth-year cohort scoring higher than their first-year counterparts. Further, as shown in Appendix 1, the two scales used for the study measured the same areas of IL, where one scale measured possession of skills while the other measured confidence in the use of the skills. The results showed that the ranking order for both information skills and information behaviour vary between the two groups. Second, the findings showed some significant differences between the two groups in information skills and information behaviour with partial support for H1. Third, the findings revealed that age and sex influence IL, with partial support for H2. As discussed in the below paragraphs in detail, our study contributed to the existing literature in several aspects and has implications for the current practices.

***Theoretical contributions of the findings***

First, we inquired whether students new to the university in their firstyear of study and students about to pass out the university possessIL skills and are confident in using information. The findings showed that IL of the fourth-year cohort is better than IL of the first-year cohort. This suggests that even in the absence of IL instruction, undergraduates develop IL to a certain extent. However, it was evident that most of the IL dimensions evaluated received lower mean values of less than 3 (when 3 is taken as the middle value of the 5-point Likert scale). This suggests that faculty and librarians should reach out to undergraduates irrespective of their level of undergraduate education, and should provide IL instructional services to better serve undergraduates.

Second, information literacy is identified as one of the graduate skills and capabilities that undergraduates should develop beyond the content of the discipline-specific degree programme. Previous studies such as Price et al. (2011) provide evidence that first-year university students experience difficulties in developing appropriate IL skills required for undergraduate degree programmes. When instruction in IL is unavailable, students may struggle to develop appropriate skills throughout the degree programme. This may lead them to understand the value of learning IL during the degree programme. This may have been reflected in the findings, where irrespective of the level of study, students showed a willingness to attend IL instructional programmes. This finding contradicts with Price et al. (2011) where they found that later-year students identifying IL instruction as too late and unnecessary, which led them to conclude that IL instruction is appropriate in the early stages of the degree programme.

Third, the IL literature identifies the field of user-focused studies as important since outcomes of such studies are helpful if designing better instructional programmes acknowledging users' IL gaps. Building on the IL literature on user-focused studies such as Pinto and Sales (2007) and de Arenas et al. (2014), we investigated engineering undergraduates in a university in a developing country. When literature does not provide sufficient knowledge on users from different study disciplines such as engineering and different region/country contexts, it limits the advancement of knowledge and the understanding of the applicability of Western-based methodologies in other parts of the world. Therefore, our study is novel and contributes to the existing literature

Fourth, we used two different scales to evaluate IL-information skills scale and information behaviour scale. The literature supports the use of the self-assessment method and reveals that self-reported

measurement scales are as reliable and valid as IL test scores (Gustavson and Nall, 2011, p 299). Although the items in these two scales correspond to similar IL areas (IL components), the two scales measured two different things. The information skills scale measures the perceived level of possession of IL whereas the information behaviour scale measures the perceived level of general competence achieved. In this regard, Bandura (1977) makes a differentiation between the possession of skills and the confidence in the use of the skills. The latter known as self-efficacy is identified as a belief in one's capabilities to successfully organize and execute a particular behaviour or task (Bandura, 1997). Bandura (1977) states that the possession of necessary skills alone is not sufficient to attain success but also confidence in the use of the skills is required. Therefore, by using these two scales we evaluated both possession of and confidence in the use of IL skills. The empirical research that investigated both these aspects in a single study is very rare or none exist in the IL literature.

Fifth, we investigated whether socio-demographic characteristics predict IL skills. In doing so, we investigated characteristics commonly used in the literature. We found these age and sex hada significant influence on information skills of applying information and on the information behaviour of information management, organization and planning, and capacity for analysis and synthesis. The previous studies do not provide conclusive evidence of the influence of demographic characteristics on IL. For example, Whitmire (2001) did not report any sex effect on IL. Overall, by incorporating individual and family-related characteristics, we extended the existing literature and provided new insights for academics, researchers, and policymakers.

### *Implications of the findings for practice*

It was observed that the majority of fourth-year students (76%) suggesting to have IL instruction compared to 60% of the first-year students. This implies that fourth-year students felt the need of developing skills and knowledge on IL more than their first-year counterparts. This suggests that IL instruction can introduce at all levels if incorporated into the undergraduate degree programme content.

Second, the findings on undergraduate users and their possession and confidence in IL are the basis for the development of user-centric library services. The findings of users' IL are important in reaching out to undergraduates from different disciplines, like engineering, and making adjustments to library services to better serve respective undergraduate cohorts.

Third, as a userstudy, the findings showeddimensions of the possession of and confidence in IL, which help to identify strengths and weaknesses that affect the academic performance of students. The ultimate purpose of such userstudies is to make libraries propose measures to make students more information literate. We believe our findings also help in this direction by introducing teaching and learning outcomes for IL in the university community.

Finally, in connection to the above, designing and delivering curriculum-based IL instruction for undergraduates to learn practice, and refine their skills and to develop confidence in the use are goals endorsed by international and national bodies, adopted by universities, and implemented by libraries and faculty at the degree propgramme level in the West (see Flierl et al., 2020). However, in developing countries, the importance of IL has yet to take hold. In Sri Lanka, IL strategies, standards, policy guidelines, and models for IL instruction do not exist at either national or university levels that explicitly emphasize IL. Sri Lankan universities face challenges in providing IL systematically due to lack of guidance, shortage of funds for information sources, and technological support.

## Conclusion

We investigated two undergraduate cohorts- first-year and fourth-year - on their possession and confidence in the use of IL and improvements over the course of a degree. Some improvements are visible over the degree programme. Still, mean values for the possession of skills and confidence in the use of each IL dimension seem insufficient. Irrespective of their level of study both cohorts showed a willingness to undergo formal IL instruction if they were provided. Since IL is a requirement for survival and success during the university programme and beyond throughout their lives, the findings made novel contributions to the existing literature and provided implications for practice, as discussed in detail in the above sections. Therefore, while this study was conducted in Sri Lanka, the findings have applicability to many contexts worldwide and will be useful for various stakeholder groups such as researchers, academics, librarians, and policymakers.

## Limitations and future research

When proper instruction and evaluation of IL does not occur, this type of research studyis needed to understand IL skill development over an undergraduate degree programme. However, our study was not designed as a longitudinal study where the same set of first-year undergraduates answered the survey during their finalyear. This is one of the limitations of the study. In this regard, Clark and Catts (2007) suggest that due to the requirements of immediate information for decision-making two separate cohorts may need to be studied for comparison. Still, we believe that the findings may have provided some sense of whether undergraduates develop IL over a degree programme in the absence of IL instruction. Future research could design longitudinal studies to evaluate improvements in IL over the degree programme. Second, our study is confined to one study discipline, i.e., engineering. Future research could increase the scope by incorporating different disciplines. In this regard, Catts (2005) suggests that students from different disciplines use information differently. Hence, it is possible to find variations in the development of IL over a degree programme in terms of study discipline.

Third, some previous research suggests that different populations could have different views of students' IL, such as undergraduates, faculty members, and librarians (see DaCosta, 2010; Williams and Wavell, 2007). We investigated the views of students. Future studies could investigate aspects such as the value faculty place on IL and views on having IL as part of curricular. The librarians could be investigated to obtain data on their experiences of working with faculty and faculty members' willingness to incorporate IL into learning outcomes of the degree programme/courses. Therefore, future studies can triangulate the data. Fourth, both student cohorts showed a willingness to attend IL instruction. Future research could investigate whether undergraduates' instructional preferences vary by the dimensions of IL. Fifth, further research could investigate whether instructional preferences vary according to individual and family characteristics. Sixth, by investigating first- and fourth-year cohorts we investigated IL from the universities' point of view. The literature on IL emphasises the need of conceptualising it from a workplace point of view. Although we investigated final-your undergraduates, the scope of the study does not allow us to investigate how far final-year students perceive IL for their future success, or whether they perceive their IL capabilities can be transferable to the workplace and other contexts beyond university education. Future research could incorporate these areas.

**References**

[1.] American Library Association (ALA) (1989). *Presidential Committee on Information Literacy. Final Report*. Chicago, IL: American Library Association. Available at: http:// www.ala.org/acrl/publications/whitepapers/presi dential (accessed April 2020).

[2.] Bandura, A. (1977), "Self-efficacy: toward a unifying theory of behavior change", *Psychological Review*, Vol. 84, pp. 191-215.

[3.] Barrie, S. (2007). A conceptual framework for the teaching and learning of generic graduate attributes. *Studies in Higher Education, 32*(4), 439-458.

[4.] Catts, R. (2005). *Information Skills Survey - Technical Manual First Edition.* Council of Australian University Librarians, Canberra, Australia.

[5.] Catts, R., & Lau, J. (2008). Towards Information Literacy Indicators, UNESCO: Paris.

[6.] Clark, C., & Catts, R. (2007). Information Skills Survey: Its Application to a Medical Course. *Evidence-Based Library and Information Practice*, 2(3), 3-26.

[7.] DaCosta, J. W. (2010). Is there an information literacy skills gap to be bridged? An examination of faculty perceptions and activities relating to information literacy in the United States and England, *College & Research Libraries*, May, 203- 222.

[8.] de Arenas, J. L., RodrÍguez, J. V., Gómez, J. A., & Arenas, M. (2004). Information literacy: Implications for Mexican and Spanish university students. *Library Review*, 53(9), 451-460.

[9.] Flierl, M., Fundator, R., Reed, J., McGowan, B., Cai, C., &Maybee, C. (2020). Training the trainer to embed IL into curricula: Results from an action research project. *Journal of Information Literacy*, 14(1), 3–18.

[10.] Folk, A. L. (2014). How well are we preparing them? An assessment of first-year library student assistants' information literacy skills. *College & Undergraduate Libraries*, 21(2), 177-192.

[11.] Gabridge, T., Gaskell, M., & Stout, A. (2008). Information seeking through students' eyes: The MIT photo diary study. *College & Research Libraries* 69(6): 510–522.

[12.] Gustavson, A., &Nall, H. C. (2011). Freshman overconfidence and library research skills: A troubling relationship? *College & Undergraduate Libraries*, 18(4), 291.

[13.] Latham, D. and Gross, M. (2013). Instructional preferences of first-year college students with below- proficient information literacy skills: A focus group study, *College & Research Libraries*, September, 430-449.

[14.] Lloyd, A. & Williamson, K. (2008). Towards an understanding of information literacy in context: Implications for research. *Journal of Librarianship and Information Science*, 40 (1), 3 -12.

[15.] Lwehabura, M. J. F. (2016). An assessment of information literacy skills among first-year postgraduate students at Sokoine University of Agriculture Tanzania. *Journal of Librarianship and Information Science*, September, 1–8, DOI: 10.1177/0961000616667802

[16.] Petermanec, Z., &Šebjan, U. (2017). Petermanec, Z., &Šebjan, U. (2017). Evaluation components of information literacy in undergraduate students in Slovenia: An experimental study. *Library & Information Science Research*, 39, 69–75.

[17.] Pinto, M., & Sales, D. (2007). A research case study for user-centred information literacy instruction: Information behaviour of translation trainees, *Journal of Information Science*, 33(5), 531–550.

[18.] Price, R., Becker, K., Clark, L., & Collins, S. (2011). Embedding information literacy in a first-year business undergraduate course, *Studies in Higher Education*, 36(6), 705-718.

[19.] Russell P (2009) Why universities need information literacy now more than ever. *Feliciter*55(3): 92–94.

[20.] Seamans, N. S. (2002). Student perceptions of information literacy: Insights for librarians. *Reference Services Review*. 30(2), 112 – 123.

[21.] Society of College, National and University Libraries (SCONUL). *Learning Outcomes and Information Literacy*. Newport, Wales: SCONUL, 2004

[22.] UNESCO (2003) *The Prague Declaration: Towards Information Literate Society*. Available at: http://portal.unesco.org/ci/en/ev.php (accessed August 2015).

[23.] Webber, S. and Johnson, B. (2000). Conceptions of information literacy: new perspectives and implications, *Journal of Information Science* 26(6), 381-397.

[24.] Whitmire, E. (2001). Factors influencing undergraduates' self-reported satisfaction with their information literacy skills. *Portal: Libraries and the Academy*, 1(4), 409–420.

[25.] Williams, D. A., & Wavell, C. (2007). Secondary school teachers' conceptions of student information literacy. *Journal of Librarianship and Information Science*, 39, 199-212.

[26.] Wilson, T.D. (1981). On user studies and information needs, *Journal of Documentation*, 37(1) 3–15.

[27.] Yager, Z., Salisbury, F. and Kirkman, L. (2013). Assessment of information literacy skills among first year students. *The International Journal of the First Year in Higher Education*, 4(1), 59-71.

**Appendix 1. Item measures of the scales**

| Information skills scale (Clark and Catts, 2007) | Information behavior scale (Pinto and Sales, 2007) |
|---|---|

| | |
|---|---|
| *Access needed information:*<br>I use a combination of search tools including library catalogues and web search engines.<br>I have a system for searching for information on a subject.<br>If my search returns too much irrelevant information, I change my keywords.<br>I decide how best to find the information I require for a particular task. | *Computer literacy:*<br>Ability to use the computer as a work tool<br>Familiarity with the library's website<br>Knowledge of how to access specific internet resources<br>Access to user training in information search techniques |
| *Evaluate information and information sources:*<br>I critically evaluate each information source I use.<br>I evaluate the information I read for accuracy and relevance.<br>In selecting information, I evaluate the quality of the information.<br>I revise my search plan and strategy if I need to gather more information or data | *Capacity for analysis and synthesis:*<br>Ability to analyse and synthesize information<br>Knowledge and application of reading and highlighting techniques<br>Ability to summarize information and present it in a succinct fashion<br>Ability to take notes in class in an effective fashion<br>Ability to summarize information from multiple sources |
| *Manage information:*<br>I have a system that helps me to organize the information I need.<br>I keep accurate details of everything I read.<br>When I make notes about the information I am reading, I include the author and title.<br>I develop a system to keep track of the information I find and its sources. | *Information management:*<br>Proper documentation of one's work<br>Ability to organize one's information system<br>Use of the library for information search<br>Library science skills for orienting information need<br>Use of encyclopedias, dictionaries, and databases to locate concrete information<br>Ability to evaluate information from any medium or support<br>Ability to present one's knowledge |
| *Apply information:*<br>When I get a new idea, I work out how to explain it effectively.<br>I present the information in a medium that suits the audience.<br>When I present the information I have found, I state the key ideas in my own words.<br>I compare information as I'm reading with what I already know. | *Decision-making:*<br>Efficient decision-making skills |
| *Use information ethically, legally, and respectfully:*<br>I include the web pages that I referred to for my assignments in the reference list.<br>I am concerned about policies regarding plagiarism.<br>I need to keep re-learning because life is constantly changing.<br>I follow the instructions on the use of the intellectual property. | *Organization and planning:*<br>Ability to structure and draw up essays<br>Experience in group work<br>Familiarity with the policies existing in one's work context on publication and dissemination of information |