Information Literacy Meets "Research 2.0": Exploring Developments in Croatian Academic Libraries

Sonja Špiranec
Department of Information Sciences, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia.
sspiran@ffzg.hr

Mihaela Banek Zorica
Department of Information Sciences, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia.
mbanek@ffzg.hr

Abstract: *Information literacy training for researchers should be determined by information needs of scholars and by reconfiguration of information environments. New research environments, which are a result of technological innovations initiated by Web 2.0, have the potential to change the very principles of science and research. In the paper the authors analyze the main features of research practices that rely on Web 2.0 tools and comment on re-conceptualizations of IL training for researchers that are a consequence of such "Research 2.0" transitions. The main idea behind IL re-conceptualizations is that libraries have to concentrate less on the traditional IL paradigm which focused heavily on resource discovery and especially on traditional library tools, while dealing more with evaluation, information management, authority issues and a range of new concerns brought about by Web 2.0. The paper presents a survey of the deployment of conceptual adaptations in IL in the context of Croatian academic libraries. The study showed that libraries concentrate on a relatively narrow subset of IL in the form of traditional library topics such as searching and finding sources in libraries and academic databases. The authors suggest that new approaches are needed to make IL sessions for researchers more relevant and truly meaningful.*

Keywords: *Information literacy, Web 2.0, academic libraries, Croatia, survey*

Introduction

Information literacy (IL) can be perceived as central to research and integral to the professional lives and careers of researchers. Information is the basic building block of research and can therefore influence the research process significantly. Information literate researchers will demonstrate awareness of how they gather, use, manage, synthesize and create information and data in an ethical manner and will have the information skills to do so effectively (SCONUL, 2011).

The information literacy concept has begun to spread as the result of a growing heterogeneity and complexity of information, information resources and information structures and has always been influenced and determined by features of information environments. With the appearance of Web 2.0, information environments became even more complex and unstructured, which poses new challenges for information literacy instruction aimed at researchers who have to cope with these complexities. In order to make IL sessions for researchers more relevant and compliant with "Science 2.0" or "Research 2.0", shifts in IL from traditional library-focused themes towards the inclusion of new issues and concepts are needed. In the remainder of this paper, the rationale and elements of such transformation will be considered and the results of a study of these issues in a national context presented.

Transformation of Research Landscapes: Research 2.0 and Science 2.0

There is no doubt that science has changed and metamorphosed through the use of information and communication technologies (ICT) and numerous authors have commented on this phenomenon (Nentwich, 2003; Van de Sompel et al., 2004; Arms & Larsen, 2007; Borgman, 2007; Waldrop, 2008; Odlyzko, 2009). However, deeper and more radical transformations that potentially may cause changing configurations of the principles of science and scholarly activities are a result of technological innovations initiated by the Web 2.0 (Waldrop, 2008; Luzon, 2009; Odlyzko, 2009; Procter et al., 2010; Lievrouw, 2011). Web 2.0 brings the promise of enabling researchers to create, annotate, review, re-use and represent information in new ways and of promoting innovations in scholarly communication practices – e.g. publishing work in progress and openly sharing research resources (Procter et al., 2010). In order to express these substantial changes the terms *Science 2.0* and *Research 2.0* were coined. The analysis of several

definitions shows that both terms refer to new approaches in research that promote collaborative knowledge construction, rely on providing online access to raw results, theories and ideas and focus on opening up the research process (Luzon, 2009; Ullmann et al, 2010). An important element of the Science 2.0 concept is the publication of drafts and non-finalized output, which brings insights that are not possible to replicate in a protected environment. Such draft products enable shorter and more frequent feedback mechanisms and continuous improvement (Burgelman, Osimo, & Bogdanowicz, 2010). *Research 2.0* or *Science 2.0* practices rely heavily on Web 2.0 tools like wikis, weblogs, social networking, RSS, etc. Such new forms of disseminating and communicating scholarly information permit scientists to create enriched conversations, digital modes of expression and participate in forms of information communication that represent an alternative to the traditional system of scholarly communication. While Science 1.0 is characterized by text and the document-centric paradigm, research in the Web 2.0 environment is very much about people and communities that have become the new central focus of scientific processes (Špiranec & Banek Zorica, 2012).

However, despite interesting possibilities of applying Web 2.0 technologies in science, a review of published literature shows that use of Web 2.0 in academic research has not been overwhelming to date. Research evidence suggests that the Web 2.0 will not prompt the kinds of radical changes in scholarly communications in the short or medium term. For example, the research findings by Procter, et al. (2010) demonstrate that only some Web 2.0 services, mainly the generic, intuitive and easy to use services that are built upon existing practices, are experiencing rapid uptake. At the same time, many researchers are discouraged from making use of new forms of scholarly communication because they are unable to put their trust in resources that have not been subject to traditional peer review (Procter et al., 2010). Similar research results are documented in other studies (Harley et al., 2010; Researchers of Tomorrow, 2011). At the same time, longitudinal data shows indications that use (active or passive) of some social media and networking tools in research is slightly on the increase among Generation Y doctoral students (Researchers of Tomorrow, 2011). This is consistent with Arms & Larsen (2007) who predict a more intensive uptake and identify younger scholars as early adopters of innovations such as Web search engines, Google Scholar, Wikipedia, and blog science. Other authors also refer to evidence that many postgraduate and postdoctoral researchers are changing the ways in which they acquire and share research information including taking advantage of Web 2.0 technologies to "pre-publish" research papers (Research Information Network, 2010). Although at this point of analysis it looks like Web 2.0 services will not replace established media and information channels in science, the power of Web 2.0 services and technologies should not be underestimated. Web 2.0 services already bring new qualities into research processes and therefore probably will at least supplement the traditional ones.

Relevance of Information Literacy Training in Web 2.0 Research Environments

Information Literacy in Web 2.0 Environments

There is no doubt that social media have caused deep impact in the Library and Information Science (LIS) field and IL as well. Some authors interpret the interdependence of IL and Web 2.0 through a *tool* perspective (Goodwin, 2009; Click & Petit, 2010; Luo, 2010). Within this perspective, Web 2.0 is perceived as a rich source of diverse tools that enable IL teaching enhancement and more engaging and active methods of teaching users.

However, a rising number of authors recognize a much deeper and more complex relationship between IL and developments of participative Web 2.0 environments (Maness, 2006; Markless, 2009; Bawden & Robinson, 2009; Webber, 2010), and some even go so far as to label this relationship *Information literacy 2.0* (Tuominen, 2007; Hapke, 2007; Špiranec & Banek Zorica, 2010; Farkas, 2011).

However, many of the arguments and concerns that are raised by authors who analyze the relationship between information literacy and social media have been put forward in earlier writings, either as a plea for more holistic views in information literacy or in forms of critical perceptions of highly skills-oriented IL practices. One of the first holistic views on IL was articulated long before the advent of social media and Web 2.0 technologies by Shapiro & Hughes who defined IL as a "new liberal art that extends from knowing how to use computers and access information to critical reflection on the nature of information itself" (1996, p. 3). The concentration on information tools and technology rather than on information per se – as content and semantic – (Basili, 2011, p. 396) is a problematical feature of many IL endeavours. Another set of similar critical observations refers to the skills-orientation that is in particular expressed in IL standards. According to Webber and Johnston (2000, p. 394), the use of a set of standards as a framework significantly reduces a complex structure of competencies and knowledge to limited and isolated units.

Such critical reflections on IL are echoed within Web 2.0 environments. More holistic and less tools- or technology-oriented approaches to IL are essential because of profound shifts in how information is flowing online. For instance, some of the concerns raised by S. Webber in the early 2000s are of even greater relevance with "the possibility to

publish things quickly via Web 2.0, and the ways in which people are able to (and often encouraged to) share information". Therefore, contemporary agendas for IL education draw on new perceptions (Webber, 2010):

- IL is context specific and sensitive,
- IL is not just searching, but also encountering, browsing, monitoring managing and creating,
- people move between the virtual and physical worlds, using different sources and spaces,
- IL with people sources,
- people being information literate individually and collaboratively (Webber, 2010).

Main themes that emerged out of the interdependency between IL and Web 2.0 environments are information overload, authority and credibility, erosion of information contexts, multi-perspectiveness and negotiation, communities, new information genres, subjective and personal information organization, etc. Bawden and Robinson (2009) identify the changing information Web 2.0 environments as the cause of current information pathologies: "The variety and diversity of novel forms of information and communication resources within Web 2.0, and their sheer number, clearly contribute to the overload and other issues. . .".

According to Hapke (2007), the emphasis on existing information literacy concepts lies in searching information and learning with information, which has to be questioned: "More than efficient retrieval and navigation strategies, information literacy today includes the creativity to organize and shape one's own information and learning process in a conscious and demand-oriented way, therefore IL 2.0 is more about learning about information than learning with information".

An interesting recent critique of existing IL research and practices that was inspired by the emergence of Web 2.0 and its potentials in creating information was expressed by I. Huvila: "Even though the term information literacy may be considered to refer to a idea of using information in a broad non-specific sense, the conceptions of information literacy discussed in the literature have tended to focus on the seeking, locating, receiving and evaluating information" (2011, p. 238). With Web 2.0 tools IL research and practices can and have to shift towards some of their neglected dimensions like the creation, organization and management of information.

Many facets of current IL practices still reflect a strong dependence on a print-based culture which is incongruent with the transient and hybrid nature of Web 2.0 environments (Špiranec & Banek Zorica, 2010). Print based environments are much more stable, structured and linear. In digitized and Web 2.0 environments information is decoupled from its material carrier, but equally from authority and sometimes trust. In recognition of this, issues like credibility and authority, intellectual property, coping with information overload or problems in privacy, understanding publishing mechanisms and gaining true understanding of contemporary information environments should become part of IL activities.

The Significance of Information Literacy in New Research Landscapes

Researchers, scientists or future researchers like PhD students are expected to conduct original scholarly research. For this reason, they have to acquire competencies related to the efficient application of various procedures involved in conducting scientific inquiry, such as the ability to ask valid questions and gather and analyze information, to evaluate ideas, proofs and arguments, to defend and communicate them. These more complex scholarly activities are based on basic competencies of finding, evaluating and using information. To put it differently, the basic building block of research is information, and information literacy as the ability of finding, evaluating and using information can significantly enhance the research process. However, researchers do not deal with any kind of information but scholarly information. Therefore, IL for researchers has a strong focus on the universe of scholarly information, which itself has gone through a tremendous change in the last decade, particularly as a result of the appearance of Web 2.0. IL for researchers, while focusing on scholarly information, should certainly be informed by the transformations that scholarly information and research processes have gone through.

The last decade has brought changes in how researchers discover and gain access to information resources relevant to their research and how they create and manage information resources of new kinds. Reconfigurations within domains of scientific activity, research cultures and scholarly communication have a direct impact of how IL training for researchers is focused, structured and offered. In particular, this assertion refers to thematic focus of IL sessions and issues and problems such sessions should deal with. More exactly, IL for researchers should be informed by issues raised within the "Information literacy 2.0" discourse described in the previous section, but in the research environments those issues are even more complex and urgent. It is necessary to focus IL programs for researchers on the specific aspects presented below (Špiranec & Banek Zorica, 2012):

Issues of Trust and Authority: Scientific data and research are traditionally captured and locked within traditional valued sites of research, like journals or academic databases, which make activities like locating or evaluating scientific information convenient, transparent and reliable. As opposed to centrally managed and structured

information environments, the research process today includes sites of information not stewarded by traditional information gatekeepers and publications or other non-traditional scholarly objects that lack the imprimatur of publishers, but still may be of scientific value. Borgman (2007) also commented on this issue: "[Quality] indicators included publication channels, selection by libraries and citation rates. With fewer external quality clues available, individuals must make more sophisticated judgments about whether to trust a document or a source". For every scholar today it is crucial to be aware of issues surrounding the trustworthiness of data and to learn to express doubt over the provenance or accuracy of posted information. IL programs should therefore draw the attention of the researcher to these new issues and enable him/her to determine authority, significance and scholarly validity of new sources and sites of scholarly information.

Understanding Novel/Alternative Forms of Disseminating Information: Scholarly communication before the Internet *required* the intermediation of publishers, libraries, etc. Intermediation is not a prerequisite for finding or accessing scholarly information any more. Although traditional journals are still vital components of scholarly communication, next to and in parallel with them new and alternative forms of scholarly output and sources have emerged that do not fit into existing traditional publication models. Even when consulting authoritative sources, the researcher is not confined to traditional scholarly domains (e.g. peer-reviewed publications, academic databases, etc.) but potentially may include blogs, self-published items, datasets, simulation or presentations in this quest for high-quality information. A deeper understanding of these forms within IL sessions could help researchers make informed decisions on whether to use particular alternative forms of scholarly information in any given case.

Managing and Communicating Research Information and Data: As changes in the scholarly domain are possible and according to the opinion of some authors will quite likely happen (Waldrop, 2008; Odlyzko, 2009; Priem & Hemminger, 2010), postgraduate researchers should be introduced to new information spaces and instructed in how to express themselves in this new context, how to organize resources for themselves and contribute to these new environments not just as users of information, but as creators and co-creators as well. This not only includes the creation of scientific content, but also the ability to take part in user-oriented organizational practices (tagging and creation of research-focused digital collection of links, collaborative managing of web links and bibliographic data). Particularly with the infusion of technology into research endeavours scientists rely more and more on networks of personal contact for accessing and acquiring information. Many scientists today share their ideas over informal networks of communication or participate in social media networks which offer access to unverified data and preliminary ideas and theories. Various communication channels like interpersonal communication and networks at different levels, including membership groups or invisible colleges are becoming an ever more important source of information (Lievrouw, 2011).

Alternative Forms of Evaluating and Pre-Reviewing Scientific Works: Social navigation or collaborative filtering systems that have spread in the Web 2.0 environment offer opportunities not just for accessing and sharing scientific content, but also to evaluate it and supplement traditional forms of peer-review of it. User judgments, reviews, tags or comments are inherent to Web 2.0 services and allow users to identify the most popular or best rated articles on a general level or articles that users with similar profiles have bookmarked and tagged. The more scientists tag a document, the more relevance this article seems to have for these people. According to Stock (2007), click rates (and additionally download rates), the number of tagging users, and the number of comments linked to articles become criteria for relevance ranking. These systems offer new indicators for evaluating scientific work, although it would be more precise to define them as popularity instead of quality markers. Insights into these emerging types of discovery and evaluating scholarly information are relevant for researchers and should be considered in IL training.

Building Reputation and Research Prestige Online: As stated before, there is no doubt that scientific research is increasingly undertaken, shared and communicated online in a highly collaborative fashion. Discussions on authority and credibility have shown that new forms of scholarly practices raise serious questions concerning identity of individuals who contribute to an expanding range of different forms of digital expressions as part of their scientific activities. This is not only an issue for users, but also for creators of scientific information. How to maintain a good reputation and research prestige online will be a crucial question for researchers. Other, albeit commercial domains (e.g. Amazon ratings) have already shown how important it is to build a good internet reputation which generates attention and influence. This is a significant aspect of Science 2.0 that is based on measures of implicit and explicit data (such as incoming links, page views or ratings). Information literacy activities should raise researchers' awareness of both positive and negative aspects of creating scholar identity in the digital environment.

The contemporary researcher acts and works in information landscapes characterized by increased complexity and new and alternative forms of scientific output like wikis, blogs, social bookmarking sites, etc. Therefore, IL frameworks for researchers should focus less on resource discovery, especially on traditional library tools, while dealing more with evaluation, information management and authority issues. Such a conceptual adaptation of IL gains in importance in the context of Web 2.0 and reflects new IL research paradigms captured in the notion of "information literacy 2.0" described in previous sections. However, conceptual transformations are always slow processes and the same may be assumed for approaches to IL. Existing research evidence (Research Information

Network, 2008; Markless, 2009; Streatfield, Allan, & Wilson, 2010) suggests that a classical approach to IL still prevails in many libraries, despite shifting needs of researchers and transformed landscapes of scholarly communication. The results of a national study addressing these questions will be presented in the next section.

The Case of Croatian Libraries

Research Questions and Problem Statement

When analyzing the state of IL in Croatia, assertions similar to those regarding the whole South-East European region can be made. South-East Europe is certainly one of the regions which lags behind in positive global IL development with few exceptions (Špiranec & Pejova, 2010). Despite low expectations regarding IL offerings at Croatian academic libraries, in 2011 a survey was conducted in order to a) determine the percentage of academic libraries active in IL training for researchers, and b) define the extent and scope of such offerings, specifically whether these offerings conform to the need of modern/future researchers who have to deal with highly complex 2.0 landscapes.

Data Collection

Data collection was based on a combined methodology (e-mail questionnaire, telephone interview, information presented on library web sites). First, questionnaires were administered to 62 academic libraries in six Croatian universities via direct e-mail. In cases where no response from libraries was received per e-mail, direct telephone interviews were set up. Where responses could not be acquired by e-mail or telephone, information about IL offerings was gathered by analyzing library web sites.

Survey Instrument

The questionnaire comprised the following two sets of questions: 1) questions concerning formal features of information literacy education (number of hours, elective or mandatory, number of credit points); and 2) content coverage and methodological features. The second part of the questionnaire was essential for answering the stated research question. Responses pertained to thematic focus of IL sessions (e.g. database search, types of information resources, search strategies, etc.) and their underpinning pedagogy (e.g. presentations, lectures, hands-on activities, etc.).

Selected Results

The surveyed sample included 62 academic libraries (5 university libraries, 57 faculty/department libraries). The survey questionnaire elicited 45 responses either by e-mail or telephone (e-mail n=18; telephone n=27), which was an overall response rate of 73%. Where response could not be obtained by e-mail or telephone, web sites were analyzed in order to determine educational services the library offered. The assumption was that libraries without presentation and promotion of IL on their web sites did not provide such service at all. At none of the 17 analyzed web sites was information on IL courses presented, meaning that those libraries do not offer specialized IL sessions for researchers systematically as part of their service. However, eight libraries offer e-guidance pertaining to IL elements (how to cite, how to retrieve academic databases) on a very generic level and not tailored to special researchers' needs.

Out of 45 responses gathered by questionnaire or telephone interview, 10 respondents (16%) claimed their library offers IL for researchers regularly as a part of the normal library service. Some 57% of libraries (n=35) indicated their library does not offer information literacy courses regularly but individually, ad hoc and on demand. For the rest of the sample (27%, n=17) web sites were analyzed and no indication of IL offerings for researchers determined (Figure 1).

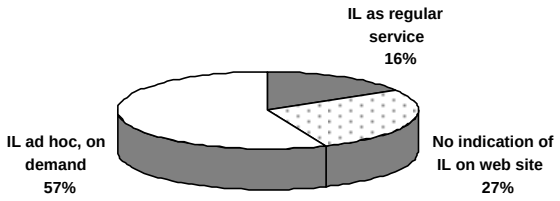

Figure 1. IL as a regular library activity

Despite the small number of responses confirming IL as a regular library activity (16%; n=10), interesting conclusions regarding formal, thematic and pedagogical features of IL education for researchers could be drawn from detailed descriptions provided by respondents.

Questions regarding formal features of IL sessions elicited some interesting insights:

- Seven out of 10 libraries that offer formal IL training for researchers carry out only the simplest and most fundamental forms of introduction to the library and information resources ranging from 1 to 4 hours, usually at the beginning of semesters;
- Only two libraries reported that their IL training course offered credit (Faculties of Medicine, University of Zagreb and University of Split);
- Three libraries indicated deeper and more extensive approaches to IL ranging from 18 hours (Faculty of Law, University of Zagreb) to 30 hours (Faculties of Medicine, Universities of Zagreb and Split);
- Two libraries restrict their researcher-oriented IL sessions to their faculty's academics;
- In just one library (Medical Faculty, University of Zagreb) information literacy sessions are obligatory.

Responses collected in telephone interviews revealed a very indicative, yet unexpected aspect of professional perception of IL. Thirteen percent (n=6) of librarians commented either in the questionnaire or in the telephone interview that PhD students receive IL training because they have a course on Informatics/ICT which is mandatory, meaning that no additional training provided by the library is needed. Such comments demonstrate that confusion between IL and computer/ICT literacy exists and librarians treat those literacies as one and the same concept.

Responses pertaining to the content of IL sessions for researchers were crucial for clarifying questions that represent the rationale of the study; those questions refer to new approaches to IL that address challenges posed by the Research 2.0 environment. The distribution of IL themes for researchers offered in Croatian academic libraries is shown in Figure 2.

The thematic focus of IL sessions shows a prevalence of training concerning the use of very specific electronic tools like academic databases, library catalogues or web resources. All libraries that provided a positive response on offering IL services in a systematic way train their users in searching academic databases. Clearly, the chart demonstrates a strong orientation towards content relating to access and retrieval and information seeking while other elements of IL like evaluating or communicating information receive much less attention or are not at all represented (Figure 2).

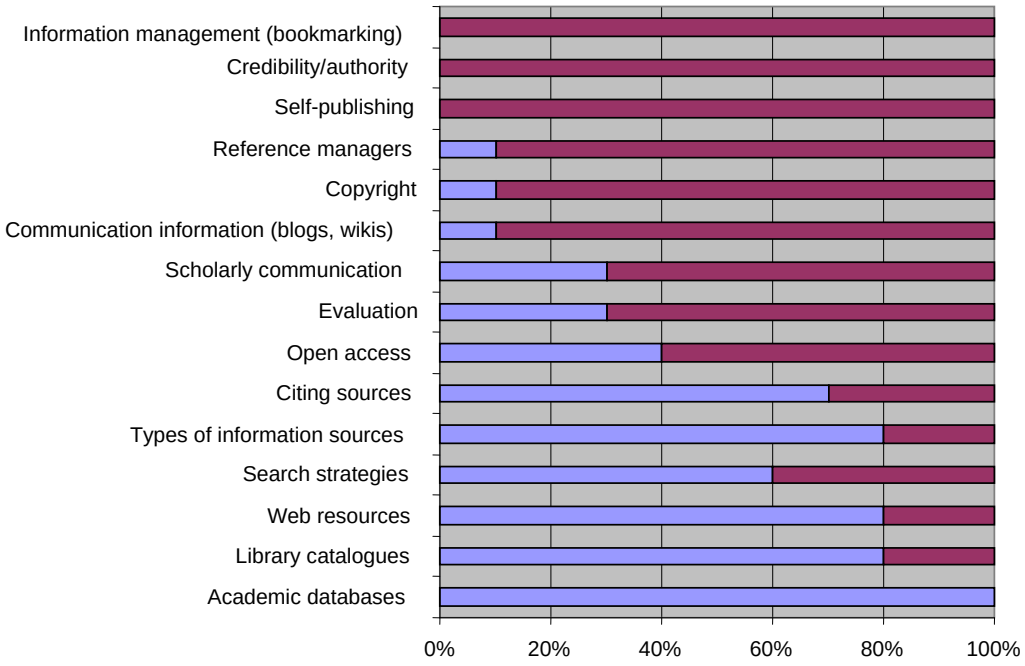

Figure 2. Thematic focus of IL sessions for researchers

An analysis of libraries offering IL instruction by research field and discipline shows a significant prevalence of libraries in the field of applied sciences (medicine, engineering) and science (mathematics), while from the wide array of social sciences just two libraries offer IL on a regular basis (law, economics). The examination by scientific branches also shows that academic libraries from the humanities are not represented at all, i.e. do not offer IL systematically (Figure 3).

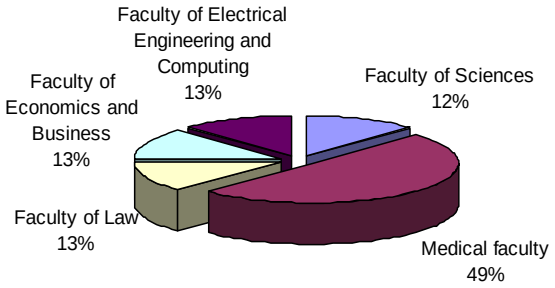

Figure 3. IL services in academic libraries by research field and discipline

The last section of the questionnaire referred to methodological approaches in IL training sessions. The set of responses revealed that libraries apply more traditional forms centered mainly on lectures and demonstrations, combined with structured exercises. As stated before, eight libraries developed some kind of e-guidance or tutorials with IL themes, but only one library offers a more advanced form of tutorial with an integrated quiz. However, after analyzing these sources it was concluded that these tutorials are generic and not tailored to the specific needs of researchers but to the wider academic community. Two libraries employ group work during IL sessions. Other alternative pedagogical approaches like case studies, group discussions, reflecting learning/research experiences, engaging with alternative forms of scholarly information, portfolios etc. are not indicated as common IL training frameworks (Figure 4).

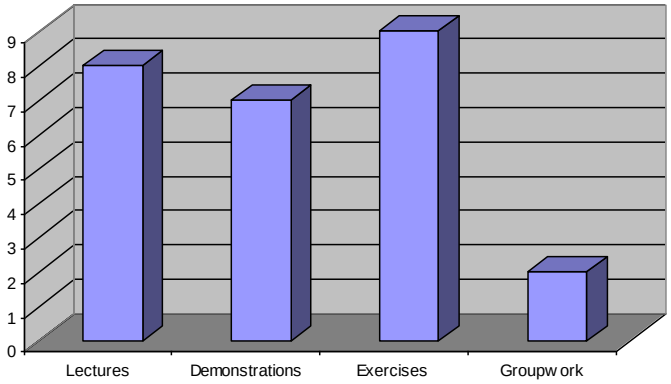

Figure 4. Pedagogical approaches applied in researcher IL training

Discussion

Responses drawn from the first questionnaire section clearly demonstrate that activities in IL represent a marginal sideline of the library service which is in most cases offered ad hoc, individually and on demand. Systematic approaches to IL are rather rare and in the case of Croatian academic libraries employed in 16% (n=10) of libraries included in the sample. Even when librarians acknowledge IL as a regular library service, such researcher training with the exception of two medical faculty libraries carries no academic credits. Credit offerings command the attention of students, faculty and administrators and serve as the key indicator of what an institution considers essential in the education of its students (Badke, 2008). Therefore, present practices in Croatian academic libraries cannot be described as effective. The teaching role of academic librarians continues to be predominantly restricted to very limited classroom engagements in the form of one or two hour sessions at the beginning of PhD programs or academic semesters.

An examination of academic libraries by scientific field shows that libraries at faculties of medicine were the most successful in integrating IL into PhD curricula and offering IL sessions for researchers. According to Petrak (2006), the reasons for such advancements are probably the changes and innovations in the structure and process of medical education, with a strong orientation towards preparing physicians to cope with the explosion of medical scientific knowledge and technology and a desire to inculcate in physicians a habit of lifelong learning. Furthermore, the mandate of the medical school is to teach the principles of scientific method and evidence-based medicine, including analytical and critical thinking, throughout the curriculum. IL instruction may play a key role in these activities.

The central focus of the study pertained to Web 2.0 issues that define contemporary research environments. Within such environments researchers have to deal with new and alternative forms of scholarly communication and have to learn how to manage personally held information. They also need to learn how they might articulate and communicate their findings in novel genres and how they can build and maintain their scholarly reputation or create networks in new environments. However, the research findings have elicited a highly "library-centric" view of IL in Croatian academic libraries where access and retrieval and the use of specific tools receive much attention while issues of information authority and credibility, critical appraisal of research evidence, copyright, community/networks, open access and personal information management are rarely or not at all elaborated.

The identified library-centric and tool-based approach to IL is also visible in pedagogical approaches to IL training. Most of the training focuses on specific information sources and tools through demonstration, lectures or defined linear hands-on activities that are often employed when training users in searching databases. A wide variety of other, pedagogically more sound, forms of IL instruction that could convey deeper and more critical insights into information environments are neglected.

Conclusion

Current developments in the information universe can be perceived principally as the drive for shifts in the way scholarly information is accessed, evaluated, disseminated, communicated or shared. Scholarly information has undergone revolutionary transformations in the last decade, particularly as a result of the appearance of Web 2.0.

The Web 2.0 has caused the outbreak of different information phenomena, and called attention to issues like information overload, authority and trust, novel forms of disseminating and communicating information, open access,

ethics, scholarly reputation, etc. These issues should become the focus of IL training for researchers. In other words, IL activities should concentrate less on finding or searching for information and instead deal more with evaluating and communicating information and promoting a deeper understanding of ever more complex information environments.

A survey among Croatian academic libraries was conducted in order to determine whether such transformation of IL training for researchers is visible. Beside expected low percentages of libraries offering any kind of IL session for researchers on a regular base, the study also showed that libraries concentrate on a relatively narrow subset of IL in the form of traditional library topics such as searching and finding sources in libraries. Academic libraries must realize that the Web 2.0 has changed how researchers find and use information and has brought about issues that seriously influence scientific processes. In order to make IL more relevant for researchers (or relevant at all), it is necessary to include such issues in IL programs because some of those issues will very soon influence careers of many researchers who will need to make informed decisions about them.

References

Arms, W. & Larsen, R. (2007). *The future of scholarly communication: Building the infrastructure for cyberscholarship*. Phoenix, AZ: National Science Foundation & British Joint Information Systems Committee. Retrieved 22 August 2011, from http://www.sis.pitt.edu/~repwkshop/NSF-JISC-report.pdf

Badke, W. (2008). A rationale for information literacy as a credit-bearing discipline. *Journal of Information Literacy*, 2(1) Retrieved October 21, 2011 from http://jil.lboro.ac.uk/ojs/index.php/JIL/article/view/RA-V2-I1-2008-1

Basili, C. (2011). A framework for analyzing and comparing information literacy policies in European countries. *Library Trends*, 60(2), 395-418.

Bawden, D. & Robinson, L. (2009). The dark side of information: overload, anxiety and other paradoxes and pathologies *Journal of Information Science*, 35, 180-191.

Borgman, C. L. (2007). *Scholarship in the digital age: Information, infrastructure, and the Internet*. Cambridge, Mass: MIT Press.

Burgelman, J., Osimo, D., & Bogdanowicz, M. (2010). Science 2.0 (change will happen). *First Monday*, 15, 7. Retrieved December 12, 2011 from http://frodo.lib.uic.edu/ojsjournals/index.php/fm/article/view/2961/2573

Click, A. & Petit, J. (2010). Social networking and Web 2.0 in information literacy, *The International Information & Library Review*, 42(2), 137-142.

Farkas, M. (2011). Information Literacy 2.0. *American Libraries*, Nov 1. Retrieved November 19, 2011 from http://americanlibrariesmagazine.org/columns/practice/information-literacy-20

Goodwin, P. (2009). Information literacy and Web 2.0: is it just a hype? *Program: Electronic Library and Information Systems*, 43(3), 264-274.

Hapke, T. (2007). Informationskompetenz 2.0 und das Verschwinden des "Nutzers". *Bibliothek*, 31, 137-148.

Harley, D., Krzys Acord, S., Earl-Novell, S., Lawrence, S., & King, C.J. (2010). *Assessing the future landscape of scholarly communication: An exploration of faculty values and needs in seven disciplines*. Center for Studies in Higher Education, UC Berkeley. Retrieved October 20, 2011 from http://escholarship.org/uc/cshe_fsc

Huvila, I. (2011). The complete information literacy? Unforgetting creation and organization of information. *Journal of Librarianship and Information Science*, 43(4), 237-245.

Lievrouw, L.A. (2011). Social media and the production of knowledge: A return to Little Science? *Social Epistemology*, 24(3), 219-237.

Luo, L. (2010). Web 2.0 integration in information literacy instruction: An overview. *The Journal of Academic Librarianship*, 36(1), 32-40.

Luzon, M.J. (2009) Scholarly hyperwriting: The function of links in academic weblogs. *Journal of the American Society for Information Science and Technology*, 60, 75-89.

Maness, J.M. (2006). Library 2.0 theory: Web 2.0 and its implications for libraries. *Webology*, 3, 2. Retrieved January 11, 2011 from http://www.webology.org/2006/v3n2/a25.html

Markless, S. (2009). A new conception of information literacy for the digital learning environment in higher education. *Nordic Journal of Information Literacy in Higher Education*, 1,1, 25-40.

Nentwich, M. (2003) *Cyberscience: Research in the age of the Internet*. Vienna: Austrian Academy of Sciences Press. Retrieved November 15, 2011 from http://hw.oeaw.ac.at/3188-7.

Odlyzko, A. (2009). *The future of scientific communication*. Retrieved November 15, 2011 from http://www.dtc.umn.edu/~odlyzko/doc/future.scientific.comm.pdf

Petrak, J. (2006). Teaching how to read and write science: a library-journal partnership. *GMS Medizin, Bibliothek, Information,* 6, 1, Retrieved January 12, 2011 from http://www.egms.de/static/en/journals/mbi/2006-6/mbi000025.shtml

Priem, J. & Hemminger, B. (2010). Scientometrics 2.0: New metrics of scholarly impact on the social Web. *First Monday, 15, 7.* Retrieved November 20, 2011 from http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2874/2570

Procter et al. (2010). Adoption and use of Web 2.0 in scholarly communications. *Philosophical Transactions of the Royal Society*, 368, 4039-4056.

Research Information Network. (2008). *Mind the skills gap: information-handling training for researchers.* Retrieved December 18, 2011 from http://www.rin.ac.uk/training-research-info

Research Information Network. (2010). *If you build it, will they come? How researchers perceive and use web 2.0.* London: RIN. Retrieved November 20, 2011 from http://www.rin.ac.uk/our-work/communicatingand-disseminating-research/use-and-relevance-web-20-researchers

Researchers of Tomorrow: Annual Report 2010-2011. (2011). Retrieved December 17, 2011 from http://explorationforchange.net/attachments/059_Researchers%20of%20Tomorrow%20Year%202%20report%20final%20110510.pdf

SCONUL Working Group on Information Literacy (2011). *The SCONUL Seven Pillars of Information Literacy. A research Lens for Higher Education.* Retrieved January 11, 2011 from http://www.sconul.ac.uk/groups/information_literacy/publications/researchlens.pdf

Shapiro, J. & Hughes, S. (1996). Information literacy as a liberal art. *Educom Review*, 31, 2. Retrieved April 16, 2011 from http://net.educause.edu/apps/er/review/reviewarticles/31231.html

Špiranec, S. & Pejova, Z. (2010). Information literacy in South-East Europe: Formulating strategic initiatives, making reforms and introducing best practices. *The International Information & Library Review*, 42(2), 75-83.

Špiranec, S. & Banek Zorica, M. (2010). Information Literacy 2.0: Hype or discourse refinement*? Journal of Documentation*, 66(1), 140-153.

Špiranec, S. & Banek Zorica, M. (2012). Changing anatomies of information literacy at the postgraduate level: refinements of models and shifts in assessment. *Nordic Journal of Information Literacy in Higher Education,* 4(1). *(in press)*

Stock, W.G. (2007). Folksonomies and science communication: A mash-up of professional science databases and Web 2.0 services. *Information Services and Use*, 27, 97-103.

Streatfield, D., Allan, W., & Wilson, T. (2010). Information literacy training for postgraduate and postdoctoral researchers: a national survey and its implications. *Libri: International Journal of Libraries and Information Services*, 60(3), 230-240.

Tuominen, K. (2007). Information literacy 2.0. *Signum*, 40(5), 6-12.

Ullmann, T.D. et al. (2010). Components of a Research 2.0 infrastructure. In M. Wolpers, P. Kirschner, M. Scheffel, S. Lindstaed, & V. Dimitrova (Eds.). *Sustaining TEL: From innovation to learning and practice, 5th European Conference on Technology-Enhanced Learning (ECTEL'10), Proceedings,* (pp. 590-596). Heidelberg: Springer.

Van de Sompel, H., Payette, S., Erickson, J., Lagoze, C., & Warner, S. (2004). Rethinking scholarly communication - building the system that scholars deserve. *D-Lib Magazine,* 10, 9. http://www.dlib.org/dlib/september04/vandesompel/09vandesompel.html

Waldrop, M.M. (2008). Science 2.0: is open access science the future? *Scientific American*. Retrieved October 22 from http://www.sciam.com/article.cfm?id=science-2-point-0

Webber, S. (2010). Information literacy for the 21st century. INFORUM 2010: *16th Conference on Professional Information Resources Prague, May 25-27, 2010*. Retrieved April 20, 2011 from http://www.inforum.cz/pdf/2010/webber-sheila-1.pdf

Webber, S. & Johnston, B. (2000). Conceptions of information literacy: New perspectives and implications. *Journal of Information Sciences*, 26(6), 381-397.