

# Tele-rehabilitation and e-learning: the HELLODOC educational experience

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**Summary.** A web-based learning activity in the field of tele-rehabilitation was conducted by Istituto Superiore di Sanità (ISS), the Italian National Institute of Health, within the EU project HELLODOC. The activity aimed at training professionals to effectively manage the tele-rehabilitation service. ISS adapted the Moodle e-learning platform and implemented the problem-based learning (PBL) methodology. One clinical and one technical module were prepared by using traditional learning sources as well as interactive tools. Each module included 4 units; each unit was based on a 5-days cycle. The courses remained open from January to October 2006. Fifty percent of the registered students attended the courses. Traditional and interactive learning resources were equally used. Overall feedback was positive, unless for the amount of time requested for the study and the lack of an official certificate of attendance. Both modules are now in the process of being revised, improved and generalised, in order to be integrated into the ISS Rehabilitation website.

*Key words:* distance education, problem-based learning, rehabilitation, telemedicine.

**Riassunto** (*Tele-riabilitazione e e-learning: l'esperienza di formazione di HELLODOC*). Nell'ambito del progetto Europeo HELLODOC, l'Istituto Superiore di Sanità (ISS) ha condotto attività di formazione a distanza nel settore della tele-riabilitazione. L'attività mirava alla formazione di personale specializzato, per la gestione efficiente del servizio di tele-riabilitazione offerto nel progetto. L'ISS ha adattato la piattaforma per e-learning Moodle, ed ha implementato la metodologia del problem-based learning (PBL). Utilizzando sia risorse didattiche tradizionali che strumenti interattivi, sono stati preparati due moduli, uno clinico e uno tecnico, ciascuno formato da 4 unità basate su cicli settimanali. I corsi sono rimasti aperti da gennaio ad ottobre 2006. Il 50% degli studenti iscritti ha frequentato il corso, utilizzando in percentuali simili le risorse tradizionali e quelle interattive. Il riscontro generale è stato positivo, ma sono stati segnalati l'eccessivo tempo necessario per lo studio e la concomitante mancanza di un attestato di partecipazione. Entrambi i moduli sono ora in fase di revisione, miglioramento e generalizzazione, in modo da poter essere integrati nel sito web dell'ISS dedicato alla riabilitazione motoria.

*Parole chiave:* educazione a distanza, problem-based learning, riabilitazione, telemedicina.

## INTRODUCTION

HELLODOC is the acronym for "Healthcare service linking tele-rehabilitation to disabled people and clinicians". The project started on March 2005 as a 18-months European project co-financed by the European Community programme eTEN. It was successfully closed on February 2007 after a 6-months extension.

The primary objective of the project was to validate

the EU market – more specifically in Italy, Spain, The Netherlands and Belgium – for a home-care service. Main aim of the service is to extend the rehabilitation treatment at patient's home under close supervision of the hospital. The tele-rehabilitation service is mainly addressed to neurological patients affected by traumatic brain injury (TBI), stroke or multiple sclerosis (MS).

Basically, it consists of two main apparatuses: an in-hospital based server and a portable unit to be installed at patients' home. The portable unit is an improved version of a prototype of a home activity desk which was developed in the framework of the European Project H-CAD home care activity desk ([www.iss.it/doc](http://www.iss.it/doc)). The instrumented desk allows execution and monitoring of a configurable set of home exercises that professionals may purposely design to improve the main arm functions.

The implementation of an e-learning platform to educate professionals to use tele-rehabilitation apparatuses was a key action of the project. The final goal was intended as a critical action to prepare a generation of professionals to effectively use the HELLODOC service and, more generally, the ICT products purposely tailored for rehabilitation.

To reach the target, ISS and the Roessingh Research & Development, The Netherlands (RRD) adapted the ISS e-learning platform and managed the implementation of the educational programme. The contribution from the other partners of the project – FPING (Fundació Institut Guttmann, Spain), NMSC (National MS Centre, Belgium), PRAGMA (Pragma Engineering, Italy), SITUS (Signo Motus Srl, Italy), UORIN (Unità Organica di Riabilitazione Intensiva Neuromotoria, ASL n. 3, Trevi, Italy) – was essential to prepare both traditional teaching resources and interactive tools like questionnaires.

As a result of the first 10 months of the project, two teaching modules – one more clinically and the other more technically oriented – were prepared. They remained available online from January to October 2006, for both training of professionals – especially those who were directly involved in the project – and validation of their contents and methodology at established centers of excellence (COE).

At the end of the 10-months online period, ISS staff performed basic statistics to assess the quality and the effectiveness of the implemented educational programme. The present paper summarises the main actions performed within the educational workpackage across the whole duration of the project. Special focus is on the results of the final assessment, on feedback from HELLODOC partners, and on indications for improvement and optimization of such an important distance educational experience.

## MATERIALS AND METHODS

### *Basics of e-learning*

E-learning is defined as a powerful means to support, and sometimes to completely deliver, distance learning educational programmes. It covers a wide set of applications and processes such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet, audio and videotape, satellite, and CD-ROM. Even though many organizations only consider it as a network-enabled transfer of skills and knowledge, it typically involves

some form of interactivity, which may include online interaction between the learner and the teacher/tutor, which greatly enhance the learning offer.

The most important e-learning activities are:

- 1) planning meetings, with the participation of both teachers and students, for the exchange of the personal experiences and to tentatively apply previous experience to the specific context;
- 2) individual monitored/guided student research of learning resources and materials;
- 3) individual study on the basis of her/his background;
- 4) problem solving meetings where teachers and students tentatively achieve solutions on the considered topics.

### *The ISS e-learning platform*

ISS is using the Moodle platform (<http://moodle.org/course/>) for the implementation and delivery of distance educational programmes.

Moodle is a course management system designed to help educators to easily create good-quality online courses.

Among its most important “technical” features:

- it runs without modification on the most common operative systems;
- it allows a great deal of flexibility to add (and remove) functionality at many levels;
- it upgrades very easily from one version to the next;
- it requires only one database (and can share it with other applications if necessary);
- strong security is guaranteed; forms are all checked, data validated, cookies encrypted etc.

Among its most important “educational” features:

- it promotes a social constructionist pedagogy (which includes collaboration, activity-based learning, critical reflection, etc.);
- it is suitable for 100% online classes as well as supplementing face-to-face learning;
- it has a simple, lightweight, efficient, compatible, low-tech browser interface;
- courses can be categorised and searched: one Moodle site can support thousands of courses;
- most text entry areas (resources, forum postings, journal entries, etc.) can be edited using a capable, embedded WYSIWYG HTML editor.

### *The HELLODOC e-learning offer: main tools and requirements*

The design and construction of the two teaching modules were based on a reasonable exploitation of the Moodle platform potentialities. A compromise was thus achieved between the opportunity of supporting the students with interactive tools and the need to avoid excessive complexity.

### *E-learning sources and activities*

Moodle is based on *sources* and *activities*.

*Sources* are formed by all those materials the students may read, download and use in a very traditional way. Examples are texts, articles, glossaries, references.

*Activities* are formed by actions the students should do to gain deeper knowledge on the course topics, and to check the level of preparation they have, at the beginning of the course, or have reached, during or at the end of the course. Among these, the following have been chosen and added to the HELLODOC teaching modules:

- planning meetings, with the participation of both teachers and students – professionals to be educated – for the exchange of the personal experiences and to tentatively apply previous experience to the specific tele-rehabilitation context;
- somministration and solving of preliminary questionnaires, to verify that the students' knowledge is sufficient to deeply understand the course contents, and of evaluation questionnaires to quantify the level of preparation the students have reached;
- monitoring and supporting meetings to help the students during their learning process. They are based on the use of chat, forum, and e-mail communication;
- problem solving meetings where teachers and students tentatively achieve solutions on the considered topics. This last point is better explained in the following paragraph.

#### PBL methodology

According to the definition of Tamblin and Barrows [1], "PBL (problem based learning) is the learning process produced by working on the comprehension and solution of a problem". This means that, at the beginning of each learning section, the teacher/tutor suggests a problem with apparently more than a unique solution. The students should learn more about it by studying the material delivered in the section, chatting and taking part to the forum with the other students and the teacher. At the end of the time period dedicated to that section, the students should be able to formulate reasonable solutions the teacher should resume and discuss [2, 3].

Basically, PBL methodology may be characterized as follows:

- student based;
- experience based;
- collaborative learning;
- flexible;
- modular structure;
- updatable.

In both the HELLODOC teaching modules the basic working cycle for each topic was 5 working days – from Monday to Friday – and the PBL working cycle was planned as follows:

- planning meeting (day 1);
- individual research + chat + forum + e-mail (day 2);
- monitoring meeting (day 3);
- individual study + chat + forum + e-mail (day 4);
- problem solving meeting (day 5).

The above described planning is one of the most commonly adopted solutions.

#### Technical requirements

Minimum technical requirements for accessing and using the HELLODOC courses were:

- PC with microprocessor Pentium or Macintosh;
- operative system Windows98, Linux, Mac;
- 56.6kb/s modem;
- Internet navigation system: Internet Explorer 6.0 – with cookies set to "on" –, Netscape, or Firefox;
- Acrobat Reader, Quick Time, Flash;
- as for course delivery, the ISS available band width allows the management of more than 10 000 students.

#### Course quality assessment

A final survey was prepared and added to the HELLODOC modules. It was intended as a tool to collect feedback from the students who attended the course. Comments and suggestions were asked within the survey in order to improve the quality of the course, its effectiveness in delivering knowledge and learning methodologies, its suitability to the learning needs of the participants. Information collected through the survey will be hopefully used in a more general process of ISS e-learning assessment. For this reason, it was prepared according to the ISS guidelines (www.eduiss.it). Briefly, it was formed by 16 questions: questions 1-7 dealt with general comments on the course, and questions 8-16 dealt with quality of course resources. Questions 1-14 had 5 choices which ranged from a full disagreement to a full agreement with the course methodologies and contents. Questions 15-16 were open questions: the former dealt with the positive aspects of the course, the latter with suggestions to improve the quality of the course.

For a more complete assessment of the HELLODOC e-learning experience, further actions have been decided and implemented:

- few experts in the field of upper limb rehabilitation and tele-rehabilitation were invited to evaluate and deliver their feedback on both usability (with regards to the structure) and effectiveness (with regards to the contents) of the courses;
- partners of the project were asked to collect direct feedback from their students. ISS staff also collected comments and criticism through e-mail messages, phone calls, courses forum and chat;
- Moodle statistical tools were deeply exploited like reports about each student's course navigation, overall usage of resources, overall tutors and/or students activities, distribution of questionnaire scores, and so on.

## RESULTS

### *The HELLODOC e-learning offer*

As a first workpackage action, ISS prepared a demonstrative e-teaching module and delivered it online to the HELLODOC partners by May to August 2005. Briefly, the module aimed to allow all the partners to become familiar with remote educational tools, while showing the graphic format of a generic online module and clarifying the procedures to ob-

tain it. A complete guide for e-teaching module redaction modalities was also delivered, together with a preliminary definition of framework and contents of the HELLODOC e-learning programme.

Soon after the definition of structure and responsibility/supervision of all units and sections of the clinical teaching module, the clinical partners performed accurate literature reviews, and collected and sent teaching materials in terms of documents, videos, images, links and references. An overall content supervision and editing was performed to tailor the material to the needs of the e-learning platform. Effort was done to design and complete new teaching tools like online glossaries and questionnaires, and the PBL methodology. The structure of the technical module was also defined, and the companies collected the requested technical documentation. An overall supporting and reviewing action was performed by ISS and RRD.

At the end of 2005 a clinical teaching module (HDCCM) and a technical teaching module (HDCTM) were completed. The modules had the same structure, which is described in the following by making reference to the generic teaching module (TM).

TM was based on four units, each of them lasting for one week.

Basic elements of TM were:

- 1) the *introduction* and the definition of *clear objectives*;
- 2) a *preliminary questionnaire*;
- 3) a *final questionnaire*;
- 4) a *glossary* containing those definitions which were relevant to the TM;
- 5) a *final survey* to assess the quality of the course.

Each unit contained:

- the *introduction* to the specific *topics and objectives* of the unit;
- the text of the *problem* of the week (PBL);
- a folder containing *reading materials* (mandatory);
- a folder containing *supporting materials* (optional);
- an evaluation questionnaire.

The reading materials were intended as those materials the students had to study in order to gain the requested knowledge of the specific topic; they were basically formed by written documents, protocols or procedures, references. The supporting materials were all those materials the students might consider to gain further skill, practice, or knowledge of the specific topic; they were formed by videos, slides, pictures, links to the web, interactive tools, and so on.

Each unit of each TM had at least one tutor selected among those HELLODOC partners who prepared the unit itself. A short presentation of the tutor was included in the unit. At the beginning of his/her unit working week, the tutor had to:

- introduce herself/himself to the students;
- give indications about his/her availability on line, (chat daily scheduling);

- present the question the students should discuss and solve as the problem of the week.

The tutor was strongly recommended: to be online every day of the working week at least for one hour; to daily check the forum and the e-mail; to support the students during the week; to make a final summary of the proposed solutions to the problem of the week.

Each module also had an overall supervisor.

A continuous supporting action was delivered by ISS trained staff for the whole online period.

The working cycle of each module was based on 4 weeks. At the beginning of the first week (first unit) the supervisor introduced himself and the course (goals and contents) and asked the students to compile the preliminary questionnaire.

At the end of the last (fourth) week, the students were asked to compile the final questionnaire and the survey.

Each unit cycle lasted from Monday to Friday:

- on Monday the tutor introduced himself and the unit, presented the problem of the week, scheduled the online meetings;
- on Tuesday, Wednesday and Thursday the students performed individual study and online activities;
- on Friday the tutor summarised the proposed solutions to the problem of the week; the students were asked to compile the evaluation questionnaire.

#### *Clinical module overview*

The CM was under the supervision of RRD. Its four units were thought as a pathway to lead the student from the general context of upper limb rehabilitation methodologies in presence of MS, stroke and TBI, to the more specific context of the HELLODOC tele-rehabilitation service. The level of basic knowledge before starting the course, could be easily tested by answering the preliminary questionnaire. In case the score of the questionnaire was below a certain threshold, indications were given to the students on how and where they might probe into specific basic questions. The overall structure of the module is reported below.

#### *HDCCM (HELLODOC clinical teaching module) – supervisor: RRD*

(R = resource ; A = activity)

- R: introduction (short text dealing with aims and structure of HDCCM);
- R: preface (“technical” information to navigate and use the course);
- R: curricula (short CV of the tutors);
- R: general objectives (list of main objectives of HDCCM);
- A: preliminary questionnaire (20 questions, 3 answers each);
  - unit 1: overview of upper limb rehabilitation (UORIN);
  - unit 2: application of rehabilitation methodologies (NMSC);

- unit 3: tele-rehabilitation (RRD);
- unit 4: use of H-CAD in upper limb rehabilitation (for “clinicians”) (FPING);

A: final questionnaire (20 questions, 3 answers each);  
survey (16 questions).

As an example of the “Clinical problem of the week”, the problem presented in unit 3 is reported below:

*“Charlot is 54 year old woman, she recently had a stroke. Directly after the stroke, she stayed in the hospital for one week followed by four weeks at the regional rehabilitation center. Right now she is released from the rehabilitation center. She still needs much practice and attention to improve her speech, her coordination and movement pattern of her left leg and left arm. Because of Charlot’s symptoms, there are several professionals involved in her rehabilitation. To receive this care, patients like Charlot should go back to the rehabilitation center 3 days a week for therapy and once a week for consultation. However Charlot lives one and a half hours away from the rehabilitation center and it is difficult for her to go to the rehabilitation center. An alternative is that a caregiver visits her twice a week at home, but he does not have the expertise of the professionals in the hospital/rehabilitation center. It takes the caregiver much more time to give the care she needs and this way the care is less efficient.*

*How could efficient and effective care be made using Information and Communication Technology? From different view points: 1) rehabilitation specialist in the hospital, 2) caregiver that visits Charlot at home; 3) Charlot.”*

#### **Technical module overview**

All units of the TM dealt with HELLODOC specific issues. A technical glossary was delivered to the students; however, a full comprehension of the contents of the module also relied on previous basic ICT knowledge. The level of such basic knowledge could be easily tested by answering to the preliminary questionnaire. In case the score of the questionnaire was below a certain threshold, indications were given to the students on how and where they might probe into specific basic questions. The overall structure of the module is reported below.

#### HDCTM (HELLODOC technical teaching module) – supervisor: PRAGMA

(R = resource ; A = activity)

R: introduction (short text dealing with aims and structure of HDCTM);

R: preface (“technical” information to navigate and use the course);

R: curricula (short CV of the tutors);

R: general objectives (list of main objectives of HDCTM);

A: preliminary questionnaire (20 questions, 3 answers each);

- unit 1 the HELLODOC service (SITUS)

- unit 2 network installation in the Hospital. Server Unit (SITUS)

- unit 3 portable unit (PRAGMA);

- unit 4 software (PRAGMA);

A: final questionnaire (20 questions, 3 answer each);  
survey (16 questions).

As an example of “Technical problem of the week”, the problem presented in unit 3 is reported below:

*“In connecting all the cables of the H-CAD system, the student should try to define (and clearly explain) the optimized sequence among those which are “allowed” – those which do not cause damage to patient, care-giver and system. The student should also clearly identify any possible damaging connecting sequence and briefly describe the associated risks”.*

#### **Course quality assessment: attendance, effectiveness and quality of the HELLODOC teaching modules**

Both modules were simultaneously opened on January 9<sup>th</sup> 2006. They remained online up to October 13<sup>th</sup> 2006. Both modules lasted 4 weeks and were thus repeated 10 times.

First cycle – 4 weeks in January – was used for fine tuning, revision and improvement of the courses by all the project partners.

Forty-three students were registered and allowed to access the courses from the very beginning of the online period. Eight further students were registered by May 2006.

#### Preliminary statistics

Preliminary basic statistics were conducted at the end of the third cycle, March 31<sup>st</sup> 2006; main results [4] were:

- clinical module:

- 20 students out of 43 started the clinical module;

- 65% of them actively participated to the forum;

- 50% read/downloaded the traditional learning resources;

- 60% read the PBL proposals;

- 80% of them successfully compiled the preliminary questionnaire; 50% the evaluation questionnaire of unit 1 and unit 2; 15% the evaluation questionnaire of unit 3; 10% the evaluation questionnaire of unit 4; 15% the final questionnaire; 0% the survey.

- teaching module:

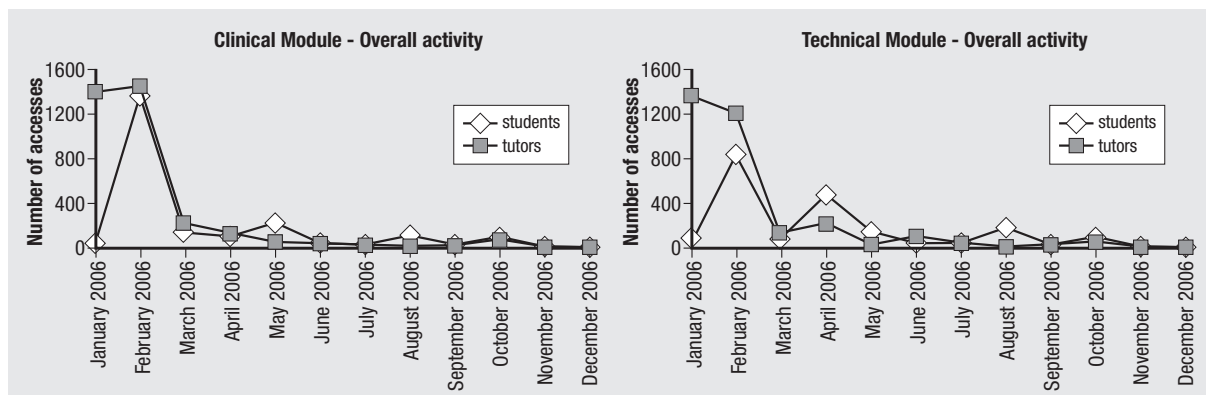
- 19 students out of 43 started the technical module;

- 37% of them actively participated to the forum;

- 58% read/downloaded the traditional learning resources;

- 63% read the PBL proposals;

- 58% of them successfully compiled the preliminary questionnaire; 37% the evaluation questionnaire of unit 1; 26% the evaluation questionnaire of unit 2; 16% the evaluation questionnaire of unit 3; 0% the evaluation questionnaire of unit 4; 5% the final questionnaire; 0% the survey.



**Fig. 1** | Distribution of overall accesses to clinical and to technical course along the whole delivery period, from January to October 2006. Cycle 1 – Jan 2006 – was only available for tutors. Each course was based on a 4-units teaching module; each unit was based on a 1-week working cycle; each cycle lasted for 4 weeks.

As for the overlapping of the modules, 16 students simultaneously attended both of them.

#### *Final statistics*

At the end of the online period, 51 students had been registered to each course. Only 31 out of the 51 students accessed the courses: 28 of them accessed the CM, 27 the TM, and 24 both modules.

An overview of the attendance was obtained by plotting the sum of all activities of both students and tutors within the courses (*Figure 1*). The use of the chat and the e-mail exchanges between students and tutors outside the forum were not taken into account.

#### *Use of resources, activities and PBL methodology*

Within each module, tools were classified as:

- RESOURCES (R): traditional learning sources (introduction and objectives of the module, reading materials, supporting multimedial material, etc.);
- ACTIVITIES (A): interactive tools (forum, glossaries, questionnaires, chat, e-mail, etc.);

- PBL (P): application of problem based methodology through the administration of open problems to be discussed and solved (the so called “Problem of the week”).

Within each HELLODOC e-teaching module:

- R = 22 in all for CM; 21 in all for TM. All of them were taken into account in the following statistics;
- A = 10 in all for CM and for TM. Only 8 of them were taken into account in the following statistics, since the accesses to chat and glossary tools were not accountable. E-mail messages to and from tutors were excluded from this analysis;
- P = 4 in all for CM and for TM. All of them were taken into account in the following statistics.

Due to the different number of tools for R, A, and P, attendance and use of the three groups of tools were not comparable on the basis of the absolute number of accesses. Thus, such numbers were normalised with respect to the accountable number of tools within each group, and mean number of accesses was considered as a comparable indicator.

Absolute and normalised accesses are reported in *Table 1*.

**Table 1** | Absolute and “normalised” number of overall accesses to traditional resources (R), activities (A) and PBL tools (P) of both Clinical and Technical HELLODOC distance course. Mean accesses per tool have been calculated on the basis of the number of accountable tools within each of the three groups of teaching tools

	Traditional resources (R)	Activities (A)	PBL (P)
<b>CLINICAL MODULE</b>			
Absolute accesses	501	137	112
Total tools	22	10	4
Accountable tools	22	8	4
<b>Mean accesses per tool</b>	<b>22.8</b>	<b>17.1</b>	<b>28.0</b>
<b>TECHNICAL MODULE</b>			
Absolute accesses	469	70	89
Total tools	21	10	4
Accountable tools	21	8	4
<b>Mean accesses per tool</b>	<b>22.3</b>	<b>8.8</b>	<b>22.3</b>

Mean number of accesses, however, is not a representative indicator of the percentual use of tools within each Unit. Detailed percentual usage of R, A and P is reported in *Figure 2* with respect to each unit.

Questionnaires

53 questionnaires were completed in all within the CM, 48 within the TM. They were considered sufficient in case their score was greater than or equal to the corresponding established threshold. Based on this criterion, 48 (90.5%) questionnaires had sufficient score within CM, 38 (79.2%) within the TM.

A detailed list of the proposed questionnaires is reported here below.

LIST OF QUESTIONNAIRES	
CLINICAL MODULE	TECHNICAL MODULE
1 PRELIMINARY Q. (threshold: 12/20)	PRELIMINARY Q. (threshold: 12/20)
2 UNIT 1 - EVALUATION Q. (threshold: 3/5)	UNIT 1 - EVALUATION Q. (threshold: 4/6)
3 UNIT 2 - EVALUATION Q. (threshold: 3/5)	UNIT 2 - EVALUATION Q. (threshold: 3/5)
4 UNIT 3 - EVALUATION Q. (threshold: 4/6)	UNIT 3 - EVALUATION Q. (threshold: 4/6)
5 UNIT 4 - EVALUATION Q. (threshold: 3/5)	UNIT 4 - EVALUATION Q. (threshold: 3/5)
6 FINAL Q. (threshold: 12/20)	FINAL Q. (threshold: 12/20)
7 SURVEY	SURVEY

Final evaluation questionnaire

Only 5 final questionnaires were completed for the CM, and only 4 for the TM. 3 CM and 1 TM final questionnaires did not obtain a sufficient score.

Survey

The survey was thought as a tool to collect feedback from the students who attended the course. Comments and suggestions would have helped in improving the quality of the course, its effectiveness in delivering knowledge and learning methodologies, its suitability to the learning needs of the participants. Information collected through the survey would have been used in a more general process of ISS e-learning assessment.

The survey was formed by 16 questions. The first 14 were closed questions – grouped into two main categories – whose possible answers were:

- 1) I strongly disagree;
- 2) I disagree;
- 3) no comment (I neither agree nor disagree);
- 4) I agree;
- 5) I strongly agree.

The last 2 were open questions, which offered the possibility to better explain opinions and suggestions.

List of Question

A. General comments:

- 1) teaching level was adequate to my previous knowledge;
- 2) course objectives were clearly stated;
- 3) course content well fitted the course objectives;
- 4) teaching method was effective;

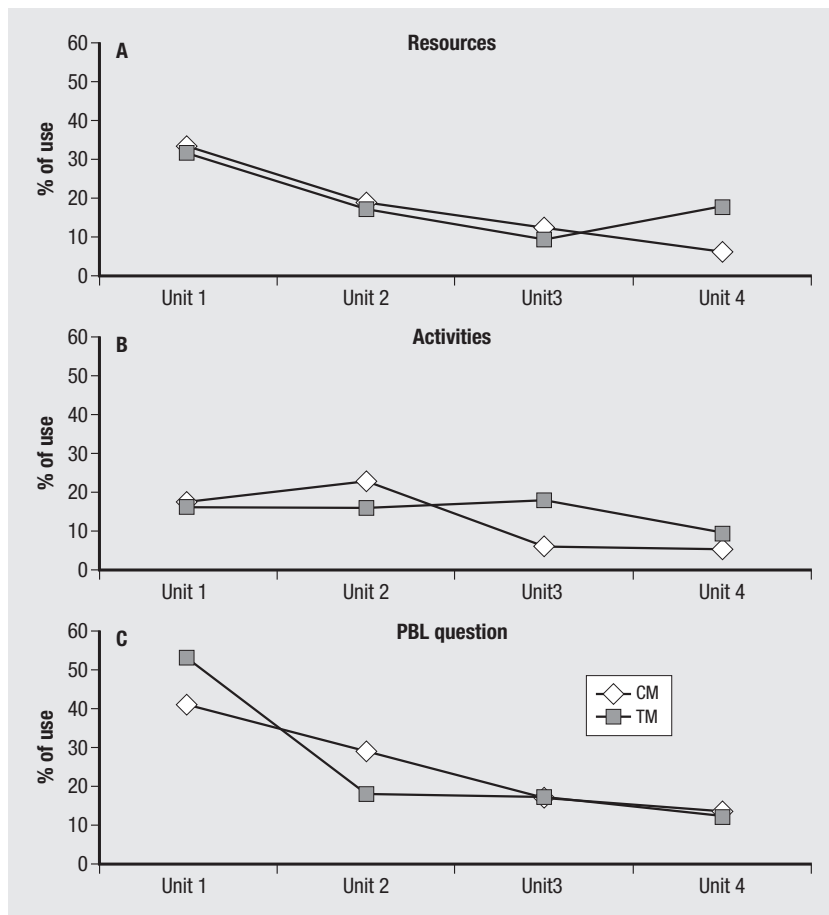


Fig. 2 | Percentages of use of resources (A), activities (B) and PBL methodology (C) within each unit.

- 5) I learned new concepts;
- 6) I gained new skills;
- 7) I am able to implement in my work what I learnt in this course.

**B. Resources:**

- 8) course duration is too short to adequately address all course objectives;
- 9) too much time is requested for individual study;
- 10) too much time is requested for practicals/group work;
- 11) delivered documentation is not sufficient;
- 12) the quality of documentation is adequate;
- 13) the number of tutors/facilitators is not sufficient;
- 14) the course is well structured;
- 15) positive aspects of the course (open question);
- 16) suggestions to improve the quality of the course (open question);

Only 2 surveys were compiled for CM, and only 1 for TM.

In all the 3 cases, all answers for General comments were “I agree”; and all answers for teaching resources were “No comment (I neither agree nor disagree)”.

## DISCUSSION

### *Feedback from statistics*

At an early stage of the delivery of the HELLODOC distance educational programme – March 2006 – participation seemed to be encouraging. Qualitative feedback from HELLODOC partners pointed out the usefulness of PBL methodology and the forum discussion to gain: i) deeper comprehension of the proposed topics, especially in the CM; ii) skill and expertise to solve technical installation and managing troubles of both server and portable units of the HELLODOC system especially in the TM. As for this module, HELLODOC technical partners do believe that the e-learning offer will lead to a professionals technical formation of better quality and more complete than that achieved by means of the short training courses they offered at the product delivery time.

At the end of the online period, a more exhaustive statistics on the attendance, results, and effectiveness of the e-learning experience highlighted the following relevant findings:

- only half of the registered students attended the courses, most of them during the working cycle of February 2006;
- few students did complete the final questionnaires. The number of accesses to the offered learning resources demonstrated that they did exploit the learning offer, but the real level of gained knowledge could not be extrapolated by using the evaluation tools of the teaching modules;
- within each working cycle, the level of participation showed a significant decrease from

unit 1 to unit 4 with respect to each type of learning source (R, A and P);

- for both modules, the percentual usage of traditional learning resources was comparable with the usage of novel learning tools which are peculiar of distance educational programmes like interactive tools, online meetings, and the step-by-step discussion of an open problem (PBL methodology).

### *Main indications from statistics and feedback*

The compiled surveys had been few indeed – 3 in all – thus they could not represent the general opinion of the HELLODOC student community. An appreciable effort was done, however, by the HELLODOC tutors, in order to personally collect feedback at their Centres. Moreover, ISS staff collected comments and suggestions from the clinical and technical experts – 5 in all – who agreed in net-surfing the courses.

The analysis of feedback from statistics, tutors and experts led to the identification of five main indications which are summarised here below:

- from a technical point of view, the ISS e-learning platform was considered reliable and effective. Both courses had been continuously accessible for the whole duration of the online offer – 10 months in all. The little amount of technical requirements needed to correctly navigate the courses were easily matched by all students of all the 4 European Countries involved in the project, either from hospital computers or from their own PCs. Minor update was occasionally conducted by ISS staff during the night without lack of continuity. Documents were quickly open and downloaded even in case of material like videos or images;
- comments from the experts only dealt with structure and content quality of the teaching offer. Their feedback was positive with respect to both aspects, even though they remained a little doubtful with respect to the direct usability of such educational tools. According to them, small residential preliminary courses are still necessary in order to introduce the e-learning methodology and to motivate the professionals to become active participants to the courses;
- most negative feedback from the students dealt with the layout of the courses. They found that it was hard to see where to start and what to do. There was too much text in the front webpage. Thus they suggested an overall “re-styling” of the homepages, with “more icons to click on and far less text”;
- most important comments from the students were referred to the amount of time requested to attend the courses. Most of them, in fact, already had their own work at the clinical centre, and they had not enough time to figure everything out. This problem was clearly highlighted by the exponential decrease of student’s activity across the Units of the courses. The only “motivated” students were those involved in the HELLODOC project. Such students, as shown in the reported statistics, intensively followed the courses at the very beginning of the online pe-



riod – February 2006 – since they needed education and training to better co-operate to the project itself;

- even though it was not clearly stated by the students, it is evident that a critical point of the HELLODOC e-learning offer was the lack of a final certificate of attendance, which might have represented a good motivation even for those students who were not probable to work with the HELLODOC service or other tele-rehabilitation systems in the near future. Evidence of this is clearly contained in the poor number of the compiled final evaluation questionnaires.

### CONCLUSIONS

The HELLODOC e-learning experience seemed to be a further positive step towards the integration of ICT with educational programmes in the field of rehabilitation and tele-rehabilitation, in view of a general and more homogeneous formation of professionals

at least at a European level. New medical and social services based on tele-rehabilitation, in fact, need to be supported by a continuous learning system. The e-learning system applied during the HELLODOC project seems to be a good candidate to accomplish this role supporting professional, caregivers and, in future, patients.

Feedback from the project experience is encouraging. Comments and suggestions will be implemented in order to improve the e-learning offer in terms of layout, tool usability, and pre-training of students and tutors. Most important, different solutions are currently under study to complete the offer itself with a EU accreditation.

### Acknowledgments

The Authors wish to thank all the HELLODOC partners who enthusiastically participated to the described e-learning experience.

Submitted on invitation.

Accepted on 15 December 2007.

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