Nurse Education Today 30 (2010) 411–419

Contents lists available at ScienceDirect

Nurse Education Today

journal homepage: www.elsevier.com/nedt

The LEONARDO-DA-VINCI pilot project "e-learning-assistant" – Situation-based learning in nursing education

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ARTICLE INFO

Article history:
Accepted 24 September 2009

Keywords:
LEONARDO-DA-VINCI programme
Blended learning
E-learning platform
Systemic situation-based learning approach
Web-based learning
Nursing education

SUMMARY

E-learning will play an important role in the training portfolio of students in higher and vocational education. Within the LEONARDO-DA-VINCI action programme transnational pilot projects were funded by the European Union, which aimed to improve the usage and quality of e-learning tools in education and professional training. The overall aim of the LEONARDO-DA-VINCI pilot project "e-learning-assistant" was to create new didactical and technical e-learning tools for Europe-wide use in nursing education. Based on a new situation-oriented learning approach, nursing teachers enrolled in the project were instructed to adapt, develop and implement e- and blended learning units. According to the training contents nursing modules were developed by teachers from partner institutions, implemented in the project centers and evaluated by students. The user-package "e-learning-assistant" as a product of the project includes two teacher training units, the authoring tool "synapse" to create situation-based e-learning units, a student's learning platform containing blended learning modules in nursing and an open sourced web-based communication centre.

Introduction

E- and blended learning units are educational programmes based on the structured involvement of electronic media. These form basic tools for future learning strategies not only at the university level but also in the field of vocational training. Even though e-learning is independent from time and place, offers flexibility and a wide choice of programmes from an international market, computer-based learning does not gain acceptance all over Europe. While in some of European countries e-learning is a crucial part of the training portfolio in higher and vocational education, in others e-learning programmes are not well established (Marry, 2005). In a changing field of health care with new professional challenges, IT skills are strongly needed to fulfill the requirements of computer-based documentation and information (Scott et al., 2008). While there is a broad range of products developed for computer-assisted skill training of medical students (Choules, 2007), e-contents especially tailored for the nursing education are lacking or not accepted by nursing teachers and students. This may due to lack of proper didactical and pedagogical approaches, user-friendly learning platforms and adequate approaches to integrate e-learning units in the curricula (Childs et al., 2005). Since nursing teachers as well as students may have poor knowledge or fear the use of new media, there seems to be a need to improve competencies in both groups (Christian, 2003). Suitable technical equipments, adequate e-didactical approaches adapted to the specific needs in nursing education and IT training programmes for teachers and students are needed to ensure a valuable implementation of e- and blended learning programmes in nursing education (Muirhead, 2007). Blended learning as a mixture of well-matched e-units and face-to-face lectures (Garrison and Kanuka, 2004) are well-suited to equip nursing students with nursing contents and to improve computing skills.

The LEONARDO-DA-VINCI programme, funded by European Union, aims to complement the teaching and learning methods of people that are involved in vocational education and training in the European Union. According to the "Strategic framework for European co-operation in education and training, Update 2008"

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doi:10.1016/j.nedt.2009.09.014

(EU, 2008), the LEONARDO-DA-VINCI programme should contribute to the harmonisation of education systems of EU member states based on comparable qualifications. From 2003 to 2006 the programme focused on new applications in e-learning (EU, 2003). Transnational partnerships were invited to submit proposals for pilot projects that promised new e-products and tools to improve vocational education in the EU member states. This was the starting point for the LEONARDO-DA-VINCI pilot project "e-learning-assistant" addressing blended learning in nursing education.

Aims of the project

The overall aim of the project was to create new didactical and technical e-learning tools and learning materials to improve media competencies of teachers and students and to facilitate the application of a web-based learning in nursing education.

In particular, the project had the following objectives:

1. Teachers working in nursing education should be able to adapt, implement, create and evaluate blended- and e-learning materials without advanced knowledge in computer programming.
2. A web-based user-package should be developed that provides a compact set of components that are necessary to implement blended learning in educational settings of nursing. A transnationally applicable user-package in computer-based learning that should be suitable for beginners as well as for advanced persons.
3. In addition to these tools for teachers to develop and implement e-learning units the user-package should include a learning platform for students where these e-learning units could be accessed.

Structure of the project

Project group

The LEONARDO-project brought together a skilled team of teachers in nursing education from Belgium, the Czech Republic, Germany, Finland and Latvia and Poland as well as two IT companies based in Germany and Great Britain.

The project was co-ordinated at the University of Applied Sciences at Bielefeld, Germany. This centre was involved in a forerunner project aimed to modularise nursing education (Knigge-Demal and Nauerth, 2003) and is therefore experienced in the field of e-learning and modularisation. To promote entrepreneurship and improve exchange of experiences between companies and educational institutions LEONARDO-DA-VINCI project partnerships are obliged to involve small and middle enterprises (SME) (EU, 2005). Therefore two IT companies from Germany and Great Britain, skilled in technical development of IT based educational tools were responsible for technical development. Other partners were from different public and non-profit educational settings, such as nursing schools, universities and higher education centres for nursing. IT companies were funded by the EU following agreement to the rules of dissemination ensuring open access of the project products via the internet.

Work packages and project organisation

Based on a route chart, featuring milestones to characterize sub-goals, tasks were assigned to the partners by the co-ordination centre (Fig. 1).

The co-ordination centre was responsible for the overall management of the project, including communication, arrangement of workshops, budget administration, documentation and the process evaluation of the project. Additionally, the co-ordination centre was responsible for the development in of the e-didactical approach, the development of teacher training units in e-learning and the construction and validation of evaluation tools.

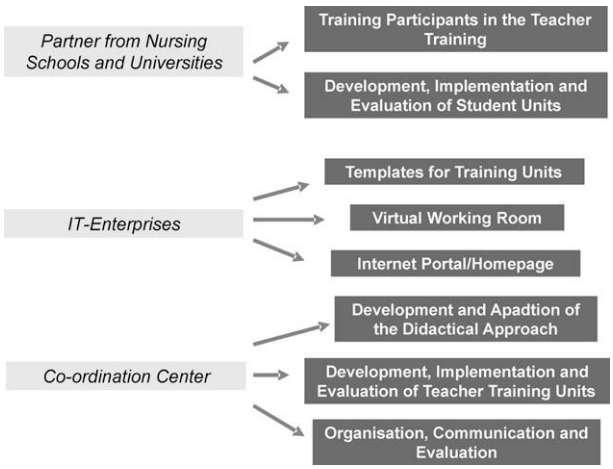

Fig. 1. Work packages of the partner within the project.

Templates were created by the IT enterprises to build up e-tools for e-unit development and learning platforms containing e-units and evaluation tools. Additionally, the companies provided technical tools for the internet presence and the intranet.

Joint teachers working in the partner institutions were responsible for the development, implementation and evaluation of blended learning nursing modules in their institutes based on the techniques provided by the "e-learning-assistant".

Working process

Starting with the conceptual and technical development for core facilities of the "e-learning-assistant", the co-ordinators laid foundations for the subsequent training of teachers in e-learning. Based on a situation-based learning approach, two teacher training units have been created to promote e-learning competencies in teachers.

The first unit addressed strategies on how to implement blended learning modules within the setting of nursing education. In the next phase teachers should act as learners within the project applying the freshly acquired knowledge to adapt and implement blended- and e-learning units. Based on these experiences the second unit aims to train teachers in the development of blended learning nursing modules. Subsequent to the application of these materials in student courses the products have been evaluated to elucidate benefits and deficits (Fig. 2).

To acquaint joint teachers with the underlying principals of blended- and e-learning, the teacher training modules were also constructed as blended learning units: the e-learning units were provided online by the "e-learning-assistant" and completed by workshops conducted in the co-ordination centre. Thereby teachers were enabled to acquire their own experiences in a "learning by doing" process guided by the co-ordinators acting as tutors on the whole process (Fig. 1).

Evaluation of the process and the products

LEONARDO-DA-VINCI pilot projects are obliged to evaluate the project and document and control the work progress. According to the parameters given by the programme guidelines evaluation of the working progress and the project products should include all persons that were involved in the project activities.

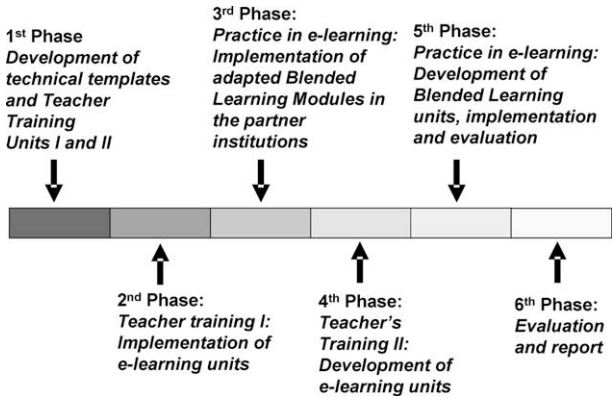

Fig. 2. Working process of the project.

The initial idea to evaluate the process and outcomes of the project was grounded on the approach of Donabedian (1980), who established evaluation as a tool in the quality management of nursing. Donabedian aimed to show that evaluated processes are in line with predefined goals. According to Donabedian three dimensions supposed to be affected by the project were evaluated in the partner institutions using standardized questionnaires:

- *Technical and structural conditions in the partner setting*
  To survey preconditions and special requirements the joint teachers from the partner institutions were asked to fill in a baseline needs assessment. Alterations within the term of the project were assessed by follow-up survey in the last project phase. The questionnaire included items concerning technical equipment, technical staff, technical organisation and management, implementation of e- and blended learning and further training of teachers in IT applications.
- *Motivational attitudes, experiences and competencies in e-learning in the teachers group*
  In order to document and control the project motivational parameters, expected benefits and tutorial challenges initiated by the project were assessed by the joint teacher group, which constantly assessed project issues. Evaluation sheets were provided on the initial and the final workshop held in the co-ordination centre.
- *Effects of the project products in students*
  To determine how students were benefited by participation in a blended learning module, students in the partner institutions were surveyed after completion. The questionnaire contained items concerning experience with the IT media, motivational attitudes regarding e-learning and an overall assessment of the blended learning module.

Based on a pre-testing the student instrument was optimised by using item and factor analysis and controlled for validity and reliability. Scales were accepted when reaching a Cronsbach $\alpha > 0.75$. Statistical analyses were carried out by using SPSS 12.1 software package.

Results and products

The following products were developed by the project team within the two years of term.

1. An e-didactical situation-based learning approach
   - To embed contents and tools into a practically relevant professional background.
   - To tailor self-learning units suitable to the level of knowledge and experience of the learner.
2. The teachers training modules containing the blended learning lectures I and II.
3. *The authoring tool "synapse": an* icon-based online tool that guide teachers in creating e-units according to the situation-based learning approach. Comparable to *Xerte*, an online authoring tool developed at the University of Nottingham to create interactive learning materials, "synapse" enables authors to compose contents by using a word/html-editor, to embed presentations and videos. According to the situation-based learning approach, the tool helps authors to link the so composed scenes in branched ways. Furthermore, "synapse" includes instruments that allow the development of structured and standardized online assessment sheets according to the student's level of education.
4. *The student's learning platform: a* virtual working area comparable to the ILIAS platform which offers communication- and management tools as well as virtual class rooms and providing

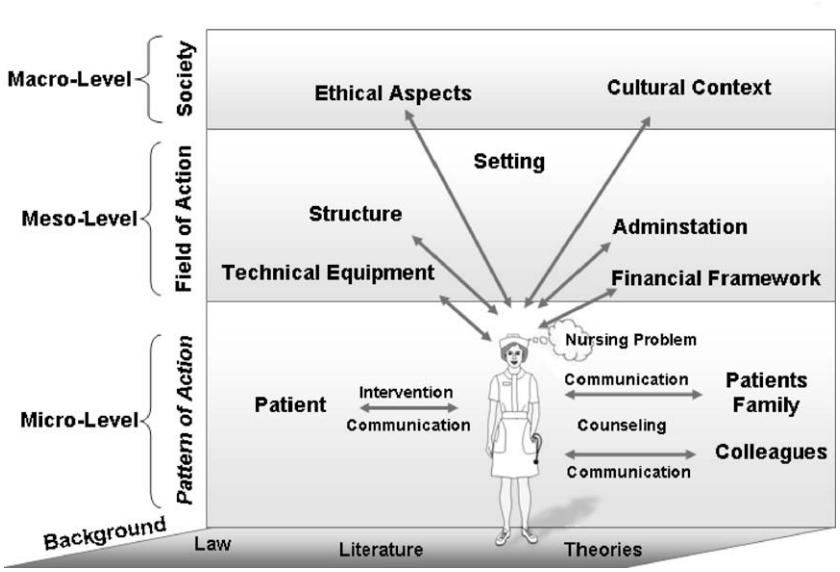

Fig. 3. Interdependencies in decision-making in the nursing process according to Bronfenbrenner (1994) and Kaiser (1985).

e-lectures developed within the project for nursing students at different grades of education.

The situation-based learning approach as a basis for e-learning units in blended learning modules

In 1988 Hundenborn and Knigge-Demal created a new didactical learning approach that aimed to synthesize two essential features of nursing education: the transfer of knowledge close to the daily practice of nursing and of principles in decision-making within a systemic network as described by King (1981). Additionally, this approach should include further pedagogical aspects:

- The process of transfer should be facilitated by a high concordance between the typical professional and the learning situations.
- The illustration of complex professional processes in decision-making for students on different levels of education should be improved.
- The degree of complexity should be adaptable by varying the number of interdependencies.

To fulfill these criteria Hundenborn and Knigge-Demal first modelled a situation-based matrix by merging the situation-based learning approach of Kaiser (1985) with the eco-systemic model of the human development and behaviour according to Bronfenbrenner (1994). In a second step this matrix was adapted to the professional field of nursing (Fig. 3). Kaiser's approach displays professional actors and their pattern of action in interdependency to their professional environment. This includes daily tasks and needs, monetary environment, technical equipment and legal and social requirements. Exemplified on typical professional processes Kaiser summed up these constellations as *situations*.

The eco-systemic model describes human processes of action as a result of impacts and interdependencies allocated on different levels of the social community. By bringing these models together Hundenborn and Knigge-Demal created a matrix structure that mirrors impacts and interdependencies influencing professional situations and processes.

In the preceeding LEONARDO-DA-VINCI-EU-pilot project "Modularisation of the Nursing Education" conducted by Knigge-Demal and Nauerth (2003), the matrix was successfully utilised as a scaffold to build up learning units that mirrors situations often met in the daily routine of nursing.

The situation-based matrix as a tool to develop e-learning units

The structure

As described above the matrix offers a high degree of flexibility to teachers in composing learning situations that reflect professional conditions adequate to the student's level of education. In return, the mosaic structure of a situation is broken down into *scenes* which represent relevant parts of the nursing process. By assembling the so created scenes to a situation the teacher is capable to determine the learning contents. The reticular structure of the matrix allows scenes to be linked linearly (e.g. to describe a chronology) but also to compose multiple ways of solution by creating hubs. This option illustrates that the nursing process is mostly non linear but eclectic and coincident. Ascertained that all scenes are involved into the sequence the student is capable to select a learning pathway self-dependently (Fig. 4).

The practice

In practice, a complex exemplary case as used in problem-based learning serves as the starting point for the construction of learning situations. Since typical problem-based cases are focused on the description and solving of a main problem, this method mostly could not provide insights in systemic dimensions of professional patterns of action. The situation-based learning approach addresses additional aspects embedded in the constitutional, institutional and social context leading to a sequence of new scenes. By using the situation-based matrix an exemplary case describing a health problem or a reason for intervention can be transferred into a situation. The sequence of linked scenes reflects the underlying process of decision-making and action. The character and content of the scenes are determined by factors resulting from the constitutional, institutional and social context affecting the nursing process. The narratively linked scenes should enable the students to stepwise and self-dependent elucidation of cross-linked implications and deductive reasoning shaping the nursing process. In this way the situation-based matrix is a useful tool to develop structured e-learning units.

Depending on the knowledge of students and the respective learning content the complexity of the situation can be designed dynamically. The integration of further impact factors such as additional actors or process parameters enables the teacher to vary the level of complexity. By adding further actors e.g. therapists or

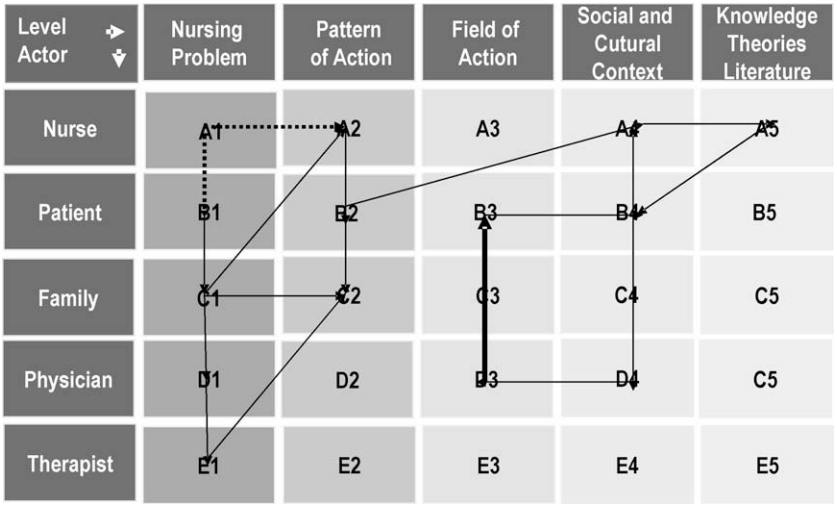

Fig. 4. Situation-based matrix of nursing interdependencies. ·····▸ Starting points; ——▸ end point.

social workers to the matrix, the student gains insight into the perception of additional persons involved as well as into interdisciplinary thinking and networking.

The situation-based matrix as a template for the authoring tool "synapse"

Technical templates rebuilding the matrix structure were constructed by the IT companies. The authoring tool "synapse" serves an instrument that enables teachers to transfer matrix-based concepts into an e-learning unit without any sophisticated knowledge in computer programming. The platform helps the teacher to construct multiple pathways, to import and integrate developed scenes, to add figures or tables, to determine hubs and to link the scenes without leaving open ends. Additionally, "synapse" facilitates the integration of assessment sheets. "Synapse" is directly linked to the students learning platform to transfer freshly developed e-learning units automatically. This allows the modification of contents and lay-outs online.

The situation-based e-learning units are ideally suitable as working materials supplying self-guided phases in blended learning modules. By altering with face-to-face-phases these units could be used as examples of learning contents that have been previously taught in the classroom.

Teacher training units

The "e-learning-assistant" aims to provide all tools that are necessary to use e- and blended learning in the daily teaching without assuming any special knowledge and experiences in e-learning. To equip teachers with the basic competencies in dealing with e-learning units and in composing such units the user-package offers two programmes:

- "How to implement e- and blended learning in the daily teaching".
- "How to compose and develop e- and blended learning units".

The online situation-based training units were created by the project co-ordinators using the authoring tool "synapse". For this purpose, the situation-based learning approach was transferred from the field of nursing to the classroom by placing the actors and the setting into an educational environment.

In the first training unit teachers become acquainted with typical problems arising in the implementation process of e- and blended learning. By accompanying a fictional teacher on the way to implement e-learning the participant gains insights in the technical conditions to be installed and in the concerns of colleagues and students regarding the application of new media. Additionally, the module emphasises the training in tutorial competencies that are necessary to assist students in e-learning.

In the second teacher training the participant joins the fictive teacher in creating a blended learning module based on situations. The participant must handle "synapse" in order to design a matrix-based storyboard of situations. The teacher learns how to link the scenes by maintaining the narrative flux and how to integrate situations within a blended learning unit. Additionally, this unit addresses the adjustment between face-to-face- and self-learning online phases (Fig. 5). In a terminal workshop teachers learned how to compile teacher's and student's manuals.

Blended learning nursing modules developed within the project – the student modules

In the preceding LEONARDO-DA-VINCI-EU-pilot project "Modularisation of Nursing Education" six nursing modules were developed to teach students in blended learning manner. By using the tools of the "e-learning-assistant" each project partner adapted one of these modules according to the national requirements in nursing education. In a trial of the adapted module, participating students were invited to evaluate the units (see evaluation).

The materials developed by the partners included a curriculum, a working plan, online-units and working materials provided in teacher's and a student's manuals that were created in different European languages. The following modules are available:

The nursing process

- Introduction to the nursing process and nursing diagnoses.
- Nursing assessment in persons with dementia.
- Basics of trans-cultural nursing.
- Nursing of persons with dysfunctions of the musculoskeletal system.

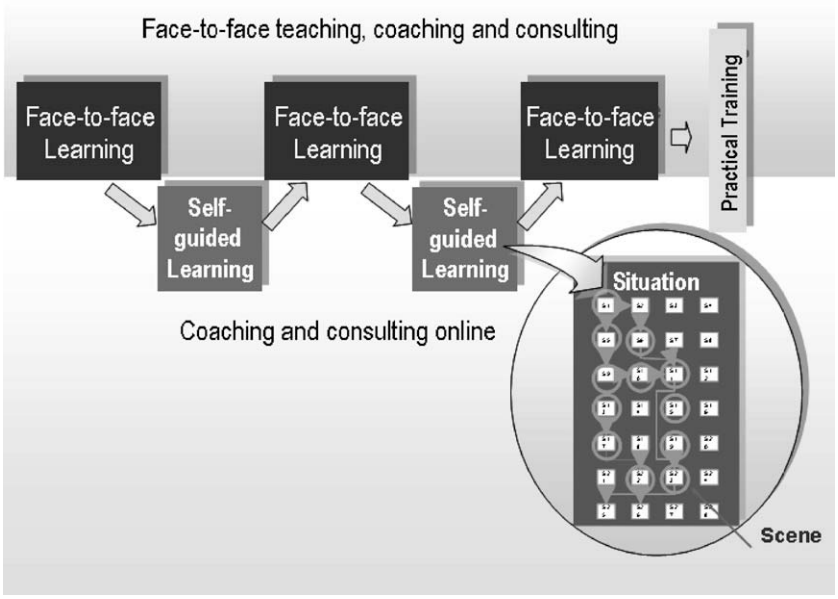

Fig. 5. Construction of a blended learning module including situation-based learning units.

Wound care management:

- Wound care assessment.
- Stoma and Tracheostoma.
- Nursing of patients with Ileostomia according to the Orem Nursing process.

Special nursing interventions:

- Infection control and practical aseptic interventions.
- Cardiopulmonal reanimation – live-saving interventions in diabetic patientsCounselling and communication.
- Health education in nursing.
- Counselling of patients and their families.

The student's platform

The student's platform includes a learning section and a communication area. The learning section offers manuals and online-units to supply the self-learning phases within blended learning modules. The platform administration is organized by an administration tool authorising the access of students, learning groups, teachers and authors.

The communication platform includes options to create blackboards, newsletters, chat-rooms and discussion boards to ensure a time- and location-independent tutoring of students.

Evaluation of the project

The following data display the feed-back given by the teachers ($n = 35$) involved in the project for the internal project evaluation. 127 students joining the blended learning module were enrolled to evaluate effects of the blended learning approach.

Preconditions of the joint partners

The basic needs assessment was carried out by teachers of the partner institutes. The majority of the involved teachers (89%) reported to have experiences with computer- and web-based working. Forty-five percent stated to have experiences with e-learning, while none of them stated to have knowledge in situation-based learning our similar learning approaches. Ninety-five percent of the teachers indicated to be acquainted with e-communication. The data displayed a major demand of training in e-didactics, in the implementation and the development of e-learning units (Fig. 6).

Improvement of e-learning competencies in teachers

A follow-up survey conducted in the teachers group emphasised effects of the project process on technical and contextual skills. Data showed an improvement of all of the surveyed competencies. As shown in Fig. 7 the effects could be observed in e-tutoring, in situation-based teaching as well as in the development and implementation of e-learning units.

Evaluation of the teacher training I and II and the implementation process

The teacher training programme achieved a high acceptance among the teachers (Fig. 8). Most of the teachers reported to work on the online-units frequently (89%) and 75% stated to accomplish the exercises set on the end of the scenes. Seventy-eight percent assessed the situations as entertaining and instructive. The workshops were assessed to be helpful in building up a collaborative atmosphere between the partners (93%). Furthermore the teachers considered the workshops to be essential in the consolidation of knowledge and skills mediated by the online-units.

The majority (70%) remarked that the situation-based learning approach is a useful and manageable tool in the development of e-learning units. Ninety-one percent of the participants reported that their knowledge of how to deal with e-learning materials was improved by working on the teachers training units.

Eighty-three percent of the teachers reported to manage the development or adaption of the chosen module as successful. The German teachers stated to have more problems in the construction of the module and in compiling the materials than the other partners.

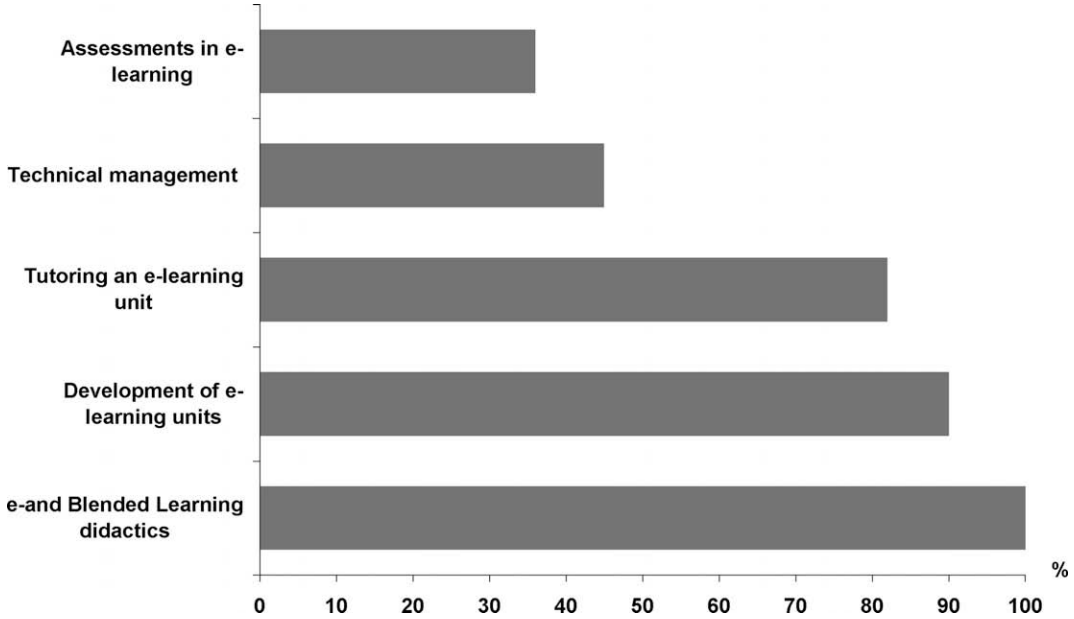

Fig. 6. Needs assessment in teachers of the partner institutions. Demands of e-learning competencies at the starting point of the project (in % of the participating teachers $n = 35$).

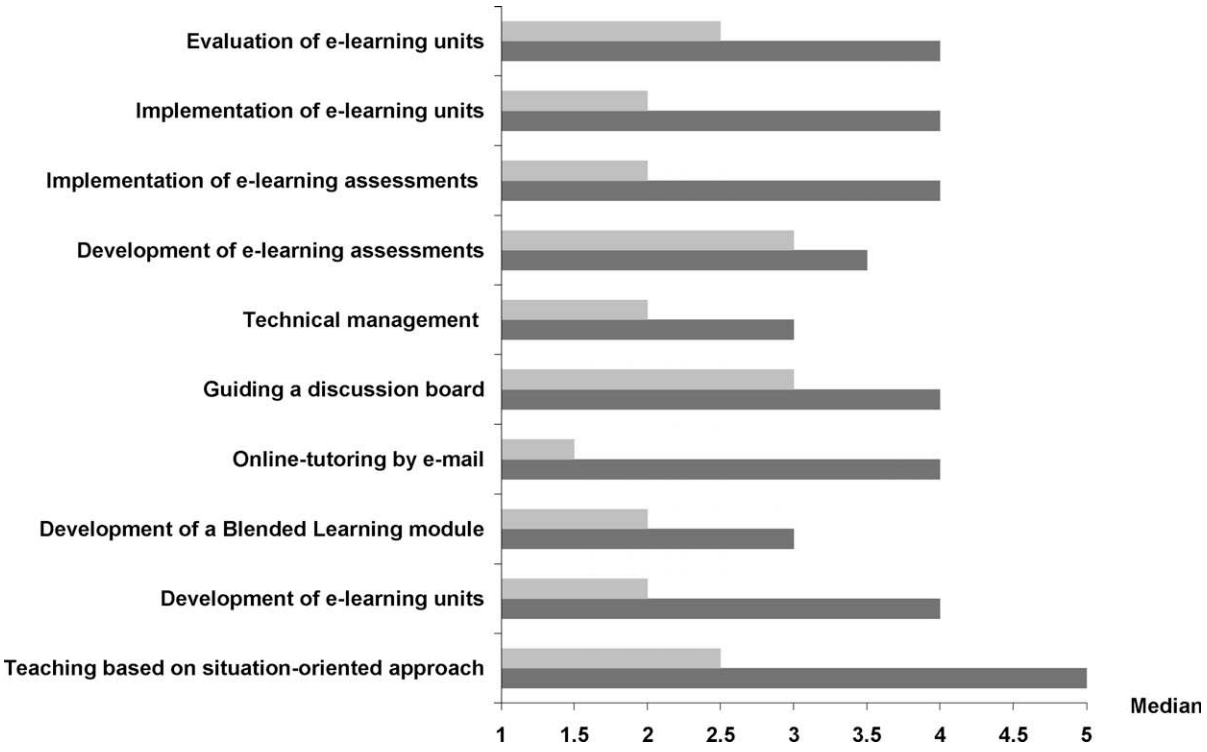

Fig. 7. Changes in e-learning competencies of joint teachers in term of the project = kick-off meeting; = final workshop. 1 = Excellent; 2 = good; 3 = satisfactory; 4 = poor; and 5 = inadequate.

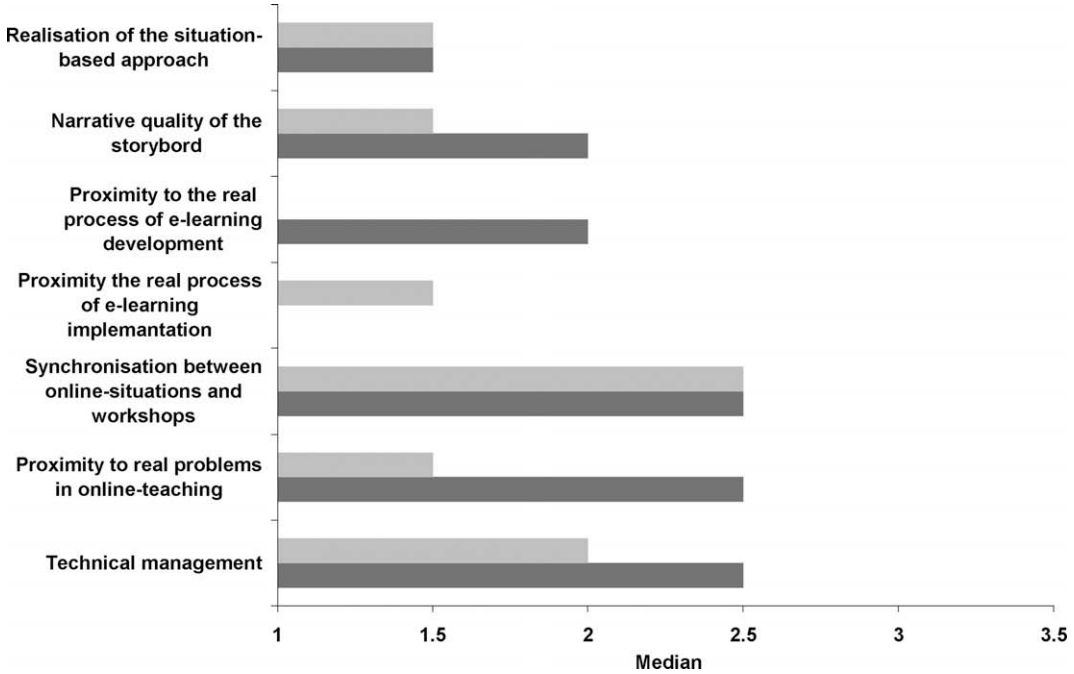

Fig. 8. Evaluation of the teacher training I and II given by the participating teachers. = Teacher training I; = teacher training II. 1 = Excellent; 2 = good; 3 = satisfactory; 4 = poor; and 5 = inadequate.

Evaluation and effects of the blended learning nursing modules in students

A change of attitudes concerning e-learning after accomplishment of a blended learning was observed (Fig. 9). German students assessed the performance of the nursing module, the e-tutoring and the learning success to be less effective than students from other partner institutions. Students from Belgium, Finland and the Czech Republic reported to reach a higher learning success compared to traditional learning, while German students reported the opposite (data not shown).

Discussion

The LEONARDO-DA-VINCI programme was designed to innovate and improve education all over Europe by supporting transnational

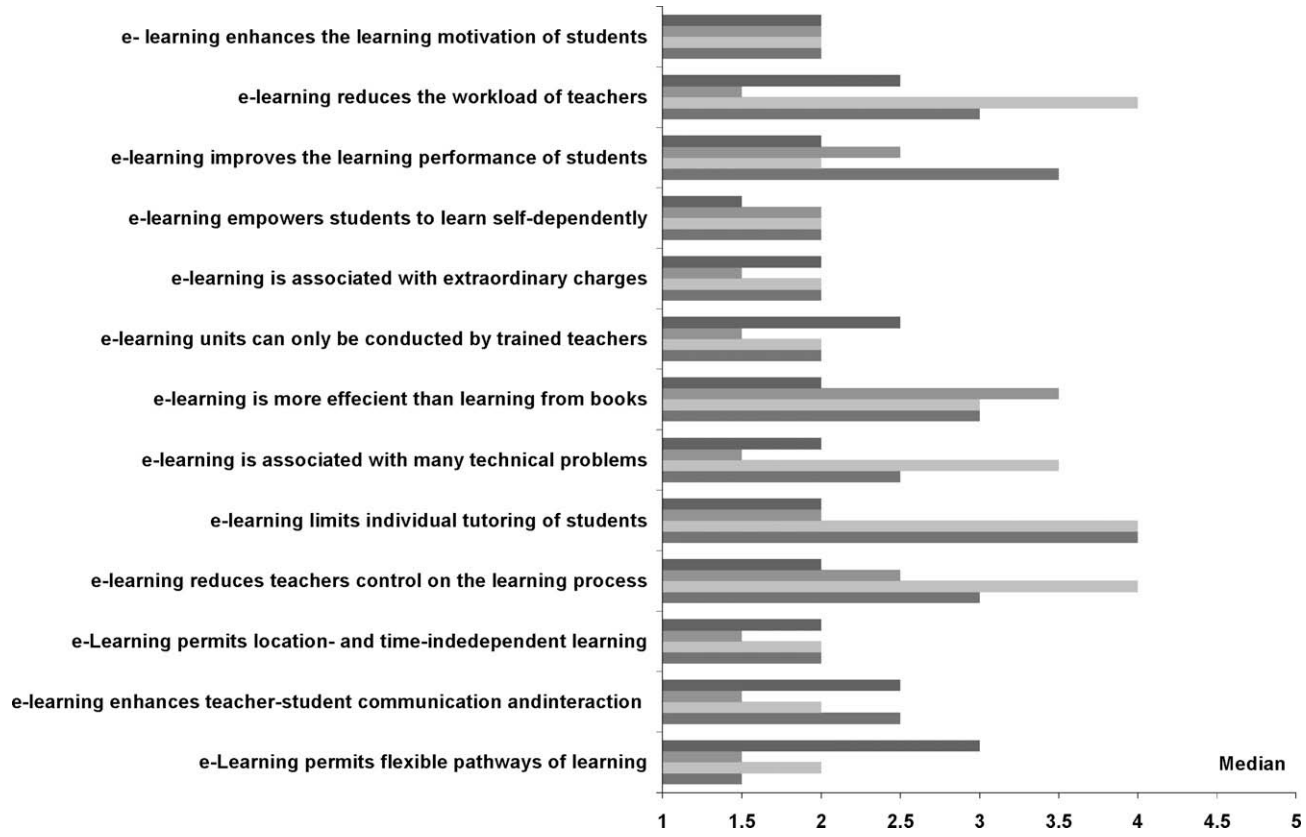

Fig. 9. Changing of e-learning attitudes in teachers and students before and after participation in a nursing module. = Students before module implementation; = students after module implementation; = teachers before module implementation; = teachers after module implementation. 1 = I totally agree; 2 = I agree; 3 = I partially agree; 4 = I disagree; and 5 = I totally disagree.

co-operation projects in the field of vocational training. The collaboration between private and public partners is one of the hallmarks of EU-funded research programmes and pursues two goals: on one the hand, the European Union aimes to support SMEs to gain reputation as technological experts to establish their competencies on the commercial market. On the other, public and non-profit institutions of education should be enabled to translate didactical and pedagogical ideas into learning applications. In this sense the pilot project "e-learning-assistant" successfully accomplished these aims by providing a new user-friendly tool kit. Another goal of EU educational programmes is the harmonisation of educational contents towards a joint strategy in professional education. Depending on the member state nursing education in Europe is allocated on different levels of education: in Poland and other Eastern European countries nursing education is allocated at the university level, in Belgium and Finland nursing students are educated at centers and schools of higher education. Germany like some other EU member states has embedded nursing schools in the vocational training system. The partnership represents these different educational systems in nursing. The contents of the "e-learning-assistant" are applicable all over Europe independent from the different levels of education. This was achieved by adjusting the contents on the professional qualifications to be initiated by learning content. Free access to the tool kit and the leaning contents as well as the open source character of the "e-learning-assistant" that allows adaptations to national conditions may also support the transnational usage of project product.

The project brought together a team of highly motivated teachers. Though each partner institution was successful in developing a blended learning module of nursing, teachers from Germany reported to have more problems to integrate the additional tasks of the project into their daily agenda. This might be due to substantial differences between the partners with regard to the knowledge and the management of virtual media. These differences might not only to be explained by impacts coming from the micro- and meso level, e. g. specific conditions of the school, fears of contact to computers or motivational differences of several teachers. National differences in the structure of the education systems and the type of setting might also have an impact. Nursing teachers working in an academic environment might have better access to the objectives of the project compared to partners coming from a vocational school. Since evaluation was implemented as an internal documentation tool and limited to the group of joint teachers the data may serve as first hints on chances and deficits of the project products. A widespread usage of the package by nursing teachers that intent to implement blended learning modules is necessary to yield valid data.

This was also true for the evaluation of the student's modules by students of the partner institutions. Data may be biased by the fact that all students surveyed are enrolled at the partner institutions. Students that attended the blended learning modules reported they enjoyed the narrative and well scripted online-scenarios but failed to achieve more knowledge than in classroom lessons. This notion might assume that an intensive tutoring via e-mail and online-discussion is necessary to gain benefits from this approach (Salmon, 2005). Working with online-scenarios does not implicate that teachers are released from any tutoring (Creedy and Hand, 1994). On the contrary, carefully scripted narrative scenarios allow to picture professional situations very close to reality and, as a consequence, elicit a number of questions to be discussed in online-discussion boards or chats and in the face-to-face lessons as well (Fox and MacKeogh, 2003). As shown for the problem-based learning strategy these discussions are essential to induce self-learning processes in students. Tutoring should aim at the initiation of these

processes that include the elucidation of the central problems pictured in the scenario and the identification of gaps in knowledge. Furthermore an adequate tutoring should enable students to develop self-directed strategies about how to fill these gaps and to maintain these strategies in a lifelong learning process (Milligan, 1999).

The situation-based learning approach, developed to structure nursing modules and to picture processes of decision-making in the daily work of a nurse, was shown to be a solid didactical fundament for the construction of e-learning units. The modules based on this approach may help to illustrate and to transfer the complex network structure of the nursing process to students by giving insights in daily situations as they occur in the routine of nursing.

The pilot project of European networking has paid off for all of the participants in several aspects: by learning to think outside the own box new perspectives were achieved to strike new paths of teaching and learning. The partnership between nursing teachers from Western and Eastern Europe brought together different traditions, views and learning cultures.

In conclusion, the co-operation within the partnership elucidates a high demand to break the mould for e-learning in nursing education.

More information and open access by registration to the "e-learning-assistant" is available on http://elearn.pflegemodule.de.

Acknowledgements

This project was supported by the European Union, LEONARDO-DA-VINCI programme from 2004 to 2006. Grant D/04/B/F/PP-146 172 "Schulung von Lehrkräften im Gesundheitsbereich zum Einsatz und zur Entwicklung von e-learning-Materialien". Acronym: "e-learning-assistant".

We thank Dr. Leigh Matthew Marsh for the critical review of the manuscript.

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