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Evidence Based Librarianship and Information Literacy: an experience at the University of Parma (Italy)

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ABSTRACT

Evidence based librarianship(EBL) is a suitable framework and a powerful tool for developing information literacy learning activities tailored on students' changing needs and skills. At the University of Parma a traditional bibliographic instruction programme had been offered to students from 2001. The learning outcomes being considered unsatisfactory by teaching librarians, a piece of research, grounded in the principles of EBL, was started.

After an analysis of students' learning needs and a wide literature review, a prototype learning activity was designed and delivered to a homogeneous group of students, involving them in individual and group work with the aim of favouring a «deep learning» approach, fostering students' reflective thinking and self evaluation. The learning outcomes of participating students were analysed and assessed.

On the basis of these findings, a new model of Information Literacy course was designed. Contents, activities and teaching methodology were defined following the evidence of students' response to the prototype activity. The course was delivered at the Faculty of Pharmacy and at the Communication Studies Degree Course in different situations and to non-homogeneous groups of students.

Three methods were chosen in order to assess the suitability of the new teaching model.
1. One pre-test/post-test was administrated to students in order to verify the occurring improvements in knowledge and skills.
2. The evaluation of a group activity, requiring students to do a small piece of research and to present it to the class, put in evidence their attitudes towards the research process.
3. A final questionnaire was administrated in order to evaluate students' satisfaction.

The paper is focused on the research-practice spiral of this experience. EBL demonstrated its suitability as a method which, bringing together research and teaching practice, makes it possible to develop information literacy educational activities and to provide data for further research.

1. Introduction

Information literacy (IL) is becoming an important focus of academic libraries. In most Universities all over the world, librarians are in charge of organising and delivering IL learning activities. These activities aim to support students in becoming able to recognise and identify their information needs, select and use appropriate information sources, locate documents, understand and interpret contents, evaluate and communicate findings (Association of College and Research Libraries, 2000).

The most recent debate emphasises the need to put the research process at the core of IL educational activities, offering students the opportunity to test and try library research tools in a meaningful, subject-related framework, and to acquire knowledge and skills valuable in different contexts (Kuhlthau, 1993; Bruce, 2002).

Information literacy education in fact, is being increasingly considered something more than the ability to access and use information search tools; rather, it is viewed as a "catalyst" (Bruce, 2002) that can empower students' learning. The cyclical, recursive nature of the research process promotes the development of higher order thinking skills, encourages critical reflection and fosters personal awareness, supporting individuals to engage themselves in self-directed learning (Breivik1989; Snavely and Cooper, 1997).

In the field of information literacy, librarians have therefore the opportunity to go beyond users' training activities and to assume a more educational role, demonstrating their actual and potential contribution to students' learning: an integral involvement in the teaching functions of the University is becoming a strong imperative for academic librarians (Rader, 1997).

At the same time, effectiveness in this role requires the convergence of pedagogical knowledge, together with information expertise. On one side, librarians must recognise the importance of understanding the language of pedagogy and of engaging with curriculum issues, ensuring that they have educational credibility. On the other side, they must produce research evidence of their teaching activity, proving that information literacy education benefits both teaching practice and learning outcomes (Hardesty 1999; Dennis, 2001).

Evidence Based Librarianship (EBL) is a means to develop librarians' professional knowledge and practice: it offers a systematic approach for introducing innovations in teaching, providing librarians with opportunities to gather evidence about their own practice and to reflect on this evidence, with a view to changing future activities. The EBL approach moves research into practice and daily routine, merging scientific research with the pressing need to solve practical problems (Eldredge, 2002). EBL also encourages the collection, interpretation and integration of valid, important and applicable user-reported and research derived evidence (Booth, 2002).

Among the domains to which the EBL approach can be applied, IL education represents a particularly favourable framework, both to collect data about teaching practice and to implement follow-up strategies. During their daily work librarians have the opportunity to observe students and verify the impact of IL initiatives and activities and to acquire users' perspectives on library services.

The present contribution aims at presenting and discussing an experience of Evidence Based Librarianship in the field of IL education.

A research-practice spiral has been developing starting from an existing Bibliographic Instruction Seminar, being delivered at the University of Parma from 2001. The purpose of this study is to develop and improve this experience in the light of the following issues:

- Learning outcomes showed by students participating in the existing activity
- Students' expressed learning needs and expectations
- Educational and library professional literature related to IL

Moreover, we aim at starting a more rigorous approach both to teaching and to the assessment of teaching itself. This approach seeks to put together enquiry, practice, reflection on practice and sharing of experience among teaching librarians.

The project was grounded on the principles of EBL and Action Research. These two approaches have more than one contact points, as Childs and Dobbins (2003) pointed out.

- Both EBL and action research aim at founding practice on research findings and to share with other practitioners the outcomes of enquiries as well as the critical evaluation of methods and techniques (Eldredge, 2000; Stringer, 1999).
- In EBL and in Action Research the researcher plays the multiple role of enquirer and practitioner: this represents an opportunity for a deep analysis of the research context, which tunes into users' culture and values (Elliot, 1991; Marshall, 2003).
- Reflection on current practice is considered both a starting point for enquiry aiming at organisational development and an evaluation technique stimulating further research (Larrivee, 2000; Crumley and Koufogiannis, 2002).

Our project, which is still in progress, can be divided, until now, into four phases.

Phase One	Spring 2004	Outcomes analysis of the Bibliographic instruction activity being carried out at the University of Parma
Phase Two	July 2004 | December 2004	Design and delivery of a prototypical Seminar. Analysis and assessment of its impact on participating students.
Phase three	December 2004 | | April 2005	Design and delivery of a new version of the Seminar delivered in two different "standard" situations: • The Seminar for Pharmacy students • The Seminar for Communication Studies students
Phase four	December 2004 | June 2005	Analysis and assessment of new Seminar outcomes and identification of further possible improvements

In this paper the first and second phases of the project are simply sketched, the focus being on the new type of Seminar, planned and designed in co-operation between the three of us, on the basis of what emerged from the prototypical activity.

We can define this study as a "cohort study", as it presents three essential components of this method, following Eldredge definition (2002):

- a defined population: two different, non-homogeneous groups of students (Pharmacy and Communication Studies)
- an exposure to a phenomenon suspected of causing a change in the population: the new type of IL learning activity carried out at the University of Parma in two different contexts.
- an observable outcome: the results from the Seminar, both as learning outcomes and as research findings.

2. Background and previous experience at the University of Parma

The University of Parma is located in the North of Italy. It is classified among the medium-size Universities and is organised in 11 Faculties and 43 Departments, with a teaching staff of about 1,100 people and a technical staff of approximately 1,000 people. The University offers more than 60 degree courses, 32 master courses and 44 PhD for about 30,000 students.

The University Library System is constituted by 6 Faculty libraries and 20 Department libraries, which altogether hold a stock of about 1 million books and 6,000 printed journals, recorded in the OPAC. In addition, a considerable number of electronic resources were added to the University libraries collection in recent years: about 70 databases and more than 4,000 e-journals (accessible through a database) are available via the University network to all users.

Since 2001 librarians at the University of Parma have been offering a bibliographic instruction learning programme named "Dalla biblioteca alla rete" (From the library to the Net). This was included into the *curricula studiorum* of several degree courses with the attribution of two credits (ECTS).

The Seminar, lasting 15 hours, offered five class activities (3 hours each) and involved groups of 20-25 students. The learning contents were: online catalogues, bibliographic electronic databases, electronic journals, Internet and the Web, citing rules. The class activities always took place in IT laboratories and, though centrally co-ordinated, were organised by different librarians; a lecture on a single research tool was followed by some demonstrations and individual hands-on activities.

Students were administrated a final test, requiring to do a simple bibliographic search on a stated subject, using those research tools they had been presented during the course. Students' feedback was obtained through a simple questionnaire related to organisational issues and to their perception of their own improvement in knowledge and skills.

3. Phase one : Outcomes analysis

Although the project "From the library to the Net" can be considered a good starting point for the introduction of an official IL activity at the University of Parma, both librarians and students identified some critical aspects in the organisation of the learning programme.

On the basis of the analysis of students' individual tasks, it appeared that most students participating in the Seminar, at the end of the activity were able to:

- understand the main purpose and characteristics of different search tools;
- access and use the University of Parma OPAC and some full text databases;
- adopt Boolean operators and truncation characters..

Also the final questionnaire demonstrated students' general appreciation for the seminar and their perception of a progress in searching skills.

However, students' opinion on their improvement did not appear consistent with our evaluation; non systematic observation of students during their activity in the library and informal conversations among teaching librarians highlighted the fact that the positive learning outcomes, verified at the end of the learning activity, did not correspond to a real change in students' attitudes towards their information needs and did not have a real impact on their ability to manage an actual research process.

We observed that students seemed able to access and use single online search tools, but hardly managed to select the most suitable information sources in relation to their needs, to plan an effective search strategy and to link together their findings. After the activity, most students still appeared referring to Google as the unique possible answer to their information needs. Moreover, some students also showed a lack of motivation towards improving their skills.

Our first, provisional diagnosis, identified as possible reasons for the limited success of the teaching activity:

1) The excessive amount of time devoted to frontal lectures
2) The rigid division of contents per topics
3) The focus on research tools rather than on the research process
4) The lack of co-ordination among teaching librarians
5) The delivering of standard courses in different disciplines and learning contexts.

However, this interpretation was mainly founded on impressions and unverified hypotheses; we felt a need to analyse our work in a more rigorous way, with the goals both to identify some possible improvements to our IL activity and to ground our action on research findings rather than on mere subjective impressions. We also intended to start a co-operation based on sharing and common reflection, which could represent also an opportunity for professional development.

4. Phase two : design and delivery of a prototypical Seminar

The prototypical activity was designed and delivered as part of a piece of action research, carried out by one of us, as a Master dissertation. The action research project involved a group of 25 students attending the Environmental Sciences degree course. They were offered an experimental programme grounded in the principle of reflective learning and "embedded" into the Ecology course. Students' knowledge, skills and attitudes towards information resources as well as their experience of the research process were investigated before, during and after the learning activity. The impact of the learning experience on students and the changes occurred in their perceptions and attitudes were analysed. The approach to the action research experience was a qualitative one and the methods chosen for the analysis of students' experience and learning were focus groups, individual in depth interviews and analysis of students' tasks.

The learning activity itself was founded on the principles of active learning, co-operative learning and problem-based learning. The core of the learning experience was a research group task that students were required to carry out during the Seminar and the contents related to the use of research tools were presented in relation to students' group task, thus focusing the whole activity on the research process.

The outcomes of the learning activity can be summarised as follows:

- At the end of the prototype Seminar students appeared able not only to access online search tools, but also to connect and to use them in a flexible way, managing an actual research process in an effective way.
- The team work stimulated students to engage themselves in their task.
- Students appeared encouraged to apply critical thinking skills to retrieved information, discriminating among information resources according to their reliability.
- A follow-up activity demonstrated that students, after two months, were keeping the acquired competence.

In general the prototype activity demonstrated that the focus on the research process and the group work are winning strategies for encouraging students to adopt a "deep learning approach" (Ramsden 1992; Laurillard , 2002) which favours the acquisition of long-term competence.

Moreover, we found evidence of the suitability of the enquiry/practice approach and felt encouraged to go beyond these first positive results, trying to apply the findings of this phase in a different, standardised situation.

2.3. Phase three: The Seminar in two Standard situations

On the basis of the results of the prototype seminar, it was decided to export activities and methods into some courses that were to be started in the academic year 2004/2005 and to analyse the impact of this different approach on participating students.

The main goals of this project were

- To verify if teaching methods based on team work and focusing on the research process could be successfully adopted in standard situations.

- To found the assessment of the teaching activity on more rigorous and measurable evaluation criteria.

The Standard situations chosen for our experiment were the Faculty of Pharmacy and the degree course in Communication Studies.

Since 2002 Pharmacy students have been offered an IL seminar, as an optional activity attributing two credits. The teaching librarian is officially in charge of organising and delivering the Seminar and of assessing students' learning. This context appeared as suitable to the implementation of an experimental project.

The Digital Publishing course (Communication Studies Degree) was chosen as a typical situation in the context of the Faculty of Humanities, with a high number of students enrolled. The course teacher appeared highly interested in integrating an educational IL activity in the context of the subject teaching. The learning plan in fact required students to work in groups and to carry out a piece of research on a pre-defined topic related to Digital publishing. The group work had to be presented to the class and was to be assessed by the teacher as part of the assignment for the final examination. The IL seminar was inserted as a preparatory activity to the group research task and appeared therefore "embedded" into the Digital Publishing course.

While planning the Seminar, we founded the learning activity on some basic principles:

1- Focus on the research process.

The activity plan was built around a group research task that students were required to carry out during the Seminar. Students were supposed to use the search tools presented during the class activity in a research context, which required the definition of a search strategy, the application of critical thinking and self evaluation skills. Team-working with peers is one of the most powerful means of educational and cultural growth and is therefore adopted in most IL educational programs: co-operation allows the expression of different approaches to problems, developing a reflective and flexible attitude (Sheridan, 1990; Pintrich, 2002).

2- Motivate students

In order to foster students' involvement and to encourage them to critically assess their own approach to an information problem, we required students to present the results of their tasks to the whole class. Presentation is an important means to foster students' awareness of their competence and to stimulate reflection on different ways to deal with a problem. Students have to communicate and defend their work, strategies and decisions. This helps to develop objectivity through the analysis of own and others' performance and the comparison/assessment of different results (Tsui, 1999; Magin, 2001). The final presentation was also likely to foster students' involvement in the learning activity.

3- Few contents and learning material

The contents to be presented during the class activity were reduced, leaving time for individual practice and group work. However, in order to provide students with the information needed to manage their piece of research, we prepared some booklets containing the main features of each research tool, together with "searching tips" and examples of research strategies. We also added some leaflets about presentation skills, the use of Power Point, and the most important citing rules.

4- Involve students in revision and contextualisation of their learning.

In order to encourage students to engage themselves in learning and practice presentation skills, they were required to revise and synthesise each morning what had been learned the previous day and to present it to the class.

It was clear that these four principles, on which our teaching plan was founded, had to be applied in different contexts, and that the organisation of the activity had to be tailored on students' different backgrounds. As a consequence, the seminar for Pharmacy students, which mirrored the prototypical activity delivered to Environmental Sciences students, was organised in a very similar way: students were offered a quite traditional model of Seminar, with class activities consisting in lectures, demonstrations, hands-on individual activities and the group work taking place each day in IT laboratories. On the contrary, the seminar for Communication students was embedded into the course of Digital publishing. The high number of students attending the class (around 70), the impossibility to offer practical activities in IT laboratories for all topics to all students, the lower number of available hours (8 instead of 15), and the need to accord the course activity with the class schedules, had some important consequences on the course design.
The table below summarises the main features of each programme and the related learning activity, highlighting the main differences between the two contexts.

Pharmacy	Communication studies
Participating students Two groups of 21 and 33 students Non-homogeneous groups (students enrolled in different degree Courses and attending 3. 4. and 5. course)	**Participating students** One group of 69 students Homogeneous group (students attending the course of Digital Publishing)
Time 14→17 December 8→11 March 16 hours of class activity, divided into 3 lessons (4 hours each) and one final presentation	**Time** 24 February→ 23April 8 hours of activity, divided into one lesson (four hours) and two students' presentations
Setting Lessons in IT laboratory: one PC each student	**Setting** One lesson in IT laboratory (one PC each student) Presentations in equipped classroom (PC for teacher and presenting students)
Context Two seminars, not embedded into any course of the Faculty of Pharmacy	**Context** Seminar "embedded" into the course of Digital Publishing. Contents and activities negotiated with the teacher. Students' group work assessed by the teacher
Contents: Know-item search: OPACs and e- journals Subject search: Databases (PubMed, Current Contents, ScienceDirect) The Web : Search engines, subject directories	**Contents** Know item search: OPACs and E-journals Subject search: databases (LISA, Emerald, ScienceDirect) The Web. Search engines, subject directories
Activity Class activity: lecture, demonstrations, individual hands-on activities. One hour each day at students' disposal for their group work.	**Activity** Students divided into three groups according to their interest towards the group task subject. Each group participated in only one class activity 1. group : Know-item search 2. group : Subject search

Final day: group presentation	3. group : The Web Three parallel class activities took place the same day in different IT laboratories, consisting in lectures, demonstrations and hands-on activity A week later each group presented to the whole class the contents learned during the class activity. After this first presentation, the groups started to work on their piece of research on Digital Publishing issues. The final day of the course the three groups presented their tasks to the class and to the teacher.
Methodology Quite traditional, even if interactive. Students were offered frontal lecture, practised their skills in a class situation with the support of the teacher and worked in group at the end of each lesson, with the presence of the teacher	**Methodology** Students were much more involved in self directed learning. Apart from one class activity they had to "drive" their work, both individually and in group. A virtual class environment (Nicenet) was adopted to deliver material, send notices and for the teams to share progress and discuss problems.
Team task Students were required to prepare and present an annotated list of about ten information resources, regarding one of the mentioned topics, employing the research tools illustrated during the lessons. They were allowed to choose their presentation tool: Power Point, Word …..	**Team task** Students had to prepare and present a piece of research about the chosen subject. Together with the annotated list, they were required to synthesise the contents of their reading and a critical account of the chosen topic They were required to use Power Point slides
Students teams 5-6 people each	**Students teams** 20-25 people each
Team task subjects: Students were allowed to choose one among the following subjects, according to their interest, for instance: doping and sport; relation between cancer and diet therapy; nutrition disorders and adolescents; children and obesity; food allergies; acne and	**Team task subjects** Students were supposed to deepen, through their research tasks, the main topics presented by the teacher during the Digital Publishing Course • Metadata • Preservation of digital content

alternative medicine; relation between hypertension and diet therapy.	• Economic issues about digital publishing
Learning material The booklets were printed and given to students each day at the starting of the activity	**Learning material** The booklets were stored on the institutional repository (DSpace) and students were invited to download and print them on their own

6. Phase Four: Analysis of findings

6.1. Assessment methods

Since this study aimed at improving our teaching activity, it required to find suitable techniques for extracting evidence from our practice. In particular, we needed some instruments that could allow us to:

1. Assess students' learning and improvement in knowledge and skills
2. Evaluate the impact of the learning activity on students' attitude towards the research process
3. Verify that students had experienced the whole activity itself as a positive learning opportunity

For each of these objectives we chose one method, following the literature findings and adapting different techniques to our own context.

6.1.1. Assessing students learning

A pre-post test was chosen as a technique suitable to verify students' knowledge before the activity started and to compare their performance at the end of the Seminar. We defined 17 questions with multiple answers, relating them to the contents that were to be treated during the activity: OPACs, Scientific Journals, Databases, the Web (Appendix 1).

The pre-post test offers the opportunity to code and analyse in an easy way students' responses and therefore to measure their performance in terms of "scores" (D'Angelo, 2001; Palmer and Tucker, 2004).

The pre-post test results were analysed comparing students' performances before and after the activity. We also analysed each question, verifying the level of improvement for each topic treated during the Seminar. We finally compared the different groups: the two groups of Pharmacy did not show any difference and so we considered them as a unique group (54 students) comparing it with the Communication Studies group (69 students).

6.1.2. Assessing students' attitude towards the research process

The ability to manage a research process was to be assessed trough the group activity. Students had to demonstrate not only the suitability and pertinence of information sources selected, but also to present their research process and to defend and justify their working method. We decided to assess their work taking into account both the type of resources chosen, the research strategy adopted and the presentation skills. Since all of us assisted at the group presentations, we had the opportunity to validate our assessment, sharing our impressions and comparing different points of view.

6.1.3. Students' experience of the learning activity

We carried out a questionnaire survey among the students attending the seminars, with the purpose of gathering their impressions about the whole activity and identifying issues to be further investigated through focus groups. Only open ended questions were included, because they seemed likely to provide more personal and meaningful responses, and facilitate students to express some unforeseen issues. We chose to focus on a few topics, so that students had the time to reflect and could feel encouraged to provide articulated answers. The questions focused on students' interest towards the topics presented during the seminar, positive and negative aspects of the activity as a whole, experience of the team work, quality of teaching, quality of learning materials, and possible improvements. The questionnaire was administrated to students during the last day of each Seminar (Appendix 2). Since some students did not return the form, we had a response rate of 92.8 % for Pharmacy and 95.6% for Communication Studies. All the questionnaire responses were transcribed, coded and clustered.

Two focus groups with Pharmacy and Communication students were planned with the aim of encouraging students to compare their opinions and share their feelings through questions more related to their impressions towards the learning experience: feelings related to the group task, interpersonal relationships and expectations not completely satisfied. Since unfortunately it was not possible to fix a date for the second group of students, we carried out only one focus group with Pharmacy students. The meeting took place a week after the activity had ended, with the participation of five students. The discussion was tape-recorded and transcribed. The analysis was made in the light of what had emerged from the questionnaires.

6.2. Findings

6.2.1. Improvement in students' knowledge: Findings from the pre-post test

From the comparison of pre-test and post-test scores, all students appeared having decisively improved their knowledge about information research tools.

In particular, Pharmacy students passed from 59% of right answers before the course to 88% after the activity, while Communication students started from 64% of right answers before, to 81% after the activity (Tab. 1) .

Pharmacy			**Communication studies**		
	Scores /Total	**%**		**Scores /Total**	**%**
Pre test	514/918	59	Pre test	754/1173	64
Post test	805/918	88	Post test	947/1173	81

Tab. 1

It appears quite evident therefore that Communication students probably had some more knowledge and experience of the library and online search tools, but did not take the same advantage from the learning activity, as Pharmacy students did (Fig. 1).

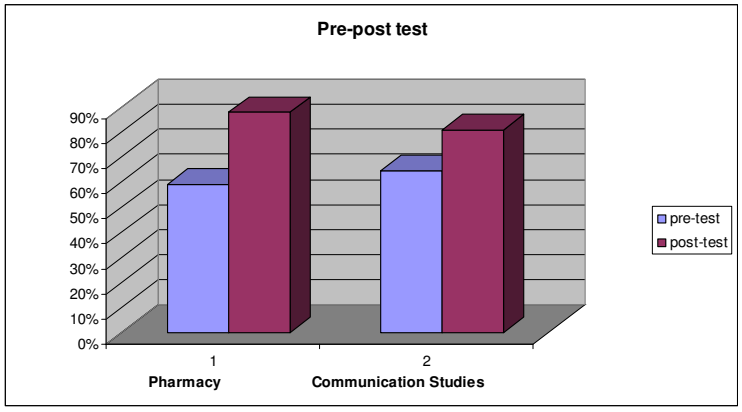

Fig. 1

Table 2 summarises the results for each question in pre and post tests for Pharmacy and Communication Studies (CS) students.

Results from pre-post test																		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
	Pre	72%	56%	31%	67%	63%	61%	70%	89%	11%	13%	93%	89%	37%	24%	67%	81%	78%
PHAR																		
	Post	94%	87%	93%	94%	94%	94%	98%	83%	70%	96%	94%	98%	91%	63%	87%	61%	91%
	Pre	78%	59%	29%	54%	94%	54%	80%	67%	12%	72%	90%	83%	83%	28%	62%	68%	81%
CS																		
	Post	86%	94%	71%	75%	97%	84%	94%	84%	33%	97%	87%	96%	91%	61%	71%	52%	99%

Tab. 2.

It is possible to observe some visible differences between the two groups of students in relation to some topics (Fig. 2.)

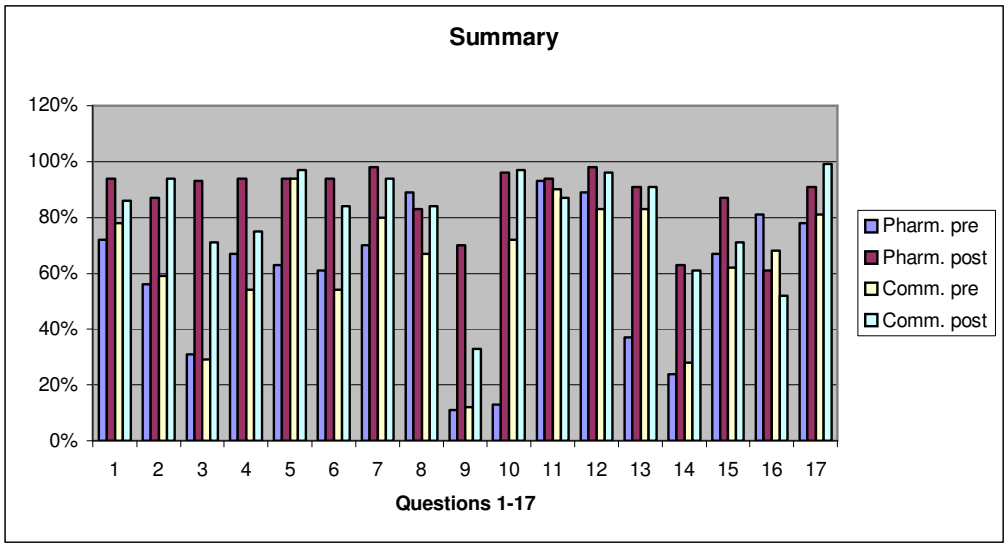

Fig.2

For instance, in question 1 – related to the location of a book- Communication Students appeared more informed on the use of the online library catalogue just before the starting of the activity (78%). If Pharmacy students were less informed about this topic (72%), they took full advantage of the lesson on the library catalogues, since their correct answers after the Seminar had a score of 94%, higher than Communication students' one (86%).

Both groups of students found it difficult to answer to question 3, related to the location of journal papers through the Online library catalogue. Only 29% of Pharmacy students and 31% of Communication students were able to identify the correct answer. However, Pharmacy students showed a higher level of improvement after the Seminar (93%), in comparison with Communication students (73%).

Communication students appeared more skilled in interpreting another type of citation, related to a book section, just before the Seminar. 94% of them gave the right answer to question 5, just before the Seminar (97% afterwards), while only 64% of Pharmacy students appeared skilled before the activity (94% of right answers afterwards). This question is quite emblematic of the higher level of competence of Communication students just before the Seminar, in comparison with Pharmacy students.

In most questions there was a visible improvement in both student groups, in particular in questions 3 and 6 (related to electronic journals).

In question 9 (about bibliographic databases), both groups showed quite a low level of knowledge before the Seminar (11% Pharmacy students and 12% Communication students). However, while 70% of Pharmacy students provided the correct answer after the Seminar, only 33% of Communication students did the same.

In question 16 (related to the quality of Internet resources) students appear having worsened their performance (form 81% to 61% for Pharmacy students; from 68% to 52% for Communication students). Actually, this question appears as incorrectly formulated and probably students were disoriented. It is also possible that this issues had not been treated clearly enough during the lessons.

In general, we can state that both groups have taken an advantage from the Seminar.
While Communication students started with a higher level of information and knowledge before the Seminar (10.92 correct answers mean before the Seminar and 13.72 afterwards), Pharmacy students showed a greater improvement and appeared as taking the most of this learning experience (10.1 correct answers mean before the Seminar and 14.9 afterwards.) (Tab. 3)

Pharmacy		**Correct answers**	**Students**	**Mean**
	Pre test	541	54	10.1
	Post test	805	54	14.9
	Improvement			**4.8**
Communication				
	Pre test	754	69	10.92
	Post test	947	69	13.72
	Improvement			**2.79**

Tab. 3

Figure 3 summarises both the initial level of competence, the final performance and the improvement of the two groups of students.

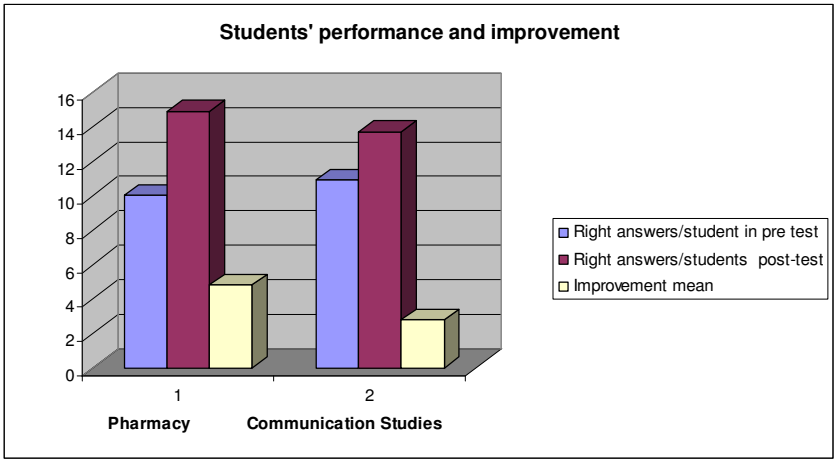

Fig. 3.

6.2.2. Students' attitude towards the research process

Pharmacy

In general, Pharmacy students gave high-level presentations, demonstrating a good comprehension of all the opportunities showed during class activities and using a great variety of information

sources. The aim of the final work (to carry out a bibliographic search on a topic) was generally clear to all groups.

Most students showed a good understanding of the different value of the research tools; for instance, several groups started their searches from databases and demonstrated a conscious and effective use of limits, Boolean operators and truncation symbols. They generally mentioned authoritative documents and showed a clear understanding of the difference between scientific and popular information sources.

Only few groups presented works of inferior quality, someone focusing the research only on contents, someone else evincing a partial use of the tools explained during the lessons.

Some groups used a simple Word document to expose their searches, because they didn't know the Power Point programme; on the other hand, the graphics of several works was more precise, because some groups (course of March 2005) had the opportunity to take advantage of a leaflet (distributed at the beginning of the course) about the use of Power Point, advantage they welcomed with interest.

Pharmacy students really appreciated the experience of team work; they successfully collaborated in group, organising a division of the tasks among the participants. They also revealed a great enthusiasm in presenting their final piece of research to the class; during the debate following presentations, students generally defended their choices with consciousness, also demonstrating attention and skills in evaluating their colleagues' works.

Communication studies

The three groups of Communication students presented well-constructed and organised works and demonstrated to have invested huge efforts in this activity.

However, they did not show to have taken advantages of all the opportunities offered by the Seminar. First of all, the presentations were mainly focused on contents and only marginally mentioned the information sources and tools. Students did not seem to have fully realised the importance of information resources in the context of a research task. Moreover, each group appeared to have mainly used the research tools analysed during the class activity they attended. For instance, the best performance was the one carried out by the group 'Preservation', which mainly cited articles retrieved from bibliographic databases. Subject search was the topic of the class activity they attended. On the contrary, the group who did a research about 'Economic aspects of digital publishing' emphasised the use of Internet as information resource. They attended a class about search engines and the Web. Asked about the criteria followed for selection of information resources, students declared they used the most easy and fast tools, and complained about the difficulties to retrieve information on their topic.

Students in CS had a more complex task than Pharmacy students: not only they had to retrieve information and present a list of resources, but also to summarise findings. Although it was possible to argue from their presentations that the topic was discussed and negotiated among the group members and it was developed following a plan, the results were partially deceiving. Two groups revealed to have not fully understood their topic, since they included issues not pertaining to it and instead ignored relevant aspects. If during the discussion they complained about the complexity of the topic and the difficulty to manage research in large groups, it seemed that they also were not effective in selecting suitable information sources, defining appropriate keywords, and identifying authoritative papers.

CS students were effective in defending and justifying their work during the presentations. Not only they seemed to have successfully applied the techniques and hints about doing effective presentations, but they also used figures and examples to illustrate concepts, and provided additional materials to integrate their illustration. During the following discussion, they lively defended the value of their work, not only regarding the contents, but also the way of conducting research and the managing of the organisation of team work.

6.2.3. Students' experience of the learning activity. Findings from the open ended questionnaire and focus group

From the open ended questionnaire and focus group emerged a general appreciation for the learning activity as a whole. However, we found some visible difference between the two groups.

1- Students' interest towards Seminar contents

While both Pharmacy and Communication students expressed their interest towards all the topics covered during the seminar, Pharmacy students generally appeared more involved in their disciplinary, professional research tools, in particular databases and specialised subject directories, while Communication students appeared interested in all the information search tools presented, and a great part of them stated their interest towards the Web.

2- Team task

One visible difference between the two groups is related to their experience of the team task. All Pharmacy students expressed their appreciation for this kind of activity and also appeared as enjoying it. Some of them underlined that they are not used to co-operate, since the teaching methods at the Faculty of Pharmacy are quite traditional and team working is not a widespread approach to students' learning. The group work was therefore experienced as something new and fruitful by most students. Communication students instead expressed different opinions about working in group. Most of them stated their difficulty in organising their work, in managing their time and in finding a constructive way to co-operate, also at an interpersonal level. Many of them underlined the problem of dealing with a complex task working in a large group.

3- Approach, methods and techniques

For both groups of students the most appreciated aspect of the course was the opportunity to practice their acquired skills just during the lesson. They also underlined, as a positive feature, the interactive approach to learning contents and the informal, friendly attitudes of teaching librarians. Most students from both groups also emphasised that the hands-on activity and the team task had favoured the development of interpersonal relationships, which has made the learning experience an unusual and enjoyable one.

Pharmacy students showed a particular appreciation for the "revising" activity: both in questionnaire and group discussion many of them underlined how the need to review and present the contents of previous lessons was both fruitful and challenging .

Communication students offered some more critical comments. Some of them complained about the lack of clear goals at the starting of the activity, about some logistic problems, related to a lack of IT laboratories within the Faculty of Humanities and about the problems related to the use of the virtual classroom. Many students showed appreciation for the learning material, but also complained about the need to download and print it. They would have preferred a more traditional way to access it, also because the lack of Pc and printers at the Faculty of Humanities. Communication students also stated that the number of attributed credits was not adequate to the workload and effort required by this activity.

In general Pharmacy students appeared more satisfied and enthusiastic. Even when required to identify some spaces for possible improvements, they showed a proactive and constructive attitude, while Communication students, even if generally satisfied, appeared sometimes willing to be offered more traditional and less challenging activity.

7. Discussion

The findings of pre-post tests seem to indicate that both Communication studies and Pharmacy students obtained a valuable increase in knowledge and skills. Although the data show a difference between the performances of the two groups, one need to consider that students in Communication Studies attended only one lecture and hands-on session. Their performance should not be considered lower than the Pharmacy students' one, as this group was offered the opportunity to attend three hands-on activities under the guide of teaching librarians.

The different level of initial knowledge between the two groups of students seems to have implications on learning programmes. It suggests the opportunity to move from standard courses to more flexible programmes, which should be targeted to existing learning needs in different disciplinary contexts. At the same time, the pre-post test led us to identify the issues in which students showed a more visible improvement and therefore represented an indirect piece of evidence related to the validity of our teaching. Finally, the pre-post test was considered useful to offer an immediate feedback to students: at the end of the seminar, we attributed the scores for the post-test and invited students to compare their performance before and after the Seminar, encouraging them to apply self assessment skills to their own learning. However, it seems that great attention must be paid to formulate questions in order to overcome risks of misunderstanding.

The presentations showed that students were able to apply information skills to a research project, although with different outcomes. The adopted strategy, based on increasing team work and leaving students the time to test and to explore independently the research tools, was proved to provide improvements in learning outcomes. However, the students' works clearly showed that research process is a highly critical aspect for both teaching and learning. Students seem to require time and increased opportunities to experiment the most challenging aspects of the research process, such as approaching an information problem in a systematic way, selecting the most appropriate resources, identifying keywords, evaluating if the results are responsive to their research need. If the annotated list of resources seems to be a suitable task within the context of a traditionally structured seminar, more emphasis in problem solving, research question analysis and research strategy seems necessary in order to support students in performing a research project.

Team task and final group presentations appeared as techniques suitable to motivate students and increase individual involvement, but the number of students in each group should be carefully planned. Otherwise, students might experience team work as a barrier rather than an opportunity.
Similarly, organisational aspects such as available equipment, IT infrastructure, and space should not be neglected within a context of interactive education. For instance, the choice to provide students with some booklets about research tools had positive outcomes for both students and teachers. The first ones had some reference materials at their disposal during the group work, while the second ones were not forced to cover each content during frontal lectures. However, the need to access materials through the DSpace institutional repository was perceived as a complication rather than a facility. Because of the insufficient IT equipment, students in Communication studies would have preferred a more traditional delivery system, such as the provision of printed copies. In order to assess these aspects, more related to students' perception and experience of the learning activity, the use of both questionnaires and focus group was proved to be very effective.

The analysis of data showed that asking students to 'revise' in class the contents of the previous lesson was effective in supporting learning and relating the different topics. However, this activity cannot substitute the lecture but only complete it.

On the basis of our analysis, we are now able to identify a number of changes that we would like to make in our future programmes.

- Pilot testing questions of pre-post tests
- Providing more clear and effective outlines of the planned activity in order to reassure students
- Carefully planning group and individual activities, in relation to the number of students and the available technical infrastructure

- Increasing focus on research process and letting students be more independent in learning research tools through the study of booklets and learning materials
- Experimenting new organisational models for the seminar, such as distributing learning contents within different years. For instance, know-item search should be introduced to undergraduate students during the first year, while the programme for the following years should concentrate on the research process.

8. Conclusions

The main goals of the present research project were

- To verify if teaching methods founded on team work and focusing on the research process could be adopted in standard situations.
- To found the assessment of the teaching activity on more rigorous and measurable evaluation criteria.

The second goal appears as being fulfilled. For the first time from the starting of the Seminar in 2001, we were able to collect some measurable data on students' learning. Even if our assessing techniques are to be perfected, we found them helpful both to acquire a more objective view on students' development and to gain insight on possible change to be made on our learning plan.

As regards the first goal, our objectives were only partially achieved. Team work and process-based approach require a huge investment in time and organisational efforts and must be tailored on different contexts. There is a need to emphasise even more the research process, and to support students in approaching information problems in a more rational and conscious way. This requires to focus on what students find as the "critical" aspects of information retrieval, that is the analysis of the research questions, the selection of suitable resources, the choice of appropriate keywords and the planning of effective search strategies.

Co-operation among teaching librarians appeared as a very fruitful way to compare teaching practice, assess our work and identify spaces for further improvement.

Evidence Based Librarianship revealed to be the right approach for grounding our teaching practice on research-derived evidence and, even if highly demanding in terms of time and efforts, it appears a powerful means for developing librarians' professional knowledge.

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Appendix 1.

Pre-Post test

PRE TEST FOR THE STUDENTS OF THE COURSE
"FROM THE LIBRARY TO THE NET" FACULTY OF PHARMACY
ACADEMIC YEAR 2004-2005

1) You are trying to locate the book "XYZ". In order to verify its availability in one of the libraries in Parma you

   - use Google
   - search the on-line Parma Library System Catalogue
   - search the University of Parma Library Web Pages

2) You are looking for a book which is not available in any library in Parma. In order to locate it elsewhere and consult or borrow it, you

   - search the Web sites of different Italian Universities
   - search "Internet bookshop"
   - search a national collective catalogue

3) You need to locate this paper: "Development of biotechnology education in Turkey". The authors are F. Severcan, A. Ozan and P. I. Harez and the paper is published in "Biochemical education" vol.28, issue 1, pp.1-62 (January 2000). How do you proceed?

   - you search the University on-line library catalogue, type Severcan in the author field and the paper's title in the title field
   - you search the University on-line library catalogue and type the journal's name in the title field
   - you search a Web engine

4) You have to identify the following citation:

Edwards, J.S.A. & Hartwell, H.H. (2002) Fruit and vegetables attitudes and knowledge of Primary School Children. *J. Hum. Nutr. Diet.* 15, 365-374.

Is the citation above referring to:

   - a book
   - a chapter or section in a conference proceedings volume
   - a journal paper

5) You have to identify the following citation:

Grucker, D. (1992) Proton imaging after dynamic polarization
In: Blumich, B., Kuhn, W. (Ed.), Magnetic resonance microscopy. Weinheim [etc.], VCH.

Is the citation above referring to:

- a journal paper
- a book
- a chapter or section in one book

6) You need to know if you can access "British journal of pharmacology" (on-line version) from a personal computer at the University of Parma. How do you proceed?

- you search the database of the electronic journals of Parma University
- you search the on-line Parma Library System catalogue
- you search the Web site of the journal's publisher

7) You have to prepare a paper about "breast tumour's epidemiology". Among the following tools, which is the best choice, in order to carry out a research obtaining valuable results?

- Virgilio (an Italian Web engine)
- a bibliographic database
- the Web site of a foreign University

8) You have an incomplete citation of a paper (you know the author's name and the title of the paper, but you don't know the journal's name and publication year). How do you proceed in order to complete the citation?

- you search the "PubMed Single Citation Matcher"
- you search the on-line Parma Library System catalogue
- you search the database of the electronic journals of Parma University

9) PubMed

- can be searched only from the personal computers of Parma University
- makes available for free all scientific papers
- makes available a thesaurus

10) The MESH (Medical Subject Headings) is

- the scientific society which provides the database PubMed
- a medical database
- a thesaurus

11) You are looking for the Web site of the "British Pharmacological Society". Which is the most appropriate tool to find it?

- a database
- a Web engine
- a subject directory

12) PJ online (Pharmaceutical journal online) is

- an electronic book
- the Web site of an association

- an electronic journal

13) The URL of a Web page can suggest you

- if the page is updated
- if the page is very popular
- the country where the page comes from

14) Read the following sentence and mark if it is true or false

The problem concerning the data coming from the Web is that you cannot always find information about the past

True False

15) Read the following sentence and mark if it is true or false

The URLs can be indifferently written with capital or small letters

True False

16) Read the following sentence and mark if it is true or false

The quality of information provided by fee-paid databases and the electronic journals is better than the one provided by free resources

True False

17) You have to find statistics about cancer in Europe. How could you enter the search terms in a Web engine?

- cancer OR statistics AND Europe
- cancer AND statistics AND Europe
- cancer AND statistics OR Europe

Appendix 2.

FINAL EVALUATION QUESTIONNAIRE
COURSE "FROM THE LIBRARY TO THE NET"
FACULTY OF PHARMACY ACADEMIC YEAR 2004-05

Dear student,

we are very interested in knowing your opinions about the course you attended.
Your impressions and suggestions will be very useful to improve future versions of this course.
So please answer the following questions:

1) Which topic were you mostly interested in?

2) Which topic do you think is most relevant for your studies?

3) Which aspect of the course did you mostly appreciate?

4) Which aspect of the course needs to be improved?

5) Evaluate clearness and effectiveness of the teachers

6) Evaluate the booklets

7) How did you experience the team work?

8) Do you have any other observation?

Many thanks for your kind collaboration!