



## HE Academy Subject Network for Information and Computer Sciences

### Overview of the HE Academy Development Fund

**Title of Project:** Critical evaluation of information literacy questions used to support the Department of Politics, International Relations & European Studies (PIRES)

**Keywords:** Information literacy; computer aided assessment; CAA; Online tests

**Abstract:** Loughborough University Library and the Department of Politics International Relations & European Studies (PIRES) wished to enhance second year student information literacy skills, so that they were able to produce good quality research dissertations. To achieve this, information literacy skills were embedded into the EUB608: Research Methods module and was delivered via the University's Virtual Learning Environment (VLE), called Learn. The student understanding of the principles of information searching was assessed using computer aided assessment (CAA).

#### Aims of the project

The primary aim of the project was to enhance the information searching skills of the students, so that they produced good quality academic research dissertations in their final year.

The project aimed to measure the effectiveness of online testing in the context of enhancing students' information literacy skills within PIREs by:

1. Creating a bank of questions that test student knowledge and understanding of the information searching process.
2. Evaluating the questions by analysis of data available from the assessment software, Questionmark Perception (QMP).
3. Obtaining reflective feedback from students that used the test .
4. Developing good practice in the evaluation of online assessment.

#### Outcomes

The outcomes of the project were:

1. Creation of an information literacy question bank through:
  - re-purposing of existing questions already created to support postgraduate students
  - enhancement of existing questions
  - deletion of poor quality questions
  - creation of new questions to assess particular learning outcomes, address different learning styles and test subject specific knowledge in relation to PIREs

- addition of metadata to each question, including Blooms taxonomy, level of difficulty, the SCONUL seven pillar of information literacy (1999) and origin of question.
2. Delivery of an online test through Questionmark Perception to PIREs students on module EUB608.
  3. Review of questions through reports generated by Questionmark Perception to ascertain level of difficulty.

### **Deliverables**

The deliverables from the project were:

1. The creation of good quality validated information literacy questions that can be incorporated into a larger question bank
2. A case study of how the project was carried out and how information literacy tests can be embedded into subject based modules.

The question bank will be of particular interest to practitioners in higher education libraries who will be able to transfer and customise the questions for their own institutions. It will also be of value to Information Science Departments as they will be able to review the questions and see what skills librarians wish students to have and can also be customised for students under taking Information Science courses. The information literacy question bank will be of general interest to all ICS departments as it will illustrate different question styles, such as multiple choice, multiple response, drag and drop, fill in the blanks and matching and how they have been used in another discipline.

### **Background:**

Information Literacy is defined by the Chartered Institute of Library and Information Professionals (CILIP 2005) as:

“knowing when and why you need information, where to find it, and how to evaluate, use and communicate it in an ethical manner”

Student information literacy skills are variable and it can be quite difficult to motivate students to attend information literacy courses.

For several years the Library had provided a two hour voluntary workshop for second year PIREs students undertaking a final year dissertation. Attendance at this workshop had been poor, as students did not wish to give up their free time for something they believed they knew how to do or could learn from friends. This is not unusual and De Rosa would argue that the majority of people chooses to learn about electronic resources from their friends (2005).

While students were confident in their information searching skills, their lecturers were unhappy with the quality of information the students were using for the dissertation. The PIREs department expressed concerns over the quality of student literature searching skills, the type of material used and the citation techniques within the final year dissertations and generally wanted to enhance student performance.

After much discussion it was agreed that the Library should deliver a workshop as part of the preparatory module for the dissertation, EUB608: Research Methods. In addition supporting material should be placed on the University's VLE, Learn and the students comprehension of information searching techniques should be assessed. It was felt that assessment would provide an extrinsic motivation (Walton 2005) for students to attend the workshops. It was originally envisaged that the assessment would be summative, however, it eventually became voluntary and a formative method of assessment. Several forms of assessment were considered: short paper question and answers about the Library and information resources; production of bibliographies; and creation of portfolios that outline how a student carried out a literature search (Swinney 2001). PIRES were concerned about over assessment and marking load. It was therefore agreed that the students information searching skills would be assessed online using Questionmark Perception.

### **Putting it into practice:**

PIRES and the Library agreed learning outcomes for the Library input into EUB608. It was originally envisaged that the Library would teach the students face to face, provide supporting material online and that the short test would be compulsory.

Supporting material was placed on Learn and covered:

- Formulating a search strategy with particular emphasis on combining keywords.
- Searching techniques for particular subject databases.
- Evaluation of information resources. Students were given four book abstracts, which they had to rank for usefulness and justify their answers.
- Ethical use of information including plagiarism and citation.

Reflective checklists were used to encourage students to think how about their own knowledge and confidence in searching for good quality information. Links to the INFORMS tutorials were made, so that students could practice searching 'live' databases in a safe environment.

Although it was originally agreed that the Library would have face to face contact with the students within core module time (an hour's lecture to introduce the subject and the online learning material and then an hour's hands on workshop) this did not happen. The PIRES department was so pleased with the online material that they decided the Library did not need to see the students face to face. Against better judgment the project team agreed. The online course material was promoted to the students (103) by the Internal Examiner for module EUB608. The students were encouraged several times to visit the site and to take the online test. Web page logs show that the online material was most heavily accessed in February and March of 2005, but continued to be used through the semester and the summer vacation. The project team believes that the supporting materials on Learn would have been more heavily used if an introductory lecture had been given by Library staff on the topic.

The project re-purposed an existing question bank of fifty questions. The existing question bank had been designed to test PhD students understanding of the literature search process. The questions were enhanced and changed to meet the needs of undergraduates. To aid learning a variety of question styles was used, e.g. multiple

choice (MCQ); multiple response (MRQ); true or false; fill in the blank; matching; and drag and drop. All the questions received a score of one, except for multiple response questions. Library jargon, such as boolean logic and bibliographic databases were avoided, as the Library wanted to test student understanding of how to find information not their understanding of terminology. Feedback was provided for each question, as well as for the test as a whole.

New questions, 28 in total, were added to the question bank. The new questions were designed to assess specific learning outcomes, skills and subject knowledge of PIREs students. Inspiration for the new questions came from other UK institutions (University of Leeds, Leicester University and the Open University) for which permission was sought and granted. The SAILS project (Thompson 2005) would have been happy for the project to re-purpose their questions as long as they were not made publicly available on the web. As the results of this project are going to be made available via the HEA-ICS website it was decided to remove their questions from the publicly available question bank.

The lecturer was very concerned about over assessment and the length of time the test would take to be completed. It was felt that students should have the opportunity to undertake a "bite size" (Robinson & Nelson 2002) test that would not take a long time. Ten questions were presented to the students. The system randomly choose the ten from the question bank. A random presentation of questions was deliberately chosen so that if students re-took the test, their knowledge rather than memory of questions would be assessed. The project team decided that students would not be able to see the feedback for each individual question until they had completed and submitted the test. There were concerns that some of the feedback would provide clues to the answers to other questions in the question bank. At the end of the test formative feedback provides links to appropriate learning materials on Learn.

The online test was created and delivered using Questionmark Perception in the second semester of 2005. The students were given the whole semester to take the test. There was no time limit set for the test, so students could take as long as they wanted to complete it. As the test was designed to be both summative and formative to encourage self-reflection, there were no restrictions on how many times students could take the tests. The test was accessed thirty times but only completed by nineteen students. The department was asked to chase the students on a regular basis, but as neither the completion of the online material or the tests were compulsory the students decided to concentrate on what gave them course marks.

The target module (EUB608) was delivered in the second semester, therefore the project was unable to re-deliver the test within formal teaching time. To compensate for this the PIREs department agreed that the original cohort of students on the module could be approached to re-take the test. Of the 105 students registered on this module 20 students re-took the test. Surprisingly a large number of students (over 300) from other departments took the test without it being advertised them including those from the Chemistry Department and several Engineering Departments.

QMP generates reports so that lecturers can review how many questions a student has taken and the answers given. Comparisons can be made between a student's answer against a particular question and their performance in the whole test. On average the test took six minutes to complete. The scores obtained by the students are not comparable, as the test presented random questions of variable marks. If the project were to be repeated, the team believes the same questions should be presented so that a comparison of comprehension and scores can be made. Most students scored just under or over 50% and tended to find multiple response questions more difficult. Students also found the short answer questions relating to truncation hard. The project team believes this is because the students did not understand the concept. This reflects classroom experience at Loughborough University. QMP also provides data on the frequency of correct versus incorrect responses as well as an individual student's performance across the entire test, that can be used to ascertain the level of difficulty of a question.

The project team analysed the reports and based on the results the project team:

1. Enhanced a fifth of the original questions by making them less ambiguous.
2. Ascertained levels of difficulty of each question. The project team is now considering whether harder questions should have a higher score.
3. Mapped the learning outcomes of the course and the SCONUL seven pillars (1999) to the questions. Therefore they should be more accessible to the wider HE library community.
4. Refined the test and added 28 questions to the question bank.
5. Allocated metadata to the entire question bank on Bloom's Taxonomy, SCONUL's Seven Pillars of Information Literacy (1999) and the name of the originating institution.

Attempts were made to obtain reflective feedback from a sample of students via a focus group. Despite the offer of incentives, such as £10 printer credits, as well as several reminders from the Library to the main contact person within PIREs, the students failed to attend the focus group. This was a very disappointing aspect of the project. After consultation with the department it was decided not to attempt to hold another focus group.

The project team produced a web-based questionnaire as another means to obtain feedback; unfortunately just two forms were submitted despite several reminders from the staff member in PIREs and the Library. Therefore the data obtained from the questionnaires are not statistically reliable and very few inferences can be drawn.

#### **Issues and debates:**

1. *Online tests only assess student knowledge not comprehension.*

Swinney (2001) argues that library tests normally only assess knowledge not comprehension. However, we would argue that this is not necessarily the case. If questions are designed to assess learning outcomes and are worded carefully, they can test understanding and application. It is easy to equate multiple choice questions with simply testing declarative knowledge. These are certainly the easiest to draft. However, according to Haladyna (1997) it is possible to craft more challenging questions, even using multiple choice questions that test higher level cognitive skills, such as problem solving and critical thinking skills. A couple of examples in our question bank of questions in the MCQ style are:

“What is the best reason for undertaking a cited reference search?”

- Find related articles
- Find more recent articles
- Find out how popular the author is
- Find more articles by the same author

“You want to find out about globalisation and its effects. You search on globalisation and get thousands of results. What do you do next?”

- Add more keywords
- Choose a different database
- Skim through the list to find relevant results
- Search on globalization with a ‘z’

An example in the true / false style:

You are starting your research for your dissertation on corruption in sport. Your best course of action is to visit your favourite search engine(s), try a few searches to get a feel for what it is out there and then work out ways to limit the number of results.

- True
- False

An example in the text match style:

Wildcards are a useful way to search for both UK and US spellings. A typical wildcard character is the “?” symbol. How would you use a wildcard to find articles containing organisation and organization?

*2. Online tests only use multiple choice questions (MCQ).*

In QMP over 15 different types of questions can be created. Descriptions of the different question types can be found on the QMP website (Questionmark 2006). The project team noted the heavy reliance on the MCQ type within other information literacy question banks and was keen to incorporate a variety of question types. This variety is both more interesting from an authoring point of view as well as for the student learning experience. As of March 2006, around half of the questions in the question bank are of the multiple choice question type, just over a quarter are multiple response questions and just under a quarter are of other styles including drag and drop, matching, true /

false, short answer and gap-fill. The project team do have plans to add a greater variety of question types to the question bank.

3. *Do students do anything that is not formally assessed?*

The project has found that students are reluctant to undertake work that is not part of core teaching or count towards their degree.

4. *How helpful is linking the learning outcomes to the SCONUL Seven Pillars?*

The SCONUL seven pillars are widely recognised and used by practitioner librarians in the higher education sector. Therefore linking to the pillars should make the questions more accessible to the wider community. However, the project team did find it difficult on occasion to allocate a question to a particular pillar, as the team did not always agree with the descriptions of certain pillars (SCONUL 1999). For example, the project team would argue that the use of boolean logic, wildcards, truncation and limitors such as date fit more neatly under pillar 3: The ability to construct strategies for locating information. Where as SCONUL would place questions on this topic under pillar 4: The ability to locate and access information. Other libraries also seem to have experienced difficulties in transferring the pillars to face to face teaching and have adapted them to their needs.

The project team recognises that CILIP also have a definition of information literacy with eight key areas. To make the question bank more accessible and relevant to all library communities, the project team are considering whether to add these to the tags field.

5. *How easy is it for librarians to create online tests and to use QMP?*

Creating quality questions was harder than first anticipated. Writing meaningful questions and answers was both taxing and time consuming. Webber and Johnston (2003) argue that multiple choice questions should not be used to test higher order questions and it is true that the project team found it easier to design factual questions testing knowledge than good quality questions testing cognitive and critical thinking skills.

Using QMP for writing multiple choice questions is relatively straightforward, but careful consideration must be given to ensure sensible distractors are provided. The scoring algorithm is simple as the author can allocate whether a correct answer receives one or more marks. More complex variables can be attempted such as deducting scores for incorrect attempts although the project team recommends that interested parties ensure that appropriate IT support is available before moving beyond the 'default settings'. Writing multiple response questions is far more challenging and the project team believes many librarians would find this rather too complex without IT (ie learning technologist) support. The key is to source an existing scoring template for questions where for example 3 out of 5 answers are correct (or 4 out of 6 and so on).

Similarly attempting other styles of questions, for example, drag and drop, can prove more difficult than at first sight and it is crucial that librarians have appropriate support for this. Without that support the project team would have been unable to create

questions in styles other than multiple choice. Librarians without IT support may wish to explore alternative online testing programs such as the HotPotatoes range of quizzes. These are extremely straightforward to use but have the drawback that scores can not be stored.

An element of QMP to which librarians will particularly relate is the indexing of questions. For example, questions can be assigned “tags” which can be Bloom’s level, a level of difficulty (as determined by a program called ?) or any desired keyword. The project team assigned tags corresponding to the Sconul Seven Pillars (1999) as well as tags which identified the originating institution.

**Resources:**

Hot Potatoes  
<http://hotpot.uvic.ca/>

Project SAILS Standardized Test of Information Literacy Skills  
<https://www.projectsails.org/>

Questionmark  
<http://www.questionmark.com/uk>

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