# 17. DEVELOPING STUDENT INFORMATION LITERACY TO SUPPORT PROJECT AND PROBLEM-BASED LEARNING

**Ellen Breen and Helen Fallon**
***DCU & NUI, Maynooth***

## INTRODUCTION

> Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information upon it. (Samuel Johnson)

This chapter highlights the importance of information literacy to the successful implementation of project and Problem-based Learning. Students today are faced with a multiplicity of information resources and are continuously challenged in their efforts to effectively identify and access quality information in support of their studies. Too much information - "information overload" or "information anxiety" – can present a significant challenge for students. Librarians, working together with their academic colleagues, play a key role in helping students develop the necessary skills to navigate an increasingly complex and diverse information environment. This involves creating the appropriate learning opportunities and contexts in which students can develop skills that allow them to effectively find, evaluate and use information.

This chapter stresses the importance of information literacy and encourages academics to integrate information literacy skills into problem and project-based learning curricula.

> Successful information literacy programs do not only focus on teaching information skills, they focus on designing learning experiences that require the use of information skills. (Bruce, 2002: 5)

### What is Information Literacy?

The concept of "information literacy" was first introduced in the United States by Paul Zurkowski in the early 1970's. (Webber, 2000:382) The concept is much debated and no single authoritative definition exists. However, the one most often used and cited in the literature, is that provided by the American Library Association's Presidential Committee on Information Literacy report in 1989:

> To be information literate an individual must recognize what information is needed and have the ability to locate, evaluate and use effectively the information needed. Ultimately information literate people are those who have learned how to learn. They know how to learn because they know how information is organised, how to find information and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning because they always find the information needed for any task or decision at hand. (American Library Association, 1989)

Information literacy is an essential 21st century skill. (Bruce, 2002:1) Universities aim to develop graduates with the skills and capabilities needed to succeed both in the work and wider societal context – graduates who have the skills necessary to be independent lifelong learners. Information literacy enables learners to

*Handbook of Enquiry & Problem Based Learning*. Barrett, T., Mac Labhrainn, I., Fallon, H. (Eds). Galway: CELT, 2005. Released under Creative Commons licence. Attribution Non-Commercial 2.0. Some rights reserved.
http://www.nuigalway.ie/celt/pblbook/

> engage critically with content and extend their investigations, become more self-directed, and assume greater control over their own learning. (Bundy, 2004:5)

**Information Literacy Standards**

Information literacy standards for higher education were first produced in the US in 2000. They were then adapted for use in Australia and New Zealand and have since been translated into several languages. The Australian and New Zealand standards were first produced in 2001 and revised in 2004. (Bundy, 2004:1) They include the following six standards:
The information literate person:

| |
|---|
| 1. Recognises the need for information and determines the nature and extent of the information needed |
| 2. Finds needed information effectively and efficiently |
| **3. Critically evaluates information and the information seeking process** |
| 4. Manages information collected or generated |
| 5. Applies prior knowledge and new information to construct new concepts or create new understanding |
| 6. Uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information |

(Bundy, 2004:11)

Each standard includes a list of learning outcomes for example, in the case of standard 3 above, the learning outcomes are as follows:

1. **Assesses the usefulness and relevance of the information obtained**

   - Assesses the quantity, quality and relevance of the search results to determine whether other information access tools or investigative methods should be used
   - Identifies gaps in the information retrieved and determines if the search strategy should be revised
   - Repeats the search using the revised strategy as necessary

2. **Defines and applies criteria for evaluating information**

   - Examines and compares information from various sources to evaluate reliability, accuracy, authority, timeliness and point of view or bias
   - Analyses the structure and logic of supporting arguments or methods
   - Recognises the cultural, physical or other context within which the information was created and understands the impact of context on interpreting the information
   - Recognises and understands own biases and cultural context

3. **Reflects on the information seeking process and revises search strategies as necessary**

   - Determines if the original information need has been satisfied or if additional information is needed
   - Reviews the search strategy
   - Reviews information access tool used and expands to include others as required
   - Recognises that the information search process is evolutionary and non-linear

(Bundy 2004:16)

The standards provide universities and colleges with a framework for embedding information literacy objectives and outcomes into curricula and are widely used in universities throughout the US, Australia and New Zealand. The standards are not prescriptive. Therefore the selection of learning outcomes will vary according to programme level and subject discipline.

In 2003, Librarians at Dublin City University developed a 3-level Information Literacy Framework which consists of an indicative set of information literacy learning objectives and outcomes for each level. The framework is used to facilitate the design and development of effective information literacy sessions in collaboration with teaching staff. Following the publication and promotion of the framework, information literacy learning outcomes have been embedded in programme modules across a large number of disciplines.

| |
|---|
| **Level 1 Objectives:**<br>1. To know about Library services and physical layout<br>2. To identify sources using the Library catalogue<br>3. To understand how information is organised<br>4. To identify a range of relevant information sources<br>5. To use Library databases to locate relevant information<br>6. To locate quality resources on the web<br>7. To compile a bibliography |
| **Level 2 Objectives:**<br>1. To access Library resources outside DCU<br>2. To competently use the full functionality of the Library catalogue<br>3. To increase understanding of how information is organised<br>4. To utilise the advanced features of Library databases and develop effective search strategies<br>5. To effectively use advanced web searching techniques to locate quality information<br>6. To cite and reference sources |
| **Level 3 Objectives:**<br>1. To conduct research using external Library resources<br>2. To understand the literature review process<br>3. To develop a deeper knowledge of subject specific resources<br>4. To keep up to date with current research<br>5. To manage and organise citations using bibliographic software |

***Information Literacy Framework Objectives, Library Dublin City University***

**How do students become information literate?**

Increasingly students enter university with highly proficient information and communication technology (ICT) skills. However ICT skills, whilst essential, do not equate with being information literate and having the knowledge and ability to effectively find, select and use information resources. Academic staff often raise concerns about the high dependence of students on the use of the internet, the poor standard of bibliographies and the increasing levels of intentional and non-intentional plagiarism.

Effective information literacy education requires students to be exposed to appropriate recursive and iterative learning opportunities throughout their undergraduate and graduate degree programmes. Students must be exposed to:

> repeated opportunities for seeking, evaluating, managing and applying information gathered from multiple sources and obtained from discipline specific research methods. (Bundy, 2004:6)

International best practice also tells us that information literacy skills development and understanding is best achieved when it is embedded within the context of course curricula, and not separated from it. Information literacy will not be the outcome of any one single course or module, rather it will be:

> the cumulative experience from a range of subjects and learning experiences which creates the information literate person. (Bruce, 1994:4)

> Integrating information literacy across curricula requires the collaborative efforts of all those engaged in, and responsible for student learning across the university including; policy makers, programme leaders, teaching staff, librarians, learning advisors and administrators. (Bundy, 2005:4)

**Current practice in Information Literacy education in Irish universities**

A report by a working group on information skills, chaired by Ellen Breen, and established by the Committee of National and Universities Librarians (CONUL) on information skills practice in Irish university libraries clearly demonstrates that all libraries are engaged in the delivery of information literacy programmes. The report includes excellent examples of exemplary practices taking place across a number of institutions. (CONUL 2004:19). These include information literacy classes delivered by librarians as part of formal course modules, for example, the Science and Engineering Librarian at DCU delivers a course on effective web searching to all first year science students as part of an introductory IT module. The learning outcomes are agreed jointly by the Librarian and module co-ordinator. The Librarian takes the class for a one-hour lecture followed by a live demonstration and a practical hands-on session. Students complete a worksheet which accounts for 20% of the overall mark of the module.

There are a number of similar collaborative initiatives taking place in other third-level institutions throughout Ireland. However, whilst such collaboration and integration has been identified as best practice, the most commons methods of information literacy skills education are:

- Project/Coursework-related classes
- Stand-alone (one-shot) classes

**Project/Coursework related classes**

The common practice of sending students to the Library for a one to two-hour session at the beginning of the academic year has been shown to be highly ineffective for both students and librarians. Students lack motivation as there is no clear context or relevance for their learning at that stage. Poor attendance is a common problem.

Where academics recognise the importance of information literacy classes, particularly around project time, student motivation increases because the students have a clear need and a focus for attending this type of session. For example an academic might set a project on an aspect of the healthcare service in Ireland. This may require using a range of resources, including government reports, newspapers, journal literature and the retrieval of international comparative data. The academic gives an official one-to-two hour lecture slot to the librarian, and students attend as part of the formal programme.

While this has some success, librarians frequently report that students feel overwhelmed by the amount and range of information covered and the varied access methods and tools.

**Stand-alone (one-shot) classes**

"Stand-alone" classes are sometimes offered by librarians to support student coursework and skills development. Typically a library may offer these sessions independent of any lecturer involvement. Students have the option of attending. These could include sessions on effective use of the library catalogue, using the journal literature, internet searching, compiling a bibliography and so forth. Practice has shown that this strategy on its own is not effective. Because these sessions are non-compulsory and not linked in terms of assessment with their courses, attendance is often low, although those attending always comment on the value and usefulness of the sessions.

The challenge for information literacy in project and Problem-based Learning is for librarians to design, in collaboration with academic colleagues, modules which can be embedded into the curriculum.

## PROJECT AND PROBLEM-BASED LEARNING AND INFORMATION LITERACY EDUCATION

The two case studies that follow – one American and one Irish - deal with problem and project-based learning and provide specific examples of curriculum-integrated approaches to information literacy skills development.

A review of the medical library literature in 1996 (Rankin, 1996:33) found that problem-based-learning students developed their information literacy skills more quickly than non-PBL students. Their use of the library increased, and they used a much wider variety of information resources. They also demonstrated increased independence in information gathering and made more effective use of library reference services.

In a PBL course students are given a particular problem and must first reflect on what they already know about the problem. This questioning technique is very effective in helping students identify relevant information relevant to working on the problem and then naming their learning issues – what they do not know.

> The question creates a context for understanding which skills one might use to effectively answer it (Cheney, 499).

As PBL problems always reflect "real" and current issues students can use their information skills in a meaningful way. This will help students understand the relevance and value of information literacy. (Carder, 2003:189) However if PBL is to work effectively, students must be adequately supported in identifying and locating relevant resources to solve problems, otherwise they will depend solely on information resources they know and feel comfortable with. The following case study illustrates this.

**PBL and Librarian/Teacher Collaboration: A US case-study**

Larry Spence, Director of Learning Initiatives in the School of Information Sciences and Technology in Penn State University, a strong advocate of PBL, argues that PBL requires the collaboration of Librarian and instructor. (Spence, 2004: 491). He had experienced a lack of interest in library assignments he created for his students, independent to his course work. He concluded that:

> integrating research into courses required an expert's knowledge of the resources available" and that "instructors in a PBL curriculum need librarians as consulting partners in designing assignments. (Spence, 2004: 492)

Spence collaborated with Debora Cheney, a Librarian at Penn State University on a pilot one-credit course which aimed to introduce students to PBL and information literacy skills. (Cheney, 2004: 497) They developed a list of specific resources which student could use when they began the information retrieval part of their PBL learning exercise. Students attended a library session where each PBL group was asked to use different databases on the resource list to answer the same question – *what evidence can you find to support the claim that Tim Berners-Lee is the real father of the internet?* The Librarian's role throughout this session was to introduce the exercise and provide assistance to the students as they searched the various databases. Each group was also required to critically evaluate the usefulness and relevance of the search tools used. To assist in this, they were given a list of evaluation criteria. Each group then made a presentation to the entire group outlining their answer to the question and their assessment of the databases used. Following this exercise it was clear that students were not only able to answer the research questions but were also able to evaluate the databases effectively in relation to content, ease of use, and relevance.

Spence and Cheney assigned a subsequent research project without using the "question" as a framework to guide students through their information gathering exercise. Students were asked to produce a list of the top 25 innovators in Information Sciences and Technology since 1945. Each student was then asked to select one of the innovators and write a biographical essay. The students were given an updated list of databases, which included some of those already used. Without the context of the "question" students were not comfortable with this task and quickly reverted back to what they were comfortable doing – using the internet. They moved quickly from database to database using poor search strategies which led to poor results and a high level of frustration. This exercise highlighted the need for more practice and reinforcement of the information literacy skills learned in the first session and emphasised the need for the question as a means of focusing students on their explicit information needs.

**Project-based information skills training at NUI Maynooth**

In 2004, the Deputy Librarian and the Librarian from the Maynooth Outreach Campus at Kilkenny, devised a module in information literacy for the B.A. in Local Studies & Community Studies, a modular degree which is offered at both the Maynooth and Kilkenny campus. The degree offers two strands of study – a local history studies strand and a community studies strand. The information literacy module was offered to students in the final stages of their degree programme when they were preparing their final project.

The aim of the module was to create an awareness of the wide range of electronic resources available via the Library and to provide training in accessing these resources. It aimed to develop students' use of electronic information resources as a tool for research and learning. A requirement of the module was that students produce an annotated bibliography on their final year project topic or on another topic of their choice, which was relevant to their course. This module was designed in consultation with the Department of Adult and Continuing Education and approved by Academic Council.

**Module Content**

- Using library catalogues
- Using databases
- Using electronic journals
- Introduction to the world wide web
- Using search engines effectively
- Evaluating information sources
- Introduction to Virtual Learning Environments (VLEs) as a tool for teaching and learning

**Assignment**

Students were asked to compile an annotated bibliography on their thesis topic or another topic of their choice. They were told this should;

- be on a specific rather than a general topic
- be between 2,500 and 3,000 words in length
- have a comprehensive introduction covering topics such as the reason for choice of topic, the scope of the bibliography and the range of resources consulted
- have a minimum of 25 items listed
- follow the Harvard citation style
- have annotations (abstracts) of approximately 4 lines
- give some indication of the resources consulted to identify items included

A sample bibliography was included on the website for the module.

**Design of Learning Plan**

Twenty-four teaching hours were allocated to this module. However, 50% of these were allocated to home study. Students registered for off-campus access to library databases in order to be able to carry out most of their research remotely. Seventeen students registered for the module. Students attended four three-hour sessions at NUI, Maynooth. These were scheduled at fortnightly intervals. The first session focused on using the library catalogue effectively and aimed to give students the expertise to create effective search strategies. While students had been using the library catalogue – in some cases for a number of years – none understood the difference between "browse" and "search" options or how to refine a search effectively. Most of the learning was done by "doing." The students' project topics were used to illustrate how to search. Between contact hours students were assigned practical assignments based on the learning. These assignments were put on the library website in a section dedicated to this module. Students downloaded the assignment sheets, completed them and submitted them in print form at the next session. In addition to completing the assignments students were encouraged to begin to compile their bibliography for their project.

The second session was devoted to the journal literature and the effective identification and utilisation of electronic journals and databases. Both the variety of ways of accessing electronic information – via the library catalogue in the case of journals which have a print equivalent; via an a-z listing of electronic journals on the library website; via searching on individual databases – and the different ways of executing searches were covered in these sessions. Students performed well in their assessment exercises.

The third session covered the internet, effective use of search engines and the evaluation of web resources. This session was totally hands on. Students were asked to work their way through a handout explaining the various features of a web-browser while working at a PC. Following

this they were given a detailed handout on using search engines and asked to carry out a range of searches using their project topic. The final session included a demonstration of the university virtual learning environment (VLE) a discussion of the assignment and an evaluation of the module.

*Student response*
At the final session, an evaluation of the learning experience was carried out. Students were asked to get together in four groups and answer the following three questions: what worked well, what didn't work well and what could be done to improve the module.

| **What worked well?** | **What didn't work so well?** | **What could be done to improve the module?** |
|---|---|---|
| Students were introduced to new and interesting information resources | This was a new way of learning. More information should have been provided to the students before commencement | Have an introductory night with an overview of whole module before students sign up for module |
| It was a new type of study – no reading lists | Sometimes the large number of people accessing the same database simultaneously caused delays | More worksheets and more practical work |
| The assignment sheets were very useful | Individual PC's sometimes crashed | Give more than 20% of final mark to continuous assessment |
| The practicals were enjoyable | Some parts of the course were much more intensive than others e.g. databases and would have benefited from more time | Module should be offered earlier in the degree possibly in the second semester to be of optimum benefit to students across all their courses |
| Class time was just right | Working on module from home on the Internet was time consuming and expensive | Allow more time for databases |
| The small size of the class | Amount of electronic resources – particularly for local history – was small | Possibly Saturday classes – two full Saturdays to replace weekly sessions |
| Training materials on the Internet | | Restrict number on module to ensure each person has an individual PC. |

Students achieved high marks in both their annotated bibliography assignment and in their continuous assessment. The module received extremely positive feedback from the external

examiner and will continue to be run in future years. The level of satisfaction and engagement the students experienced with the module was directly related to the amount and relevance of the information they located for their project. However, they saw the relevance of the learning experience to other modules on the course but felt that to gain the maximum from a module such as this, it should be offered very early on in their degree programme and be compulsory rather than optional.

## CONCLUSION

Both problem and project-based learning offer meaningful contexts in which to integrate information literacy into course content. In the case of PBL, information literacy classes are key to its success. Students are required to identify what they do not know (their information need) in order to work on a problem. They must then locate relevant information to work through their problem and where appropriate revise their search strategies and seek out new information. Project-based learning will benefit significantly from integrated information skills programmes which are integrated into the curriculum rather than standalone short inputs. When starting project or Problem-based Learning initiatives it is vital to involve librarians at the planning stage, in addition to the implementation phase and to recognise that librarians have a key role to play in ensuring the success of project and Problem-based Learning.

## REFERENCES

American Library Association (1989). Report of the Presidential Committee on Information Literacy.
www.ala.org/ala/acrl/acrlpubs/whitepapers/presidential.htm

Andretta, S. (2005) "Information Literacy: A Practitioner's Guide." Oxford: Chandos Publishing.

Bruce, C.S. (1994). Information Literacy Blueprint.
www.gu.edu.au:80/ins/training/computing/web/blueprint/content_blueprint.html

Bruce, C.S. (2002). "Information Literacy as a Catalyst for Educational Change: A Background Paper," prepared for UNESCO, the US National Commission on Libraries and Information Science, and the National Forum on Information Literacy, for use at the Information Literacy Meeting of Experts, Prague, The Czech Republic.
www.nclis.gov/libinter/infolitconf&meet/papers/bruce-fullpaper.pdf

Bundy, A. (ed.) (2004) "Australian and New Zealand Information Literacy Framework: Principles, Standards and Practice," 2nd edition. Adelaide: Australian and New Zealand Institute for Information Literacy.
www.caul.edu.au/info-literacy/InfoLiteracyFramework.pdf

Bundy, A. (2005, April "Changing and connecting the educational silos: the potential of the information literacy framework." Paper presented at the LILAC conference, Imperial College UK.
www.cilip.org.uk/groups/csg/csg_ilg/Lilac05/Papers/bundy.pdf

Carder, L. et al. (2003). "Case-Based, Problem-based Learning Information Literacy for the Real World." *Research Strategies*, 18, 181-190.

Cheney, D. (2004) "Problem-based Learning: Librarians as Collaborators and Consultants." *Portal: Libraries and the Academy*, 4, 4, 495-508.

CONUL, (2004). "Report of the CONUL Working Group on Information Skills Training, chaired by Ellen Breen."
www.conul.ie

Enger, K. et al. (2002). "Problem-based Learning: Evolving Strategies and Conversations for Library Instruction." *Reference Services Review*, 30, 4, 355-358.

Eskola, E.L. (2005). "Information Literacy of Medical Students Studying in the Problem-Based and Traditional Curriculum." *Information Research*, 10, 2, 221.
http://InformationR.net/ir/10-2/paper221.html

Fosmire, M. and Macklin, A. (2002). "Riding the Active Learning Wave: Problem-based Learning as a Catalyst for Creating Faculty-Librarian Instructional Partnerships." *Issues in Science and Technology Librarianship*, Spring
www.istl.org/02-spring/article2.html

Maclin, A. (2001). "Integrating Information Literacy Using Problem-based Learning." *Reference Services Review*, 29, 4, 306-313.

Rankin, J.A. (1996). "Problem-based Learning and Libraries: A Survey of the Literature." *Health Libraries Review*, 13, 1, 33-42.

Spence, L. (2004) "The Usual Doesn't Work: Why we need Problem-based Learning." *Libraries and the Academy*, 4, 4,485-493.

Webber, S., Johnston, B. (2000) "Conceptions of Information Literacy: New Perspectives and Implications." *Journal of Information Science*, 26, 6, 381-397.