



COACH BOT

“Modular e-course with virtual coach tool support”

LIFELONG LEARNING PROGRAMME
LEONARDO da VINCI

coordinated by FOR.COM

PROJECT FINAL REPORT

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1. Introduction

The COACH BOT project intends to cope with the adult distance learning lacks of an online assistance/teaching, of a mechanism able to maintain learners' motivation, training practical usefulness and attractiveness by designing a new e-learning methodology for home health care professionals. This training model represents the main project result and it includes an e-learning system able to interface individually in a human-like way with learners and to customize the learning process according to the their needs.

This report presents the approach, results and achievements of the COACH BOT project “Modular E-course with Virtual Coach tool support”. The overall aim of the project is to address the lack of adult distance learning programmes in Europe by designing and testing an innovative e-learning methodology for adult education that combines Conversational Agent Technology (chat-bot) with an ad hoc designed modular e-learning path. The COACH BOT project and e-course address European home health care professionals (nurses, physiotherapists, social workers, doctors etc.). The COACH BOT methodology allows this target group to customize their own personalized training paths based on their specific training needs, allowing them to successfully manage a training course amid their personal and professional life. The “Virtual Coach” supports learners “individually” during the modular e-course who acts as a teacher, coach and tutor by providing in-depth information, assessment, case studies and technical support at any time of day. The project tested the methodology on the target group of home healthcare professionals from different European countries and with different educational and professional backgrounds and specific training needs. The modular e-course permits trainees to customize their learning experience by choosing course contents that are most relevant for their job depending on their profile, thus addressing an array of diverse professions within the healthcare sector.

In order to guarantee the project impact and sustainability, the COACH BOT approach was developed to gather continuous feedback and interaction between partners and the target group. Specific actions were implemented to reach home healthcare professionals and involve them in the overall project's development. In particular, a need analysis on the European context of home healthcare assistance was conducted in each partner country and in Croatia. The subsequent report (Need analysis report, available on the project website) contains the need analysis results identifying the target groups' training needs that were used to develop the e-course contents. In order to successfully promote the project, a comprehensive Dissemination Plan was produced and

implemented to strategically involve all partners in dissemination and exploitation activities throughout the project. Dissemination materials such as multilingual brochures, posters and e-newsletters were distributed among the target group and stakeholders over the project life cycle. In order to constantly promote the project, the COACH BOT website was created featuring a multilingual public area and a private area. (www.coachbot.eu). The project is also published on the ADAM portal (Advanced Data Archive and Management System), featuring the project's results and products (<http://www.adam-europe.eu/adam>).

2. Partnership

The project partnership comprises 6 European countries: Italy, Denmark, Romania, Slovenia, United Kingdom and Switzerland. The multi-actor partnership consists of 7 organizations: Interuniversity consortium, public healthcare institution, multimedia consulting, NGO, nursing school, vocational training institutions in the health and social sector and a non-profit enterprise. All the skills required to achieve the project objectives were assured thanks the multi-actor consortium providing technological, methodological, educational, social and healthcare, communication and management expertise.

- FOR.COM. Consortium, IT (leader of the Consortium)
- Aarhus Social and Health Care College, DK
- Norton Radstock College, UK
- Societatea Romana pentru Educatie Permanenta, RO
- Gruppo Pragma, IT
- Secondary School of Nursing Ljubljana, SI
- SEED Association, Switzerland, CH

3. Project main Strategy and Goals

The overall aim of the COACH BOT project is to address the lack of adult distance learning programmes in Europe by designing and testing an innovative e-learning methodology for adult education that combines Conversational Agent Technology (chat-bot) with a modular learning path designed ad hoc. The pilot e-course addresses a target group of home healthcare professionals.

The healthcare sector is a complex system that demands extensive resources and consists of a set of integrated services and inter-collaborative health teams. Home healthcare professionals come from different educational and professional backgrounds, and thus have different gaps and training needs.

The e-course modules, as well as the possibility to concentrate more on some rather than other aspects (legal, communication, etc.) depending on the profile, is well suited to this target group, which is not homogenous. The COACH BOT methodology can help solve these problems by providing home healthcare professionals with the opportunity to renew and improve their skills by using a flexible learning approach.

The project's innovative aspect consists of the development of a collaborative e-learning environment featuring a "chat-bot" or "Virtual Coach" who interacts with users through a human-like interface. The "Virtual Coach" acts as a teacher, coach and tutor, who supports learners "individually" during the modular e-course by providing in-depth information, assessment, case studies, technical and methodological support. The COACH BOT e-course is based on a personalised approach allowing home healthcare professionals, with the help of the "Virtual Coach", to customize their own training path and benefit from a suitable training path that is relevant to their profession and based on their own specific needs, knowledge and skill requirements.

In order to test the effectiveness of the "Virtual Coach", the e-course was experimented by 2 different groups of users in each partner country (Italy, Denmark, UK, Romania, Slovenia and Switzerland): an experimental group (with the help of "Virtual Coach") and a control group (without "Virtual Coach"). This choice provided a fundamental added value by allowing the comparison between the two groups of participants and providing meaningful data for analysing the core role of the Virtual Coach (an expectation questionnaire and a satisfaction questionnaire were submitted to both groups before and after the testing of the e-course and on the base of these results it has been produced the Evaluation of COACHBOT methodology).

In order to guarantee that the project responds to target users' needs, the continuous and active involvement of home healthcare professionals (nurses, physiotherapist, social and care workers, doctors, homecare assistances) within the project activities was foreseen as follows:

- ✓ Training need analysis of the healthcare professionals work context and training needs in different European countries;
- ✓ Two National Exploitation Seminars organized in each partner country before and after the delivery of the e-learning course to involve users in the COACH BOT e-course and to spread project results;
- ✓ Testing of Virtual Coach before the e-course experimentation phase (at least 3 home healthcare professionals involved in each partner country);
- ✓ Experimentation of COACH BOT e-course in each partner country;

- ✓ Evaluation of COACH BOT methodology through the submission of an expectations questionnaire before the e-course delivery, and a customer satisfaction questionnaire after the e-course ending;
- ✓ Arrangements of focus groups by involving home healthcare professional from the control and experimental groups in each partner country after the delivery of the e-course, in order to gather qualitative and in-depth data on pilot application usability and transferability;
- ✓ Dissemination activities: circulation of project website, brochures, posters, e-newsletters and organization of the final project international conference.

Home healthcare professionals benefited by their direct participation to the project activities as they attended a course that they have contributed in creating. The COACH BOT e-learning course was customized according to their real training needs and work experience. Moreover, they were able to experiment a knowledge sharing experience during which they will discuss with colleagues of the other countries involved in the project, for the circulation and comparison of information through an effective use of ICT.

The potential short term impact of the project upon the target user group includes the following:

- ✓ facilitate the e-learning experience (in order to avoid difficulty and potentially reduce drop out) and maintaining individual motivation in ongoing updating of skills, particularly relevant for home healthcare professionals, thanks to the “Virtual Coach” main functionalities;
- ✓ promote an in depth knowledge on healthcare professionals work context at European level, through the interaction and exchange of experiences with colleagues from different European countries;
- ✓ enhance competences in the fields covered by the e-course: medical issues, psychological issues, national/EU health legislation and social and ethical aspect linked to the home healthcare work;
- ✓ narrow specific gaps perceived by each user by creating a customised training path focusing on specific topics (medical, psychological, legislation or communication skills);
- ✓ respond to adults training needs and characteristics.

The potential long term impact of the project upon the target user group includes the following:

- ✓ provide a more flexible and accessible training opportunities whereby individuals undertake self-directed learning;
- ✓ provide training opportunities for healthcare professionals allowing a cost reduction with the training delivering increase;
- ✓ support the installation and use of new IT tools for providing in-service training within healthcare institutions;
- ✓ promote individual development/sense of achievement and consequently the improvement of work performances;
- ✓ promote the improvement of specific skills of healthcare professionals ensuring compliance.

Management strategy

The project Consortium relied on an integrated management process based on coherence, sharing of results and horizontal supportive communication. The project management has been developed as a cohesive system driven by effective communication and sharing of competences among partners (favouring internal contributions), with a strong capability to collect and analyse external inputs. The Decision-making process was based on consensus.

The organisational structure of the project foresaw different roles and functions according to the specific needs and features of each project activity. FOR.COM (IT), as the prime contractor of the project, was responsible for the entire management of the project and led the Steering Committee composed of one representative from each partner organization.

Operative project management

In order to guarantee a high quality of the project outputs, specific partnership staff has been assigned to carry out the different activities according to their professional skills and expertise. For this purpose, at the beginning of project specific work teams have been identified:

- ✓ *Needs analysis and didactic Team*: researchers and trainers in charge of the development of COACH BOT curriculum and the pilot course contents;
- ✓ *Technological Team*: technicians and e-learning experts in charge of the designing and development of the COACH BOT platform and Virtual Coach, its integration, and the drawing up of the technological reports;
- ✓ *Experimentation Team*: key actors of healthcare sector, project managers in charge of the management and monitoring of the experimental and control e-courses;

- ✓ *Quality and Evaluation Team (QET)*: project managers and quality experts in charge of the definition of the quality indicators, the assessment of the COACH BOT methodology efficacy and the evaluation of the pilot application usability and transferability (follow up).
- ✓ *Dissemination and exploitation Team*: technicians and communication experts in charge of the design and set up of the dissemination and exploitation activities.

FOR.COM. developed a Project Management Handbook that explains the planned work of the project and includes: detailed work plan, time planning, risks which could affect the success of the project, working methodology and monitoring tools, means of communication among partners and management strategy.

A key tool created and used for the project circulation of information is the project website, which includes a Private Area for partners which contains the tools, templates, guidelines, reports and deliverables of the project, and is organized in 5 sections: file repository, recorded meetings, learning objects tools, calendar and gallery. In particular, within the file repository section a folder has been created for each different phase of the project: Management, Need Analysis and Design of COACH BOT Methodology, Technological Design, Production, Experimentation, Quality and Evaluation Process, Exploitation and Dissemination.

Organization and holding up of plenary and virtual meetings

Special attention has been devoted to the organization of plenary and virtual meetings, as they are important moments in which partners discuss the status of the project activities and also plan the future ones. The Meeting Agenda and the pertinent documents, have been sent out to all partners in advance, so as to allow them to be able to organize the useful documents and to suggest changes, integrations and comments. During the meetings, all documents and materials related to the Agenda are handed out to all partners and organized in a meeting folder. All partners fill out a questionnaire for the evaluation of the meeting. Furthermore, following the meetings, detailed Minutes, focusing on the topics discussed, results reached and deadlines, are sent to all partners involved.

Monitoring and reporting activity

All partners were actively involved in the ongoing monitoring procedure with respect to deadlines and the project goals. The following are the main monitoring tools created by FOR.COM. (IT) in close cooperation with all partners: project time-sheet template, quarterly cost certification template, meeting minutes template, conference report template and mid-term results report template.

Evaluation strategy

The Quality and Evaluation Team (QET) was composed of partner staff and an external quality expert (devoted to the carrying out the external evaluation process and to contribute to the project's outputs evaluation). The project evaluation strategy and process is based on the assumption that it should cover all representative aspects of 'process' and 'content/product'. In fact, the evaluation process deals with both qualitative and quantitative aspects of the project and it is devoted to monitor and evaluate both process (e.g. project management) and products (e.g. training contents and methodology). The project evaluation process was described in detail in the Quality and Evaluation Plan, and includes the following main steps:

- ✓ *Evaluation of project outputs*: is related to the respect of quality criteria during project activities. To assess the quality of project outputs and the grade of achievement of the project results, an evaluation grid has been designed to be submitted to all partners for each outputs carried out. The evaluation of project outputs was carried out regularly throughout the whole project duration.
- ✓ *External evaluation*: Since the project management is a critical activity that influences the success of all project activities and the project mid-term and final results achievements, the evaluation process includes an external evaluation, as a specific task for evaluating and monitoring the project management activity. For this purpose, FOR.COM. selected an External Quality Expert who was involved in the external evaluation process and that contributed at the identification of the evaluation strategy, critical issues and risks related to management process and the working out of the properly corrective actions. The following specific tools have been designed in order to collect the management evaluation data, assess the quality management activity and analyse the critical issues: evaluation grid, meeting minutes and meeting questionnaire. The external evaluation was carried out regularly during the whole project duration and its results were analysed in the Mid-term Evaluation Report and in the External Evaluation Report.
- ✓ *Evaluation of COACH BOT methodology*: aims at evaluating the pilot application efficacy and effectiveness. Specifically, two questionnaires have been designed and submitted to both control and experimentation learners groups (an expectations questionnaire – at the beginning of the course – and a customer satisfaction questionnaire – after the e-course) and the evaluation results have been analysed in the COACH BOT Methodology Evaluation Report.
- ✓ *Follow up*: the project follow up aims at evaluating the pilot application further development and transferability through the arrangement of focus groups among learners. Focus groups

were arranged in each country among experimental and control group users and the results were analysed in the Focus Group Report.

Dissemination and Exploitation strategy

The project partnership agreed on a specific and structured strategy for dissemination and exploitation activities, with the aim of making the progress of the COACH BOT project accessible to the most extensive audience possible. The dissemination strategy was designed to obtain major project results and increase project visibility among the target group and stakeholders, in terms of promoting the project objectives, mid-term results and the state of the art of the project. The project Dissemination Plan details the multiple dissemination strategies addressing different types of target groups through the use of diverse tools:

- ✓ *Paper strategy*: multilingual brochures and posters were produced to illustrate the project's objectives and activities. Since these tools provide instant information and are easy to distribute, they are mainly target local, regional and national healthcare authorities, associations providing healthcare services and potential course participants in order to promote their participation to the e-course. Meanwhile, papers and articles containing more technical language address the community of researchers and engineers interested in the application of ICT in the field of education. Some papers and articles have been written by the partners and published in national and international magazines.
- ✓ *Internet strategy*: aimed at promoting the project through the official multilingual project website, the production of the COACH BOT multilingual e-learning platform demo and quarterly e-newsletters promoting the project to local stakeholders.
- ✓ *Event strategy*: aimed at promoting partner participation in key thematic national and international events and the COACH BOT final international conference in Aarhus (Denmark) to present the project results and share information and best practices in the field. The partnership has participated in different national and international conferences to present the COACH BOT project, through the submission of detailed papers and articles. Two National Exploitation Seminars were held in each partner countries to reach and involve target groups.

In order to guarantee the project impact and sustainability, the COACH BOT approach was developed to gather continuous feedback and interaction between partners and the target group. The partnership created a COACH BOT database of contacts (including mail and e-mail addresses of about 150 contacts for each country involved) consisting of local, regional and national healthcare

authorities, associations providing healthcare services, home healthcare professionals, secondary schools of health care sector, vocational training agencies and universities of applied science etc. The project's brochure and the e-newsletters were mailed to them. All the contacts, in each country involved, received invitations to all events organized by the partners within the COACH BOT project and the new e-newsletters.

4. Project main Results and Products

During the whole duration of the project, the partnership achieved the following main outcomes and results:

WPI – MANAGEMENT

- ✓ *Project Management Handbook*: represents the planned project activities, as well as a detailed work plan, timed planning, risks which could influence the proceeding of the project, working methodology and monitoring tools, means of communication among partners and management strategy. It is available in the project website private area.
- ✓ *Report about mid-term results*: includes activities realized during each phase of the project by each partner and the results and products achieved. It is available in the project website private area.
- ✓ *1st Annual workshop with EACEA Agency*, Brussels, 15 December 2008.
- ✓ *Project Kick off Meeting*, hosted by FOR.COM. (IT), Rome, 20-21 November 2008 and bilateral Kick off Meeting between FOR.COM. and SOSUAarhus (DK), Rome, 22 December 2008.
- ✓ *Plenary Interim Meeting*, Bucharest, 14-15 May 2009, hosted by Romanian Society for Lifelong Learning (RO).
- ✓ *Plenary interim meeting*, Ljubljana, 14-15 January 2010 hosted by Secondary School of Nursing Ljubljana (SI).
- ✓ *Project Interim Virtual Meetings* (14 January 2009, 26 October 2009, 4 October 2010).
Research and Didactic and Technological project Teams meetings.

All the meetings documents are available in the project website public area.

WP 2 - NEED ANALYSIS AND DESIGN OF COACH-BOT METHODOLOGY

- ✓ *Training Needs Report*: this report contains the main results of the training needs analysis of home healthcare professionals carried out in all project partner's countries and a general overview of the EU context. It also includes the research carried out in Switzerland and in

Croatia (thanks to the Swiss partner contacts in this country) and the results of the interviews carried out in each partner's country to some representatives of the healthcare sector or/and of the VET system. Thanks to the interviews it was possible to define in detail the characteristics of the home healthcare professionals in the different countries. Furthermore, the partners have had the opportunity to actively involve the project target group since the project beginning and also to guarantee the creation of a course addressing the target group's specific training needs. Home healthcare professionals did not participate as mere users but also as active members providing pivotal information for the design of both course methodology and contents. The Training needs report also clarifies the link between the research conducted on the healthcare professionals' in EU and the fifteen course modules (training program) developed during the project, and more precisely how the course contents based on the comparative research results were developed into Learning Objects and tools on the COACH BOT e-learning platform with virtual assistant. The report is available in the project website public area.

- ✓ *COACH BOT curriculum*: the description of the course topics and contents. The curriculum represents the starting point and the basilar tool for the further definition of the specific e-course syllabus. The document is available in the COACH BOT website public area.
- ✓ *E-course Syllabus*: one syllabus for each module has been prepared. The syllabi are divided into topics and include the e-course objectives, description of contents, didactic materials foreseen and expected support services for the course delivery phase (i.e. chat, video chat, videoconferencing, forum, online tutoring Session). The document is available in the project website private area.
- ✓ *Instructional Design Handbook*: describes the COACH BOT methodology and has been designed based on Pedagogical Agents technology. Pedagogical Agents are autonomous software systems, realized with AI-Artificial Intelligence, methods that can operate in the training environment as tutors or facilitators who adaptively assist users in performing training tasks. The COACH BOT virtual assistant acts as different roles within the e-learning platform: tutor, teacher, technical assistant, and mentor. The innovative methodology also includes the designing of a "personalized" learning path presented and supported by the virtual assistant, for each student according to his/her own profession, experiences and work needs. The document is available in the project website public area.

WP 3 – COACH BOT TECHNOLOGICAL DESIGN

- ✓ *COACH BOT platform architecture report*: it presents the features, requirements and the different sections of the e-learning platform which will host the course.
- ✓ *Virtual Coach technology report*: it describes the features of the COACH BOT conversational agent and details the technical requirements ensuring the effectiveness of the tool.
- ✓ *COACH-BOT technological report*: it includes the Technological Architecture of the entire tool; the platform hosting the course and Virtual Coach. It explains how to integrate the conversational agent technology into the e-course platform structure providing the technical instructions to effectively merge the two technologies.

The three reports, developed by the technical team, are available in the project website private area.

WP4 - PRODUCTION OF THE COACH BOT TRAINING PATH AND VIRTUAL ASSISTANT

- ✓ *COACH BOT e-learning platform*: on the basis of the COACH BOT Architecture report it was developed the COACH BOT e-course platform to be integrated with the Virtual Coach and able to provide the modular e-learning course. Two versions of the platform have been developed: one “experimental” platform includes the Virtual Coach integrate with the LMS system, while the “control” platform does not include the Virtual Coach. The E-Learning platform is based on the open source LMS Claroline that allows teachers to create and administer course websites through a WEB browser. This LMS is worldwide used and the vast community guarantees to solve any problems the platform administrators or users might have. The project’s technological team selected the LMS Claroline, among other possibilities e.g. Moodle, for its very clean and comprehensible source code, allowing developers to easily implement new modules to create highly personalized learning paths and embed the virtual agent into the LMS. In particular the Technical team implemented source code modifications on the original open source E-Learning platform used in the project to provide highly customized learning paths (those modifications have affected the quiz and module areas of the platform) and the development from scratch of a summarizing table which tracks the learning progress of the participant.
- ✓ *Virtual Assistant*: the main result of the COACH BOT project has been the development of the Virtual Assistant called “Clara” who becomes a mentor, a coach, a teacher, a didactic or technical tutor depending on the student’s type of learning activity, and all of this embedded in an open source and SCORM compliant learning management system. On the basis of the Virtual Coach technology report and the Technological report it was developed the Virtual

Coach's conversational engine and then it was integrated in the "experimental" COACH BOT e-learning platform. The conversational agent engine was developed using the AIML programming language (Artificial Intelligence Mark-up language) to give communicative skills, in natural language, to the Virtual Assistant. Several linguistic patterns have been developed in AIML to make the virtual assistant capable to understand and reply correctly. In particular, this kind of technology has been used in three semantic areas of the Virtual Assistant: a guidance interview for starting a friendly conversation between the student and the virtual assistant and for defining a professional profile of the trainee; an help desk to provide users with extensive help concerning LMS functionalities and tools and some "Suggestions" to help the user concerning specific course topics. The Virtual Coach was integrated in the E-learning platform thanks to the open source software Program which parses AIML linguistic patterns in PHP/MySQL, the technology behind the E-Learning platform Claroline, and makes the messages generated by the Virtual Assistant visible in the E-learning platform. Moreover, the technical team developed an automatic and customized messaging system, delivered by the Virtual Assistant. The Message content depends on the user's learning progress, on his or her performance to quizzes and on the area of the E-Learning platform the trainee is visiting to. The project technical team developed the Virtual Assistant graphical interface or Avatar to make more user friendly the Virtual Coach called "Clara". The Avatar is dynamic i.e. reacts with facial expressions to user's actions e.g. after a quiz completion. Adobe Flash has been used for implementing the avatar because of the high qualities' vector graphic, very easy to animate with the point to point technique of interpolation.

The integration of the COACH BOT e-learning platform with the Virtual Coach (with all its functionalities) required a close cooperation between project's researchers/teachers and technicians, who worked in parallel. Specifically, technicians' tasks included the development of the conversational agent engine, Virtual Coach software and the design and development of the Virtual Coach graphic interface that allowed the Virtual Coach to interact with users. Teachers had to provide technicians with course contents for allowing them to 'fill' the conversational agent engine. For this reason, as soon as the different Learning Objects were produced, they were sent and shared with the technicians. In order to allow mutual understanding and therefore integrated activities between researchers and technicians, various meetings have been held both in presence and in virtual modality. The course was based on an e-learning methodology that allowed each learner to build a personalized learning path. The 'Guidance interview' defines the professional profile and

consequently a learning path that fit better the student while the ‘start up quiz’ checks the student’s previous knowledge and indicates which course contents are mandatory or optional depending on the score carried out.

- ✓ *Guidelines to develop Learning Objects*: COACH BOT teachers have been provided with specific guidelines for the realization of suitable Learning Objects (e.g. audio lessons, start-up/final quizzes, lecture notes, slides and case studies).The purpose of the document is to guarantee the production and realization of homogeneous contents, in order to facilitate participants’ course attendance. The document is available in the COACH BOT website private area.
- ✓ *COACH BOT e-course “Enhancing the European home healthcare professionals’ competencies”*: the partners in charge of the production of the contents were Romanian Society for Lifelong Learning (RO), Secondary School of Nursing Ljubljana (SI), Norton Radstok College (UK) and Seed Association (CH). FOR.COM. coordinated the overall production of the LOs. On the base of the project Training needs report and the Curriculum and Syllabus, the partners developed 15 Training Modules (each module included 2/3 topics) referred on 4 main subjects of the Home Healthcare Assistance (Medical, Psychological issues, National/EU health laws and Social/ethical aspects). To each partner involved in this activity were assigned a number of Module to be produced. In particular the LOs produced for each topic were the following: start up and final quizzes, Audio Lessons, Lecture Notes and Slides. Furthermore, Seed Association produced 3 case studies by utilizing the Machinimas techniques. A Machinima is the use of real-time three-dimensional (3-D) graphics rendering engines to generate computer animation. In particular, Linden lab’s Second Life has been used to create these highly engaging 3-D animations. The partnership decided to release the COACH BOT course contents under a Creative Commons License. This means that the 15 Modules and Learning Objects (audio lessons, lecture notes, slides, quizzes, and case studies) developed within the COACH BOT project are free to use and to adapt (open source) and have been published on the project website (public area) under a Creative Commons License.

WP5 - EXPERIMENTATION

- ✓ *Experimental Plan*: containing the experimental strategy and principles, guidelines for setting up the two training sessions (control group session and experimentation group session), indications to monitor the e-courses, as well as guidelines to carry out the selection

phase, including the main features and requirements of both the control and experimental group participants. The plan is available in the COACH BOT website private area.

- ✓ *Testing of the COACH BOT e-course “Enhancing the European home healthcare professionals’ competences”*: each partner country autonomously managed the national promotion of the e-course through different ways (organization of the first national exploitation seminars, sending of informative emails to potential participants, publishing the information on their organization website and on websites of organizations linked to the target group, publication of press releases, etc.). The e-course was delivered in all partner countries involving a total of 165 participants (home healthcare professionals). The total course duration was 6 months, from March to August 2010. The participants were divided in two groups, experimental and control that attended the e-course on two different e-learning platforms. All learners participated in the e-course (with the same Learning Objects) but only the experimental group benefited from the Virtual Coach - Clara’s assistance on the experimental e-learning platform. This choice provided a fundamental added value by allowing the comparison between the two groups of participants and providing meaningful data for analysing the core role of the Virtual Coach (an expectation questionnaire and a satisfaction questionnaire were submitted to both groups before and after the testing of the e-course and on the base of these results it has been produced the Evaluation of COACHBOT methodology). These activities are described in detail in the *COACH BOT Experimentation Report* available on the project website, public area.

WP6 - QUALITY AND EVALUATION PROCESS

- ✓ *Quality and Evaluation Plan*: was drafted by FOR.COM. (IT) and SREP (RO) in collaboration with an external evaluator in order to illustrate the overall quality evaluation strategy and tools to be used during the project. The tools includes the project Meeting Evaluation Questionnaire (to be filled up by partners after each project plenary meeting), the “Evaluation of project outputs/products” and “Evaluation of project management activities” grids, to be filled in periodically by all the partners.
- ✓ *Mid-term Evaluation report*: was drafted in collaboration with the external evaluator in order to ensure effective management and overall evaluation of the project. It includes the evaluation of the first year of project activities, and analyze data collected through the meeting evaluation questionnaires and evaluation grids (filled in periodically by all the project partners) for project management and project outputs/products. Furthermore, this report includes a list of “suggestions” to correct and improve the different project results. On

the base of these suggestions, the management strategy and all the project outcomes resulted improved and updated at the end of the project.

- ✓ *Project outcomes Evaluation report*: it was drafted at the end of the project to analyze the results of the evaluation of the main project outcomes.
- ✓ *COACH BOT Evaluation methodology report*: the evaluation and validation of the methodology have been fully elaborated in this report aimed at evaluating the pilot application efficacy (through the analysis and the comparison between the results of the Expectation and the Customer Satisfaction questionnaire submitted to the participants before and after the experimentation of the e-course, and the comparison between the control group and the experimental group results) and in the Follow up report aimed at evaluating the pilot application usability and transferability (through the analysis of the results of the focus groups organized in each partner country involving the e-course participants). The reports are both available on the project website public area.
- ✓ *External Evaluation report*: it was drafted by the external evaluator at the end of the project and it describes the project critical path evaluation and results. Thus, it includes the project main risks and corrective actions previously identified as well as the solutions that have been put in practice during the project lifecycle. The report is available on the project website public area.

WP7 – EXPLOITATION

- ✓ *Database of contacts*: contains 888 contacts of the target groups and stakeholders; local and national health authorities, home healthcare professionals, vocational training agencies, universities of applied sciences, secondary schools for the health sector and other actors interested to the project. The database is available in the project website private area.
- ✓ *National exploitation seminars*: were arranged in each partner country in different dates according to the Country specific context of the national healthcare sector and to the COACH BOT e-course testing phase delay. In particular, the first National exploitation seminars were arranged from September 2009 to April 2010 in all partner countries. The second national exploitation seminars were held from August to October 2010. The seminars were addressed to the target groups and stakeholders to promote the project results and encourage further utilization of pilot application. All the National exploitation seminar reports are available on the public area of the project website.
- ✓ *Exploitation Agreement*: concerning the commercialisation of the COACH BOT Virtual Assistant and Methodology and further improvements, the exploitation agreement states

some important rules about the Intellectual Property Rights and the potential commercialization of the COACH BOT pilot application (COACH BOT web platform + virtual Assistant software). Furthermore, the partnership decided to release the COACH BOT course contents under a Creative Commons License. This means that the 15 Modules and Learning Objects (audio lessons, lecture notes, slides, quizzes, and case studies) developed within the COACH BOT project will be free to use and to adapt (open source) and have been published on the project website (public area) under a Creative Commons License.

WP8 - DISSEMINATION

- ✓ *Dissemination Plan*: contains the executive planning, the definition of the different dissemination strategies (i.e. Paper, Internet and Event) and the different tools to be delivered in the framework of each strategy, according to specific target group. The document is available on the project website public area.
- ✓ *COACH BOT website*: features all the results of project activities. In order to ensure a user friendly organization of materials and information, the website is structured in two main parts: Public and Private Area. The Public Area provides access to all the project information and the main tangible outputs within different sections: Project (objectives, target group, methodology and technology), Course (description, course online), Products and Results, Partners, News, Contacts, Poll for Home Healthcare Professionals, Virtual Coach Trial and e-learning platform demo. The Private Area addresses to the partnership and collects and shares tools and contents related to the project management. The project website address is www.coachbot.eu.
- ✓ *COACH BOT multilingual brochures and posters*: these materials have been published in different languages illustrating the project's objectives and activities. They also target potential users in order to promote the e-course, and are distributed at all meetings and conferences to present the project. Brochure and posters have been distributed at local, national and international level in each partner country and are available on the project website public area.
- ✓ *COACH BOT e-Newsletters*: six e-Newsletter have been written in English and delivered among beneficiaries and stakeholders, using the COACH BOT database. The newsletter is part of the informative material concerning the project state of the art and the current achieved results. Each newsletter is available on the project website public area.

- ✓ *COACH BOT e-learning platform demo*: the demo aims to present the e-learning platform various functionalities and to explain how the learners can benefit from the e-course. It has been recorded in all partner languages (English, Danish, Italian, Slovenian, Romanian). The partnership produced and handed out 150 extra CD copies of the demo (in addition to the 300 foreseen in the proposal). 150 copies of e-learning demo, together with 150 project brochures in English, were sent to the EACEA Agency in order to promote the project during the LLP Info days 2011 foreseen the 12th and 15th of November 2010 in Brussels. The COACH BOT e-learning platform demo is available also on the project website (public area).
- ✓ *Articles on the project results*: have been published by the partners on national and international magazines, web sites and blogs. Furthermore, different papers have been submitted to national and international conferences. Press releases and advertisement on national magazines have been produced to inform home healthcare professionals and stakeholders about the e-course experimentation and national exploitation seminars.
- ✓ *Virtual Coach Trial*: is available on the project website to promote the pilot application testing and to gather users' feedback.
- ✓ *National and international conferences*: partners took part to several events to disseminate the project spreading promotional materials and presenting the project. The conferences were focused on both the technological/methodological aspects of the e-learning as well as the project target group and sector (healthcare). The conference reports area available on the public area of the project website.
- ✓ *Final project Conference*: the project results were exploited also during the final project Conference held in Aarhus (DK) on the 15 of October 2010. Different stakeholders were invited to the conference where the project results were presented. The detailed description of this activity is available in the report of the final conference published on the public area of the project website.
- ✓ The project is published on the ADAM project and product portal for Leonardo da Vinci program (Advanced Data Archive and Management System), featuring the project's results and products (see <http://www.adam-europe.eu/adam>).

5. COACH BOT e-course “Enhancing the European home healthcare professionals’ competences” Experimentation

Experimental strategy

The COACH BOT methodology is based on the e-course curriculum developed according to a personalised approach. This approach allows learners to benefit from a training path based on learners' specific needs. Considering that each learner has his or her own specific work needs, knowledge and skill requirements, learners have the opportunity to create their own personal training programme. For example, a learner can choose to focus on certain topics while avoiding others or merely study only the basic information.

The main innovation of the COACH BOT project is the "Virtual Coach", which was tested in one of the groups of learners (experimental group). It supports participants "individually" during the modular e-course providing them with various kinds of services. The "Virtual Coach" interviews and chats with learners in order to create a students' profile that can help them in selecting useful course modules which constitute their own personal training path. The "Virtual Coach" acts as a personal teacher, a coach and a peer assistant.

The main idea was to create two groups of participants, experimental and control group. All learners participated in the e-course "*Enhancing the European home healthcare professionals' competences*", but only the experimental group benefited from the Virtual Coach- Clara's assistance. In each partner country one experimental group including 10/15 learners and one control group including 7/10 learners was required for the course.

The students were selected according to the following requirements:

- ✓ A good knowledge of the English language, due to the fact that all lessons and course materials was delivered in English;
- ✓ Being healthcare or home caregiver workers;
- ✓ Level of interest and motivation to participate in the course;
- ✓ Being able to access the PC or Laptop connected to the Internet

Each partner country autonomously managed the promotion of the course, but they were provided by the list of the procedures to follow in the way they found appropriate: informative e-mails to potential candidates, information about the course on the website, other commercial activities, distributing course brochures etc. After receiving applications from the potential candidates, each partner selected the students on the base of requirements. Then the group of selected students were divided in the experimental and control group. They were also asked to fill in the expectation questionnaires (translated into national languages) in two versions: the one for the experimental group including specific questions related to the virtual assistant and the one for the control group without the questions related to the virtual assistant.

The e-course was delivered in all partner countries involving a total of 165 participants (home healthcare professionals). The total course duration was 6 months, from March to August 2010.

COACH BOT Course contents

The curriculum of the e-course “*Enhancing the European Home Healthcare Professionals’ competences*” was divided into 4 areas and 15 modules. Each of the modules contained 3 topics (some 2).

MEDICAL ISSUES

A1 Support individuals to access and participate in recreational activities

The care environment

Assess what an individual wants and needs

Promote activity

A2 Support individuals in their daily living

Meet domestic and personal needs

Food and drink for individuals

Personal hygiene

PSYCHOLOGICAL ISSUES

B3 Communication with elderly people

Late adulthood

Factors affecting communication of elderly people

Communication skills

B4 Communication with dying patients and their family

Communication with terminally ill and dying patients

Communication with dying patients’ families

How to talk about terminal disease

B5 Communication with patients with hearing disabilities

Deafness - What is it?

The loss of hearing

Principles of communication with patients with hearing disabilities

B6 Communication with patients with seeing disabilities

Vision, seeing disabilities, blindness

How do the blind and people with seeing disabilities see the world

Principles of communication with patients with seeing disabilities

B7 The relationship with patients family

Listening and communicating

Family empowerment and professionalism

- B8 Establishing a help relationship*
 - Mediation and mediators
 - Help relationship
 - NATIONAL/EU LAWS
- C9 Introduction to the main home health care worker EU legislation*
 - European Union Treaties
 - Fundamental rights
 - European health strategy
- C10 Home health care worker UK legislation*
 - Legal care standards
 - Minimum level of service standards
 - Going beyond the standards
- C11 Home health care worker SI legislation*
 - General legal environment
 - Healthcare Legislation
 - SOCIAL/ETHICAL ASPECTS
- D12 Nurse: professional code and ethical aspects*
 - Nurse and the patient
 - Nurse and ethical aspects of her work
 - Nurse and ethical decisions
- D13 Cultural differences in help relationships*
 - Culture and cultures
 - The nursing theory of universality and diversity
 - Passage rites
- D14 Social Care Worker Professional Code*
 - Code of practice
 - Enforcement and care standards
 - Policies and procedures
- D15 Self instruction and continuing learning*
 - Self-instruction
 - Toward reflective practice

For every lesson following LO's (learning objects) were created:

- ✓ start-up quiz

- ✓ final quiz
- ✓ audio lesson
- ✓ lecture notes
- ✓ case studies (for communication with elderly people in two parts and confidentiality)

The course was based on an e-learning methodology that allowed each learner to build a personalized learning path. The personalized learning path of each student consisted of the topics selected from the list of modules of the course curriculum, on the base of each student specific needs and answers at the start-up quiz.

Synthesis of the Experimentation phase

The COACH-BOT methodology represents a pedagogical model of adult distance education based on the combination of the conversational agent technology and the modular e-course delivered through the platform. The e-learning system created should be able to interface individually in a human-like way with learners and to customize the learning process according to their needs. Authors tried to create a tool that is user friendly, can suit each student's profile, gives support to learners and is available at any time. Beside authors, teachers and tutors, also learners played an important role in the experimentation phase. In all partner countries they were selected through the course promotion and selection processes.

All together *165 learners* were involved in the experimentation. They were divided in two groups, experimental and control. In experimental groups learners were supported by the Virtual Coach, in control groups, learners were without such support. During the experimentation many problems were reported. Mostly they were of technical nature, but also many learners had problems with using foreign language.

Teachers and tutors provided a lot of support to their participants. Some participants were more successful, some less. 50 % of students were successful in experimental groups and 43 in control groups. At the end, we can say that experimentation phase was interesting experience for both sides, teachers and learners. Both gathered a lot of new knowledge.

The COACH BOT course "*Enhancing the European Home Healthcare Professionals' competences*" was promoted by partners in different ways. Partners organized national seminars in their countries. National seminars were used as promotion of the project, but also as an opportunity to meet with the professionals. Most of the partners promoted national seminars on their websites, some of them also in newspaper. Partners sent many informative e-mails to potential candidates and also many phone contacts were made. Partners sent invitations also to hospitals, professional associations, former students and companies active in home health care. After enrolment forms of

candidates were received, experimental and control groups were formed. In the selection process most of the applicants who fulfilled basic requirements were accepted. Those requirements were:

- ✓ knowledge of the English language
- ✓ access to the PC and internet connection
- ✓ motivation to participate

Partners used different methods to select candidates to experimental or control group. Some selected them randomly, others filled at first experimental group and then control etc.

Introductory meetings with control and experimental groups were held by most partners in March 2010. In those meetings COACH BOT course was introduced and teachers gave the participants information about:

- ✓ COACH BOT course details (modules, topics, contents)
- ✓ ways of defining individualized learning paths (start-up and final quizzes, difference between required and optional modules)
- ✓ available communication tools (agenda, forum and chat)
- ✓ learning objects (audio lessons, lecture notes, glossaries, quizzes, forums, chat),
- ✓ time plan

Participants were also introduced with technical aspects of the platform and minimum system requirements, details about username and password. Also demos for experimental and control group were shown. After few days participants received their usernames and passwords. Most of the partners provided tutor and technical supporter during the whole process of experimentation. Mostly, both were available by e-mail or phone, in some countries also individual meetings with participants were organized. Most of the partners also held interim in person meetings to resolve difficulties that were reported by the participants. There were some technical problems, but also others connected directly with course contents or problems with using foreign language. During the experimentation phase participants were asked to fill satisfaction questionnaire.

The end of the course was postponed from the end of June 2010 to the end of August 2010 in order to allow students to successfully finish the course as many partner countries had summer holidays in that period. Courses in different partner countries were completed with meetings.

All the detailed information related to the COACH BOT Experimentation phase are available in the COACH BOT Experimentation Report published on the project website, public area.

6. Evaluation of COACH BOT Methodology

In order to carry out the evaluation of COACH BOT methodology it was designed and submitted two questionnaires to both control and experimentation groups:

- ✓ expectations questionnaire - at the beginning of the e-course
- ✓ customer satisfaction questionnaire - after the e-course ended

The choice to realize two sessions of the e-learning course provided a fundamental added value to the project because thanks to the comparison between the two groups it was possible to obtain meaningful data for analysing the core role of the “Virtual Coach” within an e-learning course.

There were designed two versions of the questionnaires for the two learners groups:

- ✓ *Control group*: both the questionnaires will include questions related to the e-learning platform and course contents (Learning Objects).
- ✓ *Experimental group*: both the questionnaires will include the same questions of the control group’s questionnaires (related to the course e-learning platform and contents), but they will also include an additional section related to the Virtual Coach application.

The questionnaires are multiple-choice questions’ questionnaires.

Background and working methodology

The evaluation of the expectations of the control group and the experimental group was done during April-May 2010. The evaluation of the satisfaction of the control group and the experimental group was done during July-August 2010.

For the evaluation of the expectations of the control group: 60 persons from 6 countries (Italy, Romania, UK, Denmark, Slovenia and Switzerland). For the evaluation of the satisfaction of the control group: 41 persons from 6 countries (Italy, Romania, UK, Denmark, Slovenia and Switzerland).

For the evaluation of the expectations of the participants from the experimental group: 69 persons from 6 countries (Italy, Romania, Denmark, UK, Slovenia and Switzerland). For the evaluation of the satisfaction of the participants from the experimental group: 49 persons from 6 countries (Italy, Romania, Denmark, UK, Slovenia and Switzerland).

In conclusion, 68% of the participants of the control group remained until the end of the course and 71% from the experimental group.

The information is provided by SREP, RO after processing the data from each country and realizing a common evaluation at a European level (for the 6 countries involved).

This evaluation is based on a comparison between the results of the evaluation of students' expectations and of the evaluation of the students' satisfaction. Therefore, the results will be presented and then conclusion will be drawn.

Analysis and conclusions

- ✓ In both groups (control and experimental), there were more women than men (80% in the control group 67% in the experimental group) and the balance between the gender remained the same until the end of the course even if the majority of the persons that dropped out were also women;
- ✓ In both cases (control and experimental) at the evaluation of the expectation were less people convinced by the fact that e-learning courses offer more benefits than traditional learning. After undertaking the course, in both groups the percentage raised to 95% of the participants that appreciate more e-learning;
- ✓ The students from both groups believed both before and after the course that the main opportunities of the course are the ability to study at home and the benefit from studying at a time that suits them;
- ✓ Regarding the knowledge and skills that the participants wanted to improve, 48.5% of those from the control believe that their expectations were met; instead 75% of the participants from the experimental group believe the same thing, thus considering that the experimental course was more expected than the control group;
- ✓ The users of the control course stated that they did not encounter so much problems before with e-learning platforms and were also satisfied with the COACH BOT e-course because even if they had some technical problems they considered it worth recommending; On the other hand most of the users of the experimental group stated that sometimes they had problems with other e-courses and met also technical problems to the COACH BOT e-learning platform;
- ✓ The users from the experimental group considered that they would prefer assistance in order to solve the problems met during their learning process, and that the virtual assistant "Clara" helped them navigating the platform easier but in the same time confused them;
- ✓ 67% of the users considered that Clara's assistance represents an added value to the course, therefore improvements should be made.

7. Conclusions: the added value of the COACH BOT Virtual Coach

The Romanian Society for Lifelong Learning (SREP), partner in charge of the evaluation in the COACH BOT project, drawn up the report ‘Evaluation of the experimental and control group satisfaction’, where they collected questionnaires filled in by the course participants, analyzed and commented them.

There were submitted two versions of the questionnaires, one for each learner group:

- ✓ Control group: both the questionnaires will include questions related to the e-learning platform and course contents (Learning Objects).
- ✓ Experimental group: both the questionnaires will include the same questions of the control group’s questionnaires (related to the course e-learning platform and contents), but they will also include an additional section related to the Virtual Coach application.

The two groups were separated and didn’t communicate each other i.e. the evaluation by users of the control group course has been carried out without any awareness of the possible benefits that could come up by the virtual Coach assistance. In the other hand, the users of the Experimental group course didn’t use the platform without the Virtual assistant. It means that the data collected, and the subsequent analyses and comments, in the report are absolute i.e. not dependant of the other user group. In the questionnaire for the experimental group, many questions have been asked concerning the virtual assistant and its added value in the E-Learning platform, but students didn’t really know if the course without it would be worse, the same or even better because they didn’t use the platform without the Coach Bot.

Nevertheless by comparing answers on the appreciation of the E-Learning platform, it is possible to infer if the virtual assistant added or not some value to the course.

Comparable results

First of all it’s important to understand if the results of the two groups are comparable i.e. if the members of the 2 groups have more or less the same characteristics in term of gender, age and profession.

	Control group	Experimental group
Total users	41	49
Gender	female > 2/3	female > 2/3
Age	almost all between 18 - 45	almost all between 18 - 45

Profession	far majority social / care worker	far majority social / care worker
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The previous table shows that the 2 groups have the same characteristics and can be comparable.

Answers to questions that relate implicitly to the presence of the virtual assistant

Question:

Did the overall course “Enhancing the European home healthcare professionals’ competencies” meet your expectations?

Aggregate answer

	Control group	Experimental group	Difference
Agree	63 %	67 %	+ 4 %

Question:

Do you think the e-learning platform of the course offered you some benefits compared to the traditional learning?

Aggregate answer

	Control group	Experimental group	Difference
Agree	92 %	96 %	+ 4 %

Question:

Did the course “Enhancing the European home healthcare professionals’ competencies” meet your expectation in term of knowledge and skills you expected to acquire?

Aggregate answer

	Control group	Experimental group	Difference
Agree	58,5 %	73 %	+ 14,5 %

Question:

Would you recommend the course “Enhancing the European home healthcare professionals’ competencies” to others?

Aggregate answer

	Control group	Experimental group	Difference
Agree	67 %	75 %	+ 8 %

Analysis and conclusion

The results of the cross questions show always a bias towards the course with the virtual assistant (from 4% to 14.5 %). It is reasonable to state that the virtual assistant add some value to the course. By examining the answers that the participants have given on the questions related to the virtual assistant, it could be possible to infer in particular where the added value resides and how to improve the aspects of the virtual coach that have been carried out a lower score.

To do this it would be better to assign an overall value to the different answers given by the participants in pages 59-62 of the Evaluation report. it's sufficient to apply this simple formula:

$(\sum_i n_i \times i) / \sum_i n_i$ $i= 1 , 2 , 3 , 4 , 5$ and n_i are the number of choices for each possible answer where:

1 : Totally disagree

2 : Disagree

3: Fair

4: Agree

5: Totally agree

The above formula was applied to the different answers related to the virtual assistant and a number between 1 and 5 has been obtained. Then this number has been converted in a linguistic value following the scale shown above.

The results are shown hereafter:

I am satisfied on the overall quality of "Clara" performance	Between fair and agree
The presence of "Clara" makes the course more interesting	Fair
The presence of "Clara" makes the navigation within the platform more straightforward	Fair
The presence of "Clara" helps you to maintain your motivation during the course	Fair
"Clara" is nice and engaging	Fair
The size is adequate	Fair
The reply time is adequate	Agree

The size of written text is adequate	Agree
The syntax is adequate	Agree
The contextual messages given by “Clara” help the user all along his / her learning path	Between fair and agree
Verbal and non verbal feedbacks conveyed by “Clara” after a user has finished a final quiz are meaningful	Between fair and agree
Help desk (service provided by “Clara” which aims to answer student questions on technical or training methodology issues)	Fair
The help desk facilities provided by “Clara” are useful	Between fair and agree
The answers of “Clara” are adequate	Between fair and agree
Guidance interview (first contact with “Clara” before starting the course)	
The messages of “Clara” during your first dialogue with her are clear and meaningful	Agree
Suggestion (service provided by “Clara” which aims to answer student questions on specific course contents as an interactive glossary)	Between fair and agree
“Clara” as an interactive glossary is useful	Between fair and agree
The answers of “Clara” are adequate	Between fair and agree

The users’ assessment range from fair to agree that prove at least the virtual assistant doesn’t introduce drawbacks in the E-Learning platform and in many case the overall score is positive.

In particular some improvements should be made in some aspects of the virtual assistant that are:

- ✓ The virtual assistant should make the navigation within the platform more straightforward providing more messages to orient the user even if not asked explicitly by the latter. Generally the E-Learning platform Claroline has been assessed to be quite simple and straightforward to navigate, but this is not the case with the Coach Bot’s target group.
- ✓ The virtual assistant should provide more messages to encourage and motivate students all along the course.

- ✓ Some external features of Clara have been assessed just as fair. Probably an effort should be made to provide more facial expressions and gazes, to enhance all the non verbal communication of the virtual assistant.
- ✓ The help desk facilities provided by Clara should be improved by acting on his knowledge base (or 'mind') i.e. to improve the capacity to answer in natural language to more questions concerning methodological and technological aspects of the platform and the course.

In the other hand, some functionalities of the virtual assistant were appreciated by the course participants such as the interactive glossary and the guidance interview. Moreover 66 % of the users stated explicitly the Virtual assistant is an added value.

This is a very good result considering that the Coach Bot is very innovative and can be considered as the first step to embed a general purpose pedagogical agent in a traditional open source E-Learning platform. Some improvements can be made, in particular in the design and the empowerment of the knowledge base of the virtual assistant and the user feedbacks clearly highlighted where further developments should be addressed for a possible follow up of the project and for its commercialization.

The real innovation of the COACH BOT project is the embedding of a pedagogical agent in an open source and SCORM compliant learning management system. The virtual agent becomes a mentor, a coach, a teacher, a didactic or technical tutor depending on the student's type of learning activity. This project provides the premises to provide the distance learning community with a multiple purpose pedagogical agent that is easy to integrate in any open source LMS like Moodle, ILIAS, Dokeos, Atutor, etc. The main long term strategy could be to further implement the system to make the virtual assistant completely independent of the learning management where is integrated in as a standard web service. In that sense the strategy would be to go beyond the prototypal phase and to make the system ready to use for any educational institutions. Moreover the system should be sector independent i.e. not only suitable for training in the health care sector but also available for other fields. In order to fulfil this objective, further developments in the virtual assistant's knowledge base should be implemented.