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Evaluation components of information literacy in undergraduate students in Slovenia: An experimental study

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1. Introduction

Alongside the right to universal access to information, the right to education, and the right to information literacy (IL), IL competencies are of key importance. New IL programs are constantly being developed to increase students' IL proficiency. To do so the complexity of the information behaviors associated with IL, including the cognitive, behavioral, cognitive and affective elements, must be considered (Bowles-Terry, 2012; Farrell, Goosney, & Hutchens, 2013; McClurg, Powelson, Lang, Aghajafari, & Edworthy, 2015; Walton & Hepworth, 2011). Mastery of IL competencies has tested by researchers longitudinally (e.g., the Strategies for Assessment of Inquiry Learning in Science [SAILS] project) in different ways, including using current information tools and testing IL proficiency before and after an IL certificate. Researchers such as Fain (2011); Farrell et al. (2013); Forys, Forys, Ford, and Dodd (2000); Kratochvíl (2013) and Lockhart (2015) have used a variety of different experimental approaches.

Although there are many international studies confirming higher levels of IL proficiency after a program is completed (Fox, Richter, & White, 1996; Tarrant, Dodgson, & Law, 2008; Verhey, 1999), such research has not yet been carried out in the Slovenian higher education system, where IL programs are not yet implemented. The choice of an appropriate IL program and the evaluation of its effects still present huge research challenges. Saunders' (2012) statement that educational institutions have not identified ways to integrate IL into the curriculum in a systematic way, or to move beyond individual courses to the program level, can also be identified as problems in Slovenia. Studying existing IL programs is important because it enables comparison of the influence of different programs in different environments. As a result, it also makes the implementation of programs in individual education systems, which are specific for each study environment, easier. A successful IL program is never finished. An IL program as a whole and its component modules must be constantly evaluated, reworked, updated, and tailored to user needs (Sonntag & Ohr, 1996). The traditional educational approach is systematically planned and guided and does not allow an integrated conceptual approach, which is crucial for IL. Weak general literacy is a result of failings in the educational system (Novljan, 2003; Novljan, 2005).

2. Problem statement

The main purpose of this study is to prepare an IL program for Slovenian higher education, based on IL models and programs in the world, and to test that program. The results are important for higher education policy in Slovenia, and for teachers and others who work in educational institutions, and who should be aware of the importance of IL and its effects on lifelong learning.

In a small country like Slovenia, educators in higher education strive for flexibility, universality, and quality (Špiranec, 2003; Špiranec, Toth, & Zorica, 2009). Slovenia pays 6.1% of its GDP for formal education, which is comparable to other countries, but the money is not efficiently used. IL is not explicitly mentioned as a goal of higher education policies, it is not part of university curricula, and professors do not trust librarians' pedagogical expertise. IL is left to the initiative of individual teachers, and therefore no reliable statistics on how it is taught exist. Only 20% of academic libraries in Slovenia teach IL, while 80% provide bibliographic instruction. Educational initiatives and teaching methods are more or less left to librarians. Only five out of 52 libraries confirmed that such education is a part of mandatory education for faculty; and only one faculty awards European Credit Transfer and Accumulation System (ECTS) points for this kind of education. Also, there are more modules designed for undergraduate than for postgraduate students. Evaluation of the quality of courses and testing of gained knowledge are extremely rare. Both academic management personnel and financiers are unaware of the importance of courses and evaluation of knowledge regarding education initiatives such as IL.

Guidelines for IL in central and south Europe, including Slovenia (Stopar & Rabzelj, 2006), do exist, but on national levels there are no strategies, standards, or educational policies which explicitly include IL. Most universities do not teach IL systematically. The shortage of IL specialists, money for information sources, and technological support

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only gets worse each year because of the financial situation in these countries (Basili, 2003). Slovenia, for example, does not have a national policy, vision, or special financial source for IL. A handful of professors are aware of the importance of IL and in their opinion education resulting in information literate students is a global as well as national responsibility. Unfortunately, this is not enough for formal implementation of IL into the Slovenian higher education system. Slovenian higher education, therefore, is lacking regarding IL. Smith (2013) suggested that the current curricular mandates are insufficient to ensure that IL is incorporated into instruction, and also teachers are ill-prepared to instruct in IL effectively.

Many students can only express their information needs poorly, cannot evaluate information, and have difficulties with research hypotheses. They are familiar with the basics of copyright, but rarely use them in source management (Godec, Jug, & Kotar, 2006; Petermanec & Pejova, 2005). Similarly, many librarians receive insufficient support from their institutions, and so must educate their users voluntarily. There are only a few academic libraries in Slovenia that actively participate in the pedagogical process. IL provision is neither coordinated nor systematic and is largely based on traditional patterns and individual initiative.

Most Slovenian higher education institutions do not include IL in their study programs, which can have important negative consequences for the quality of students'' competencies. These consequences include poor quality written work, low level use of appropriate databases for searching for resources, and poor knowledge of resources available and their ethical use. The basic problem is the lack of awareness of the positive effects of IL among higher education teachers and researchers.

While many IL researchers have studied the general level of students' IL (Bruce, 2008; Huvila, 2011; Kaplowitz, 2014), they have rarely combined that research with examination of IL programs and measurements of the success of their results. This study focuses on a suggested IL program and how it was tested within the Slovenian higher education system. The research questions are

RQ1. Can the IL program improve students' proficiency in individual IL components?
RQ2. Does the level of IL proficiency in individual IL components differ before and after the completion of the IL program?
RQ3. Which IL competence did the students determine to be the most difficult and which needs future improvement?

3. Literature review

IL is a strategy that will improve the study habits of every student in any discipline and guide him or her in lifelong learning (Snavely & Cooper, 1997). The main purpose of modern IL education is to achieve functional literacy using information and communication technology. This is an important step toward the understanding of the concept of IL (Bawden, 2001; Behrens, 1994; Doyle, 1992). The IL standards developed by the Association of College and Research Libraries ([ACRL], 2000) make it clear that the mission of IL must be coordinated with the mission of the home institution. This document clearly defines the input and expected results, and establishes a basis for lifelong learning.

IL program planning is based on past knowledge and experience. It considers planning of IT development and library services development. It defines contents, programs and courses for IL teaching. It considers different study levels and it actively integrates different partners, including students, teachers, librarians, and IT specialists, who exchange their teaching and evaluating experiences and are constantly involved in the process of further education. Their work is constantly evaluated. A faculty supports IL if it provides financial means and cooperation of participants in the process of IL. This cooperation must be a priority of the entire institution and not only of its library (Kasowitz-Scheer & Pasqualoni, 2002).

IL stresses student-oriented learning and enhances the likelihood of an upgrade in student learning and information proficiency throughout the whole study period. Good IL programs can also help provide a competitive advantage for academic institutions, for their graduates are better qualified for future employment. Such programs must be prepared on the basis of a student needs analysis. It is also important to ask the following questions while preparing IL programs: Why do students need to find information? How can they find information? What do they have to know to use information successfully (Kardoš, 2002)?

According to most established models and standards, such as Bruce (1997), the Big6 (Eisenberg, Lowe, & Spitzer, 2004) and the ACRL standards, the important IL components are as follows: acknowledgment or awareness of information needs, including searching for and access to information; evaluation and use or application of information; and expertise regarding the rules and ethical norms for the use of information. Among these components, Lenox and Walker (1993) emphasize the analytical and critical competencies while formulating a research question, and the evaluation of search results. An information literate person must have analytical and critical competencies so she or he can formulate a research question, evaluate the results, and search for different ways to access various types of information that will satisfy information needs.

IL competencies are present when an individual has the ability to use knowledge for the successful and efficient completion of a certain task or job. The individual abilities of an person possessing the competencies of IL include knowledge, talents, skills, personal and behavioral characteristics, concepts, beliefs, values, and self-image. All those abilities help to guarantee professional or personal success.

Several studies have shown the importance of search, retrieval, interpretation, and understanding, which play a central role in the acquisition of information seeking skills. The ability to effectively search for and evaluate information has the potential to help students better understand the nature of science and scientific knowledge (Gross & Latham, 2009; Julien & Barker, 2009).

Studies suggest that the implementation of IL programs contributes significantly to students' use of bibliographic databases and journal literature, and have a positive impact on the development of different dimensions of their information literacy (Chu, Tse, & Chow, 2011; Jacobs, Rosenfeld, & Haber, 2003; Verhey, 1999). Students who were involved in a course with consistent inclusion of a substantive information literacy-related assignment tended to rate the effectiveness, importance, and impacts of information literacy instruction, and their own information literacy skills higher than those in a course with an inconsistent level of engagement with information literacy (Kim & Shumaker, 2015). Fox et al. (1996) demonstrated that students benefit from IL programs, developing information literacy skills and the confidence needed to use those skills. Cooperation between academic librarians and professors in different fields can create conditions for the improvement of those IL competencies which are beneficial to students. Brown and Krumhol (2002) implemented the ACRL standards to determine students' IL proficiency and found an 11% increase in information literacy, but no significant improvement in the students' abilities to present, critique, and discuss information. Tarrant et al. (2008) tested IL proficiency before and after an IL program and concluded that prior to commencing the program, students reported low information literacy and writing skills, especially in accessing and searching electronic databases and using referencing formats. Post-test evaluation of skills showed substantial and statistically significant increases in all assessed competencies. The findings of one recent study indicated that students lacked the IL proficiency required to succeed in the post-secondary educational environment and libraries were not prepared to effectively address this gap (Smith, Given, Julien, Ouellette, & DeLong, 2013).

Table 1
Descriptive statistics and correlation matrix.

Information literacy essential elements	M_i Initial testing	SD_i	M_f Final testing	SD_f	1	2	3	4
1. Knowledge	10.8	3.79	22.1	6.84	–			
2. Search	15.3	4.36	23.5	6.05	0.602*	–		
3. Evaluation	2.9	1.20	4.0	1.23	0.412*	0.225*	–	
4. Use of information	3.7	2.06	6.1	2,53	0.596*	0.385*	0.322*	–

Note: M_i (mean for initial testing), M_f (mean for final testing), SD_i (standard deviation for initial testing), SD_f (standard deviation for final testing).
* $p < 0.01$.

4. Methodology

4.1. Participants and procedures

The study included 197 regular undergraduate students who were enrolled in the second year of the university program in economics. The execution time of the study, which began in the study year 2007/2008, was important for it is related to the students' final success and their final grades at graduation. The study continued throughout 2013, when all of these students were finishing their studies. A total of 153 students participated in both the initial and the final tests.

Two groups were formed in order to carry out the study, the experimental group (EG) and the control group (CG). Students were assigned randomly to one or the other group. The level of information literacy in both groups was evaluated before the experiment. The experiment was carried out as part of the course "Basics of Marketing" at the University of Maribor Faculty of Economics and Business during 26 regular teaching hours (20 lessons of executed IL program, 2 introductory lessons about the experiment, and IL testing at the beginning and the end of the experiment) over 13 class meetings. The control group attended lectures on marketing as part of the regular study process. The experimental group also took part in the IL introductory course. Students were not aware that the test at the end of the IL program would be the same as the test at the beginning. Only the tests of participants who took the test twice were counted. Both test forms were marked with student codes, which consisted of the group mark (EG, CG), the mark I (initial) and F (final) and the student's matriculation number. The tests were carried out in both groups before the beginning of the information literacy training program and after its end. Each test was taken individually and interactively (each student at his or her own computer with access to the web-based OPAC called COBISS, the Internet, and e-resources accessible through the university).

The test consisted of 40 questions, which covered four components of IL:

- Theoretical knowledge, covering characteristics of business and economic literature, understanding the importance of economic journals and their methods of information dissemination, understanding the systematic organization of information, formulating a clearly focused question for problem solving, grasping the structure, methodology and functioning of scientific work, knowing the modalities of critical appraisal of scientific papers, and being aware of available databases.
- Search, covering understanding effective searching techniques and how to find high-quality evidence-based information.
- Evaluation, covering being able to recognize credible sources of business information and understand the importance of different bibliometric indicators.
- Use of information, covering prudent use of information for the benefit of students and others and assessment of its ethical use, knowledge of how to choose the right library type and the appropriate resources, use of various presentation techniques, and use of references and citation tools.

These were close-ended questions with a possible supplemental (descriptive) answer. The part on theoretical knowledge included 18 questions testing knowledge about information, knowledge, science, communication, IT, and databases; for example, "You found a book on your research question. Which chapter would you use to find other documents on the same topic: a) dictionary, b) index, c) bibliography, d) contents, e) other, f) I don't know". The part on searching had 14 questions, such as "If you want to find articles from journals on service marketing, will you search: a) OPAC, b) specialized databases, c) Internet, d) printed or online journals in a library, e) other, f) I don't know". Two questions addressed evaluation; one was "Which criteria for sources selections would you use if you found 100 and needed only 20? a) publication year, b) source extent, c) language, d) authors/co-authors, e) value of the source, f) nothing from the above, g) I don't know". Five questions applied to the use of information; for example, "Cite the following article correctly. TI = The effect of customer satisfaction on consumer spending growth AU = C. Fornell, R.T. Rust, M.G. Dekimpe Vol. 47. No. 1 pp. 28–35. Source: Journal of Marketing Research ISSN 1547-7193. Year: 2010". In this way all four components of comprehensive information literacy were included.

The points for individual questions ranged from 1 to 5, based on the difficulty and length of possible answers. Before grading the frequency of correct answers was checked to determine the difficulty of a question. The maximum number of points was 100 for 40 questions. The grading of individual questions was preliminarily recommended by three IL experts. The results were standardized, the average number of points for each individual part was calculated by dividing the number of all possible points for each individual part and then multiplying by 100. In this way the average number of points achieved by each student in a specific part of the test was calculated. This enabled the comparison of students' proficiency in specific fields. Students could get the following number of points:

- For the theory part a student could get a maximum of 40 points for 18 correct answers;
- For the search part a student could get maximum of 40 points for 14 correct answers;
- For the evaluation part a student could get maximum of 7 points for 2 correct answers;
- For the use part a student could get maximum of 13 points for 5 correct answers.

4.2. Instruments

This study was based on an IL program with components defined by the ACRL standard (2000). The efficiency of the IL program was checked using the quantitative techniques of the instrument developed by Tovote (2004), which was adapted for the needs of Slovenian students

Table 2
Difference between experimental group and control group in final and initial testing.

Testing of information literacy	Levene's test p-value	t	df	p-Value	Mean difference	Standard error difference
Final testing	0.146	−12.630	151	0.000	−22.648	1.793
Initial testing	0.600	2.217	151	0.028	3.287	1.482

and verified by the IL test results. The contents of the questionnaire were adapted to accord with the academic content, literacy sources, and databases which are available to Slovenian students. In designing the individual components, the researchers considered the dimensions of IL as defined by Cheetham and Chivers (2005), Gawith (2000), and Selfe (1999): cognitive competency, which means possession of appropriate study-related knowledge of IL and the ability to put this to effective use (theoretical knowledge, evaluation); technological literacy, which refers to activities that involve reading, writing, and communicating within a computer-based environment (use of information and ICT competencies); and library literacy (search). The contents of the initial and the final test were identical, although the students were not aware of this.

The following hypotheses were tested:

H1. Introduction of an information literacy program improves the level of IL among students.

H1a. There are significant differences in the initial and final testing of students that achieved levels of IL between EG (Experimental group) and CG (Control group).

H1b. There are significant differences between EG and CG in final testing of individual IL components.

H1c. There are significant differences in achieved level of individual IL components between the initial and final testing of students in the EG.

4.3. Analysis

The research analysis was conducted in two phases. The first phase included descriptive statistics. The data were presented at a nominal level with frequencies in percentages; at the interval level (points of the test) the effects of the experiment were checked. The second phase included the identification of differences between the groups (CG and EG) and between the initial and final tests. For the determination of differences, a *t*-test was used to analyze average values of statistical significance on the level $p < 0.05$, and Levene's test for equality of variance and correlation with statistical significance on the level $p < 0.05$ for dependent samples (Field, 2009). SPSS 21 was used to process the data.

5. Findings

5.1. Descriptive statistics

Table 1 summarizes the average number of points achieved in the total sample surveys for individual components of information literacy. Table 2 shows that students achieved the best test results in the field of searching ($M_i = 15.3$, $SD_i = 4.36$; $M_f = 23.5$, $SD_f = 6.05$), followed by the field of knowledge ($M_i = 10.8$, $SD_i = 3.79$; $M_f = 22.1$, $SD_f = 6.84$) and use of information ($M_i = 3.7$, $SD_i = 2.06$; $M_f = 6.1$, $SD_f = 2.53$). The students achieved the lowest number of points in the field of evaluation ($M_i = 2.9$, $SD_i = 1.20$; $M_f = 4.0$, $SD_f = 1.23$). The correlation matrix in Table 2 indicates a medium strong correlation between knowledge and searching ($r = 0.602$, $p < 0.01$), and between knowledge and use of information ($r = 0.596$, $p < 0.01$). At the same time, a weak statistically significant link between evaluation and searching ($r = 0.225$, $p < 0.01$) was found, and between the use of information and evaluation ($r = 0.322$, $p < 0.01$).

5.2. Hypothesis testing

Table 2 shows statistically significant differences between the initial and final tests in the EG and CG. The results show that the initial level of information literacy achievement was very low in both research groups.

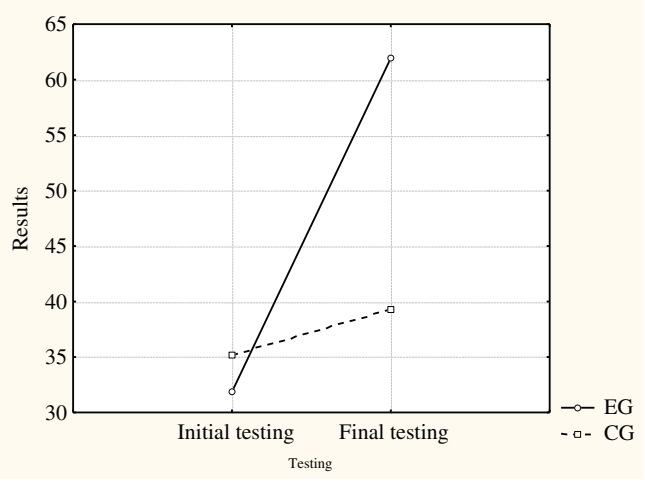

Fig. 1. Average results of the knowledge test for the experimental group (EG) and the control group (CG).

The *t*-test for two independent sample at a statistically significant level of $p < 0.001$showed that EG students in the final test performed significantly better ($M_{EG} = 61.9 \pm SD_{EG} = 10.6$) than CG students ($M_{CG} = 39.3 \pm SD_{CG} = 7.6$). This suggests that the information literacy program achieved its intention of raising the achieved results of the information literacy test in EG. A small statistically significant difference between EG ($M_{EG} = 31.9 \pm SD_{EG} = 8.4$) and CG ($M_{CG} = 35.1 \pm SD_{CG} = 7.5$) in the initial test of information literacy at the level of $p < 0.05$ was detected. This difference in favour of CG was formed randomly because of variance in motivation or prior knowledge of students who were enrolled in each group (Fig. 1).

Statistically significant differences between the results of the initial and final testing of IL for EG and CG students (Table 3) were also evaluated. Significant differences at the level of $p < 0.001$were found in mastering IL in EG and CG. Students in EG achieved significantly lower results in initial testing ($M_i = 31.9 \pm SD_i = 8.4$) than in testing after completion of the IL program ($M_f = 61.9 \pm SD_f = 10.6$).

Statistically significant differences between the initial and final tests of IL were also detected in the CG at the level of $p < 0.001$; scores were significantly lower in comparison with the students of EG. The CG students achieved mediocre results in the initial IL tests in the range $M_i = 35.1 \pm SD_i = 7.5$. The average results of the final IL tests were in the range of $M_f = 39.3 \pm SD_f = 7.6$. Based on these results, the hypothesis H1a, which predicted that there would be statistically significant differences in the initial and final IL testing on the attained level of IL between EG and CG was confirmed.

The summarized results of the study show a significant increase in IL proficiency upon completion of the program. The average results of the initial IL testing are $M_i = 31.9$, and $M_f = 61.9$ of the final testing. The IL proficiency level was significantly higher after the program and the students reached the 60% that represents the minimal criteria for passing an exam by the faculty. Similar progress was also determined in other studies (Gawalt & Adams, 2011).

Table 3
Difference between final and initial testing for control group (CG) and experimental group (EG).

Group of testing	*M*	*SD*	*t*	*df*	*p*-Value	Standard error mean
CG	−4.155	6.51	−4.137	41	0.000	1.004
EG	−30.090	10.11	−31.370	110	0.000	0.959

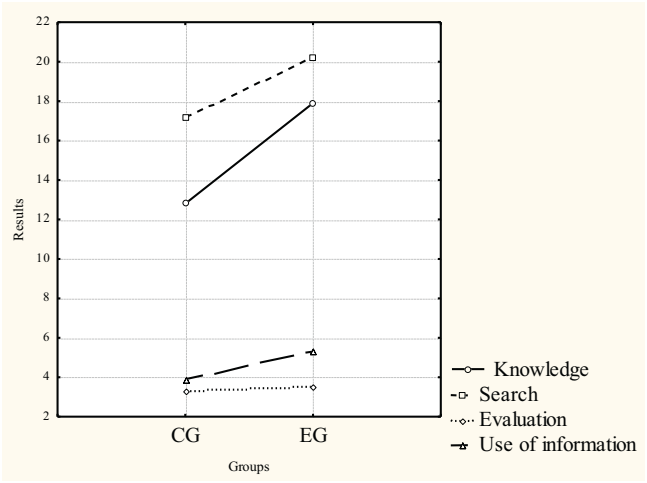

Fig. 2. Average results of the knowledge test of information literacy components for the experimental group (EG) and the control group (CG).

As a third level of analysis, the possible existence of statistically significant differences between EG and CG in the final testing of individual IL components was examined. Both groups of students had the greatest difficulty with evaluation and use of information (Fig. 2). The best results were achieved in the component of students' theoretical knowledge and information search. Table 4 shows that there were statistically significant differences ($p < 0.001$) between CG and EG in the final IL testing in three components of information literacy: knowledge, searching, and use of information. Statistically significant differences between EG ($M_e = 3.5 \pm SD_e = 0.9$) and CG ($M_e = 3.3 \pm SD_e = 1.1$) in final testing of the evaluation component were not found ($p = 0.526$). Students of EG achieved an average result $M_{s.} = 20.2 \pm SD_s = 3.9$ in the searching component, and students of CG achieved $M_{s.} = 17.2 \pm SD_s = 3.3$. In the use of information component, the students in EG achieved an average score of $M_u = 5.3 \pm SD_u = 1.7$, whereas the students of CG achieved $M_u = 3.9 \pm SD_u = 1.6$. In the knowledge component, the EG students achieved an average score of $M_k = 17.9 \pm SD_k = 3.7$, and the CG students $M_k = 12.8 \pm SD_k = 3.3$.

The results of the study confirmed the second hypothesis H1b, since statistically significant differences between EG and CG in the final IL testing were found only in components of knowledge, search of information, and use of information, and not in the component of evaluation.

The fourth stage of analysis verified the existence of statistically significant differences between the initial ($M_i \pm SD_i$) and final testing ($M_f \pm SD_f$) only for the students of EG regarding the achieved average performance of individual IL components. In all IL components there were statistically significant differences between initial and final testing at the level of $p < 0.001$ in the EG (see Table 5). Fig. 3 presents the largest range in achieved average scores between initial and final testing of two IL components, knowledge ($M_i = 10.5 \pm SD_i = 3.9$; $M_f = 25.2 \pm SD_f = 4.8$; $\Delta M_k = +14.7$; $r_k = 0.420$), and searching ($M_i = 14.8 \pm SD_i = 4.4$; $M_f = 25.7 \pm SD_f = 5.2$; $\Delta M_s = +10.9$; $r_s = 0.338$), in which correlation between the initial and final testing was statistically significant at $p < 0.001$ in both components.

Statistically significant differences at the level of $p < 0.01$ existed between the initial and final testing of IL for EG in evaluation ($M_i = 2.8 \pm SD_i = 1.2$; $M_f = 4.1 \pm SD_f = 1.2$; $\Delta M_e = +1.3$; $r_e = 0.272$) and use of information ($M_i = 3.7 \pm SD_i = 2.1$; $M_f = 6.9 \pm SD_f = 2.3$; $\Delta M_u = +3.2$; $r_u = 0.266$), but the differences were smaller. The results confirm the hypothesis H1c: There are statistically significant differences between the results of the initial and final testing of all components of information literacy in the EG group.

6. Discussion

The results confirm that at the initial stage of the IL program, students had little knowledge of how to manage IL tasks. The two groups (control and experimental) initially demonstrated only one third of all possible competencies that would be expected in any information literate student. After the experiment, there was evident progress in IL proficiency among students from the experimental group. The greatest progress was seen in the theoretical knowledge that is a precondition for a systematic approach to solving scholarly information problems. The results before and after the course were relatively similar in the control group, without distinct difference in the second test. The results for the experimental group were very different. While the highest increase in the experimental group was achieved in theoretical knowledge, the lowest was found in evaluation of information. Both groups performed best in using the Internet, Internet browsers, and library catalogues (OPAC). This was followed by improved skills in searching for information. The belief that declarative and procedural knowledge is easier to attain than conceptual knowledge was also confirmed. Students showed the least progress in the ability to evaluate information, which is understandable, because not enough attention was paid to this difficult and complex task (only four hours). The level of knowledge measured was lowest in "Strategic knowledge" (why and for what to use the obtained information) and how to integrate it into the research.

Students in the EG had difficulties finding relevant information in the mass of information while they were solving their problems. Almost all of them rated this procedure as difficult. This can be attributed to the complexity of this area, to which too little attention is paid within the 20 h of the introductory course. Most IL experts believe that how information is obtained matters less than knowing how to analytically select and integrate the information into existing knowledge and use it in new situations (Biggs, 1999; Limberg & Sundin, 2006). Students are aware of the difficulty of the problem; therefore, educators should pay more attention to the criteria for evaluation of resources, understanding, integration, and critical thinking. Despite the insufficient number of hours that were spent in examining meaningful use of information, in the second test the experimental group found this task easier than in the first. Students in the control group considered the logical use of information to be an easier task than searching for information. The control group had the most problems with search tasks in the final test.

Evaluation and use of information are the most important IL components that students in higher education need. There are approaches and methods suitable for different learning styles that encourage students' critical thinking and their responses. They build on students' existing knowledge and on their current real life problems. When searching for information, students must be familiar with the entire bibliographical

Table 4
Difference between experimental group and control group in results of testing elements.

Components of testing IL	*t*	*df*	*p-Value*	Mean difference	Standard error difference
Knowledge	−7.891	149	0.000	−5.090	0.645
Search for information	−4.496	151	0.000	−3.066	0.682
Evaluation information	−0.636	151	0.526	−0.114	0.179
Use of information	−4.576	151	0.000	−1.421	0.311

Table 5
Difference between final and initial testing of IL elements for experimental group.

Components of testing IL	*M*	*SD*	*t*	*df*	*p*-Value	Standard error mean
Knowledge	−14.688	4.72	−32.467	108	0.000	0.452
Search for information	−10.946	5.56	−20.724	110	0.000	0.528
Evaluation information	−1.279	1.47	−9.195	110	0.000	0.139
Use of information	−3.266	2.66	−12.926	110	0.000	0.253

apparatus. It is also important to understand the learning process, research, and its results (Bruce, 1997).

The findings regarding the difficulty of learning IL components fully correspond to results found in the professional literature (e.g. Bruce, 1994, 1997; Bruce, Chesterton, & Grimison, 2002; Eisenberg et al., 2004). The fact that students in the experimental IL program achieved a higher level of IL presents a strong argument for implementation in higher education curricula for the same number of hours designated for regular professional subjects. An IL program can improve students' IL proficiency, mostly as a result of teaching contents (qualitative variables), the use of different teaching tools (IT), and different teaching methods (lectures, exercises and cases). IL should be a planned, continuous process, starting in the primary school library, continuing in secondary education, and implemented in curricula in higher levels of education. Information literacy is essential to the research process. It strengthens academic success, and information literate graduates will have better opportunities finding jobs.

Academic libraries are ideal starting points for students and teachers who want to improve their information literacy proficiency. More libraries, and especially those are styled as learning resources centers, are beginning to take the initiative in the implementation of IL. This would be more successful if it were part of the broader mandate of higher education institutions, planned and coordinated with content-based courses. It is cheaper and more effective to teach IL skills in groups rather than informing individual users of the library. Educating users in how to use databases helps justify the high costs of new acquisitions and interlibrary loans. Bundy (1999) believes that libraries are the umbrella institutions of the learning society, because of the resources they offer and because of their conscientiousness, knowledge, and the motivation of their staff.

The most important challenge that librarians face is convincing university administrators, who decide on the content and scope of study materials and on teaching forms and methods, of the importance of IL. It is also important that they change the current opinion of what a library can actually contribute to the educational and research process.

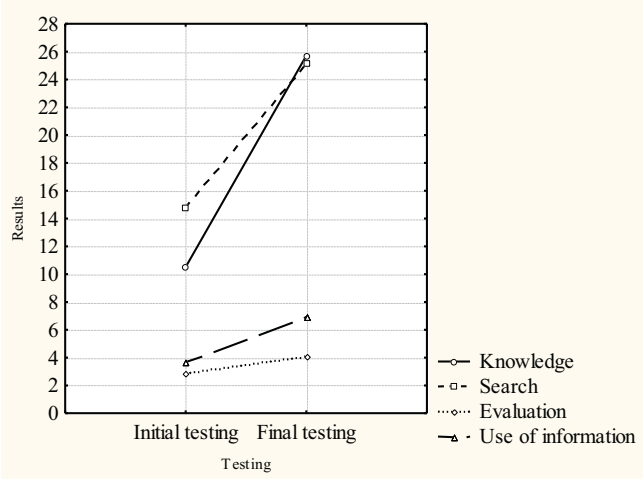

Fig. 3. Average results of the knowledge test of information literacy elements for the experimental group.

A longitudinal study could verify the impact of gained IL competencies on students' overall academic success at the end of their studies. Such a study could propose verification of the degree of mastering IL components among students in the same discipline in different countries. It could develop additional components for the IL program, which would be verified by experimental study. It could propose the implementation of experimental studies with different pedagogical approaches to stimulate more interest in IL by students and faculty. In the future, such research could also create a conceptual model for the perception of the usefulness of IL technologies, based on the well-established technology acceptance model (TAM), and expanded with new external components.

7. Conclusion

Information literacy is a necessary skill in a modern information society, as it strengthens the effectiveness of academic research, and information literate graduates have better job opportunities. This study confirms that successful IL programs can improve students' management of IL components, student's written work, proficiency in using valid databases to search for necessary resources, and expertise regarding available resources. Results also suggest that more attention needs to be paid to the evaluation and appropriate use of information, which are the most complex components of IL and are the components in which students are the least proficient. IL programs have a positive effect on students' knowledge and skills. The results of this research highlight the need to introduce a well-designed and organized IL program into educational systems, from primary to higher education, conducted by trained teaching staff in cooperation with librarians. While this study was conducted in Slovenia, the findings apply to any country where IL needs improvement. Finally, it should be noted that IL proficiency also has a social dimension, as it has an impact on the intellectual and economic potential of a nation's young professionals.

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