

DISTRIBUTED PROBLEM-BASED LEARNING IN A LOW- RESOURCES SETTING

**The design and evaluation of a problem-based, web-based
curriculum for training family doctors in Brazil**

José Batista Cisne Tomaz

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Distributed Problem Based Learning in a Low Resources Setting

The design and evaluation of a problem-based, web-based curriculum for training family doctors in Brazil

Probleemgestuurd onderwijs in een arm gebied
De ontwikkeling en evaluatie van een probleemgestuurd, web-based curriculum voor de opleiding van huisartsen in Brazilië

Thesis

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by

José Batista Cisne Tomaz

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Doctoral Committee

Promotor: Prof. dr. H.T. van der Molen

Other members: Dr. A.A.C.M. Smeets
Prof. dr. H.G. Schmidt
Prof. dr. D.H.J.M. Dolmans

Copromotor: Dr. S. Mamede

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*Chapter 1 – Introduction: the content
and the structure of the thesis*

This thesis explores the use of Problem Based Learning (PBL) at distance for training family health professionals in a low-resources setting. This introduction aims at providing the reader with an overview of the content and structure of the thesis. It is divided into five sections: Background information; the subject of this thesis and theoretical framework; the aim and purposes of this thesis; the central research questions, and the structure of the thesis.

Background information

In this section, we describe when, why and where the ideas for this study arose. Initially, we present some reasons why there is an urgent need for training the family health professionals in Brazil, which are analysed in more detail in Chapter 2. Afterwards, we describe the context and the place where the studies were carried out – the State of Ceará, Brazil.

The ideas for the present study emerged from the challenges brought by the implementation of the so-called *Programa Saúde da Família – PSF* (Family Health Programme) in Brazil in 1994 – a Primary Health Care (PHC) based programme. The main goal of the PSF is to improve the health care and the health indicators (in particular the infant morbidity and mortality rates) in the country, mainly in poor and rural areas. Gradually, thousands of professionals – including family doctors, nurses, dentists and other health professionals – started being enrolled in the PSF. At present, there are around 33.000 family health teams in the whole country (Brasil/MS, 2013). However, in Brazil, doctors and other health professionals enroll in the PSF without being required to have a board certified degree, differently to what happens in other countries, such as the United States of America (ABFM, 2013) and the Netherlands (GMC, 2013). Therefore, they need to acquire knowledge and skills necessary to perform the new tasks requested by the family health practice while they are already working. But how to train them, so many people scattered in a so huge territory? That was the big challenge. Some residential family health training programmes were implemented in several states of the country, but this strategy has not been able to respond to the current and growing demand. Thus, other alternatives for training them have been proposed

and distance education appeared the most adequate. However, research should be conducted to evaluate the feasibility, acceptability, effectiveness and efficiency of such an approach. The set of studies conducted in this thesis contributes to clarify two of these aspects: the acceptability - under students' point of view (Chapter 4) - and the effectiveness of the distance education curriculum (Chapter 6).

A summary of the rationale and the process of implementation of PSF in Brazil as well as an analysis of the need and strategies for training the family health professional are described in Chapter 2.

The studies were carried out in the State of Ceará – Brazil. Brazil is a big South American country with a geographical area of more than 8 million km². That is one of the good reasons to implement DE programmes. Its population is around 190 million of inhabitants concentrated more in the southeast and south regions (IBGE, 2010). Its Human Development Index (HDI) is 0.730 (85th in the world) (PNUD, 2013). The infant mortality rate (IMR) is 16.0 deaths/1,000 live births (Brasil/MS, 2010). In the northeast region of Brazil, where Ceará is located, the situation is worse; the IMR is 19.1 deaths/1,000 live births, the highest rate in Brazil (Brasil/MS, 2010). Ceará is one of the poorest states of Brazil. Its HDI is 0.723, 22nd among the 27 Brazilian states (CEPAL/PNUD/OIT, 2008). Its geographical area is around 146 thousand km². Its size justifies the implementation of distance education (DE) programmes. It has a population of around 8.5 millions of inhabitants (IBGE, 2010), one third of them concentrated in the capital - Fortaleza. The infant mortality rate (IMR) is 16.2 deaths/1,000 live births (Brasil/MS, 2010), one of the highest in Brazil.

Since the 80's a huge Health Reform Project has been implemented by the Ministry of Health in Brazil based on the decentralisation of the health care and the increment of Primary Health Care (PHC). The implementation of Programa Saúde da Família (PSF) is one of the most important strategies.

Ceará was one of the first states in Brazil to implement PSF. In 1994, it started the programme in 12 municipalities. Nowadays, the PSF is implemented in all 184 municipalities and there are around 1,800 family health teams (Brasil/MS, 2013).

Theoretical framework and the subject of this thesis

The design of the studies developed in this thesis was based on three theoretical frameworks: constructivism, Problem-based Learning and Distance Education (DE). The studies were focused on: (a) the understanding of the profile and needs of prospective students (family health professionals) in DE, (b) a dPBL programme evaluation, and (c) an evaluation of the effectiveness of a dPBL curriculum for training family health professionals. The understanding of prospective students in DE was based on the work carried out by Evans from the Faculty of Education, Deakin University, Australia (Evans, 1994) and by Rowntree's (1992) work. In their work, they investigated in detail a variety of themes ranging from the learners' social and educational backgrounds to important aspects of students' lives and the interrelationships with their broader contexts. The programme evaluation was based on Donabedian's (1999) work in which four components of programme evaluation are established: structure, process, results and impact. The first three aspects were included in this thesis. The evaluation of the effectiveness of the PBL, DE curriculum was based on a pretest, posttest, control group design. The educational concepts and theories that underlie the theoretical framework of this thesis are described in detail in Chapter 3.

The subject of this thesis is the use of PBL at distance. Therefore, it deals with the combination of two educational approaches: Problem-based Learning and Distance Education, namely distributed PBL (dPBL) (Wheeler, 2006), and its application on health professional education. This is a theme that has been gradually investigated during the last decade around the world, but still needs more exploration, mainly in low resources settings, such as the northeast region of Brazil.

In this thesis, DE is defined as Moore and Kearsley (1996) proposed:

“Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organisation and administrative arrangements.” pp 2.

Problem-based Learning (PBL) is defined as the learning which results from a process oriented to the understanding and resolution of a specific problem (Barrows & Tamblyn, 1980), or more precisely as a teaching and learning approach in which students deal with specific problems in small groups under the supervision of a tutor (Schmidt, 1993). In dPBL, according to Wheeler (2006), “learning is mediated through computer technology, and a shared, ‘virtual’ distributed learning environment is used to enable students to collaborate” (p.176).

PBL since its beginning has been implemented in a face-to-face format and is already well established. The description of PBL experiences and its effectiveness in such format have been extensively studied by many authors, for instance Berkson (1993), Schmidt (1983; 1993), Vernon & Blake (1993), Schmidt & Van der Molen (2001), Dochy, Segers, Van den Bossche, & Gijbels (2003), Schmidt, Vermeulen & Van der Molen (2006) and others. Over the past decade, PBL and DE have been combined as educational approaches in higher education (e.g. Cameron, Barrows & Crooks, 1999; Valaitis, Sword, Jones & Hodges, 2005; Brodie & Porter, 2008; Chagas, Faria, Mourato, Pereira & Santos, 2012). However, in our context, there are only a few PBL courses or programmes which use a web-based, distance education approach. Thus, the challenge of our thesis was to propose the design and to evaluate the effectiveness of a curriculum using both educational approaches.

The aims of this thesis

The main aim of this thesis was to explore the use of dPBL in a low-resources setting. We developed a constructivist, competence-based, problem-based, web-based curriculum for training family doctors in Brazil and evaluated its effectiveness. The goal of this curriculum is to enhance the competencies (medical knowledge and diagnostic skills) of family doctors in order to deal with elderly people with dementia.

This thesis has scientific and educational purposes. We expect that the results obtained from the studies carried out in this thesis may contribute to the production of knowledge about the relationship of two relevant fields: Problem-based Learning and Distance Education. In fact, there is an immediate and vital need to develop a more integrated programme of research in DE area based on a well-established theoretical framework. To our knowledge, this is one of the first effectiveness studies on distributed PBL in health professional education in a low-resources context.

In terms of educational purposes, this thesis aims at obtaining knowledge that will contribute to the solution of a real life problem (Crowl, 1996). Therefore, a general purpose of this thesis is to provide a framework that can be used in Brazil and elsewhere in the world with a similar context. It also has the purpose of contributing to the provision of information in order to develop a strategy to elaborate a continuing education programme for family health professionals in the State of Ceará. The studies carried out in this thesis were focused on a course about strategies to approach elderly people with dementia, using a dPBL curriculum for training family doctors. The course “Clinical Approach for Elderly with Dementia” was offered by the School of Public Health of Ceará and is described in detail in Chapter 2. The other professionals of the family health team (nurse, dentist, auxiliary nurse, community health worker and others) can be included in later research.

In addition, we also expect that the results of this thesis may serve individual and collective family health professionals, administrators and community interests. Since the results of our studies, overall, indicated that the dPBL curriculum is acceptable and effective in a low resource context, family health professionals may be more motivated in participating in an interactive and challenging DE programme. Besides that, they may have the benefits of participating in the continuing education programme without wasting money and time in travels. Administrators would be more satisfied in having the professionals working more time and the community would benefit from the more present and qualified family health professionals.

Research questions

Based on the central question of this thesis - *Does distributed PBL work in a low-resources setting?* - we elaborated three research questions:

1. Is distance education an acceptable educational strategy to train the family health professionals in the State of Ceará under their perspective?
2. How do family health doctors appreciate a dPBL course that was developed for them?
3. How effective is this curriculum to achieve its purposes in terms of enhancement of medical knowledge and diagnostic skills?

In order to address the first question, we conducted a study with Brazilian family health professionals, reported in Chapter 4. The goal of this first study was to investigate the acceptability of the DE approach for prospective students. We were interested in describing the family health professionals' characteristics, perceptions, opinions and attitudes as prospective students in a distance education course.

To address the second research question we conducted a comprehensive programme evaluation study with family doctors who had participated in a dPBL course. This study is reported in Chapter 5. The aim of this study was to describe

the curriculum design process and the evaluation results of the course “Clinical Approach for Elderly with Dementia” from the participants’ perspective. Our intention was to explore the use of the combination of PBL and DE in the context of health professional education in a low-resources setting.

Finally, the third research question was addressed by a quasi-experimental study aiming at evaluating the effectiveness of the dPBL course in terms of enhancement of knowledge and diagnostic skills on dementia. Chapter 6 reports its results.

The structure of the thesis

This thesis is structured into seven chapters. After this introductory chapter, Chapter 2 has the objective of describing the context within which this thesis was conducted. It presents and analyses the urgent need for training family health professionals in Brazil. Therefore, it provides the reader with an overview of the rationale for developing a DE programme for training health professionals in Brazil. In this chapter, we also present the dPBL curriculum of the Course “Clinical Approach for Elderly with Dementia” offered by the School of Public Health of the State of Ceará, Brazil.

In Chapter 3, we present the theoretical basis of this thesis. We discuss the most relevant concepts and principles involved in this dissertation related to Distance Education, Constructivism and Problem-Based Learning. It focuses mainly, under the constructivism perspective, on the two educational approaches explored by the studies developed in this thesis: the combination of web-based DE and PBL - the distributed PBL (dPBL). It has the purpose of providing the reader with an optimal understanding of the theoretical framework, the concepts, and research evidences that underlie the studies described in this thesis. This review of the literature also gives insights into the ideas that were incorporated in our own research. It is divided into three sections. *Section I – Distance Education: learning without limits* - describes a review of DE literature and research. It addresses the

theme of DE as an important modality of education that promotes access to learning without limits. Section II – *Constructivism in Distance Education: an old approach to a new era* - describes the main concepts and principles of this educational theory and its implications for learning and instruction, in particular at distance. The third section - *Problem-based Learning: a constructivist educational innovation* – is dedicated to the description of PBL as an alternative to conventional education and as the conceptual foundation for dPBL.

In Chapter 4, we present the report of the study that was undertaken to understand family health professionals as prospective students in distance education. The objective of this first study was to know the prospective students' (family doctors and nurses) perceptions and attitudes towards distance education. The purpose was to gather information about the feasibility and adequacy, in terms of students' point of view, of a DE programme in the family health context. The results of this study have also been used in the design and development of the web-based, problem-based curriculum of the Course Clinical Approach for Elderly with Dementia, described in Chapter 2.

Chapter 5 describes the curriculum design process and the programme evaluation of the distributed PBL course that has been developed for family health doctors - Course Clinical Approach for Elderly with Dementia. This study had the objective of evaluating the quality of the first version of the dPBL curriculum in order to improve the programme. A variety of aspects regarding the structure and process of the programme were addressed, including the quality of infrastructure (equipment, learning resources, web-page etc.) and how adequate the functioning of the course was (quality of interaction between students-tutors, students-students; tutors' performance, access to the web-page, the functioning of dPBL methodology etc.). Emphasis was given to pedagogical aspects in detriment of technological aspects. We evaluated the students' perceptions about the programme.

The study into the effectiveness of the dPBL course is presented in Chapter 6. This study was conducted following a pretest, posttest, control group design in which we measured the effectiveness of the course in terms of enhancement of medical knowledge and diagnostic skills. Thirty students were enrolled in the experimental group and the same amount in the control group. In order to test the enhancement of medical knowledge, we used a multiple choice knowledge test covering the knowledge goals of the course. In order to test the enhancement of diagnostic skills we used behavioural tests.

Finally, in Chapter 7, we present a summary of the study findings and discuss some implications of these findings for the design and delivery of educational programmes based on dPBL in our context. In addition, we point out future directions for further research on the theme.

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*Chapter 2 - The urgent need for
training Family Health professionals
in Brazil*

Abstract

This chapter has the objective of describing the context within which this thesis was conducted. It presents and analyses the urgent need for training family health professionals in Brazil. It provides the reader with an overview of the rationale for developing a DE programme for continuing education of the health professionals in Brazil. Initially, it describes the rationale, the process of implementation and the organization of the Programa Saúde da Família - PSF (Family Health Programme - FHP) in Brazil – a primary health care based model. In addition, some reasons why there is an urgent need for training the family health professions in Brazil are presented and analysed. Following, we describe briefly the main initiatives for training family health professionals that have been proposed by Ministry of Health and various educational institutions, in particular those based in DE approach. Finally, we make a detailed description of the problem-based, web-based Course *Clinical Approach for Elderly with Dementia* offered by the School of Public Health of the State of Ceará) and evaluated in this thesis.

The Family Health Programme in Brazil

“Health for all by the year 2,000” – that was the goal established by more than 150 countries in the International Conference in Primary Health Care (PHC), in Alma-Ata, former USSR, in 1978. Health should be understood here in its comprehensive sense, that is the complete physical, mental and social welfare, and not only the absence of the disease and seen as a fundamental human right (WHO, 1978). Primary Health Care (PHC) was chosen as the main strategy to reach that goal. PHC is the first level of contact between the individual, the family and the community with the health system and focuses on the main problems in the community, implementing health promotion, prevention of disease, basic health care and rehabilitation. However, providing PHC for all in a huge country as Brazil has been a great challenge. The first important question was: What model of health care should be established in order to provide PHC for all?

Before the PSF was launched, the model of health care in Brazil focused on the “disease” instead of the “health”. The hospital was seen as the centre of the health care system. The medical doctor had the power in detriment of the other health

professionals. The health strategies were “top-down” and centralized, that is, defined by central health managers and did not take into account the characteristics and the autonomy of the community. The human body is “segmented” according to the medical specialities and it is not seen as a whole. Generally, this traditional health care model does not take into account the social and economic factors in the health-disease process. This model is inefficient and ineffective and has not changed the health indicators at the community (Starfield, 1998). Therefore, there was an urgent need to break this paradigm. The model based on family health, the Family Health Programme (FHP) was proposed as an alternative (Brasil/MS, 1994; Brasil/MS, 1997; Tomaz, 1997).

The FHP model is based on the tripod: health promotion, citizenship, and quality of life (Brasil/MS, 1997). The *health* is the centre of the health system and not the *disease*. It stimulates the holistic health practice and emphasises multidisciplinary work. It recognises the family and the community in their own living places. It gives priority to the family and groups with major risk of becoming sick or of dying. It takes into account the biological, environmental, cultural, social and economic factors in the causal explanation of the development of health-disease process. It links the health professionals to a specific geographical area where they should work, and recovers the feeling of responsibility and the affection between the health team and the community.

The FHP model is based on other models being implemented in various countries, such as Canada, 1954, United Kingdom, 1955, Holland, 1957, Mexico, 1971, Denmark, 1973, Portugal, 1974 and Cuba, 1984 (WHO, 1994), although there are important differences in the bases and format of the models. One of the reasons for implementing this family health approach is that this health care model has high positive impact on health indicators mainly among poor populations and it is highly cost-effective (Atun, 2002). In Brazil, the first experience started in Ceará in January 1994. The Ministry of Health launched the Programa Saúde da Família – PSF (Family Health Programme) at the national level in March 1994 (Brasil/MS,

1994). Each family health team (FHT) is formed by at least one medical doctor, one nurse, one auxiliary nurse and eight to ten community health workers. The FHT is responsible for providing continuous primary care to on average 1,000 families or 4,500 people through a broad scope of activities oriented to health promotion. Nowadays, according to Ministry of Health of Brazil (Brasil/MS, 2013), there are around 33,000 FHT in Brazil spread over 5,260 municipalities covering a population of over 105 million inhabitants, corresponding to roughly 55% of the Brazilian population. In Ceará, there are around 1,800 FHT distributed over 179 out of 184 municipalities covering around 5.7 million of inhabitants – about 67% of the population of Ceará (Brasil/MS, 2013). These numbers shows the great challenge for training all the health professionals enrolled in PSF.

As we can observe PSF is an important part of the health policies in Brazil. In fact, in an evaluation of the programme supported by the Ministry of Health in two municipalities (Quixadá in Ceará and Camaragibe in Pernambuco), important results were found. The results showed progressive reduction of admission of patients, decrease in the number of referrals of patients to other municipalities and reduction of the costs with in-patients, mainly among those between 0 and 4 years old (Brasil/MS, 1999). Besides that, it has facilitated the access to the health services mainly in rural areas and, to a certain extent, has increased the satisfaction of the population towards the health services (Andrade, 1998). In addition, some PSF experiences, such as one implemented in Niterói – Brazil, have had a positive impact on the local health services organisation (Senna & Cohen, 2002; Hubner & Franco, 2007).

The urgent need for training

The paucity of health professionals with knowledge and skills necessary to perform the new tasks requested by the family health practice is thought to be a great constraint on the achievement of a comprehensive impact by the PSF. In 1995, the Escola de Saúde Pública do Ceará (ESP-Ce) (School of Public Health of Ceará), one of the institutions in charge of the continuing education of the

Ceará health system professionals, was challenged to train the FHT that were already working in the field. To that end, the School developed a planning process to design a continuing education programme directed to medical doctors and nurses engaged in the PSF. The process of programme design was based on the competence-based curriculum approach (Harden, 2002). PBL was chosen as the instructional method (Schmidt, 1983; 1993). Other institutions also implemented educational programmes in family health in Ceará and in the most regions of the country. However, they have not been able to respond to all the growing demands. Most programmes for training family health professionals are face-to-face with limited capacity to train all demand. To increase their capacity would require a great deal of investments in terms of human, material, financial and infrastructural resources. If we take the case of Ceará and consider the total estimated number of family health professionals (about 5,400 professionals, including doctors, nurses and dentists), it would take several years to train all of them.

For the whole country, the situation is not so different. Few institutions, nowadays, have the capacity to train the current demand. They need urgent investments, mainly in terms of human and financial resources.

Initiatives for training family health professionals

Several initiatives for training family health professionals have been proposed by the Ministry of Health and various educational institutions. The description of all initiatives is out of the scope of this thesis. Most educational initiatives were in a face-to-face format with limited places. Therefore, these initiatives were not able to cope with the crescent demand. Two important factors affected the implementation of the educational initiatives. First, most family professionals work in rural areas, sometimes a hundred or thousand (in case of Amazon, for instance) kilometres from the educational institutions. Second, the difficulty of the family health professionals reconciling the combination of work and study since most of them work on average more than 60 hours a week (Tomaz & Van der Molen, 2011).

One important initiative was the National Policy on Continuing Education for the workers of Unique Health System (SUS) proposed by the Ministry of Health in 2004 (Brasil/MS, 2004a). This Policy was implemented by the *Centers of Permanent Education in Health for the Unique Health System* (Brasil/MS, 2004b). These Centers were formed by a pool of educational institutions from the whole country aiming at training all health professionals from the Brazilian National Health System (Unique Health System - SUS) including the family health professionals. Among a series of guidelines, the proposal established the allocation of resources in order to stimulate the utilization of DE as an important pedagogical approach for continuing education of health professionals in Brazil. Actually, a variety of investment projects in terms of financing, educational and human resource development has been planned in the DE field in Brazil.

However, the use of DE for training family health professionals in Brazil is not disseminated yet. There were some relevant projects such as the *Distance Education Project for Training Community Health Workers*. The Ministry of Health launched this project in 1998. The project used printed material, video and other technologies. A series of 25 videos and 25 brochures were produced for training around 70.000 community health workers in the whole country (Tomaz, 1998).

More recently, in 2008, the Ministry of Health created the Open University of the National Health System (UNA-SUS) aiming at fostering collaboration between the educational institutions in order to develop continuing education programmes based on DE for training health professionals. The first action of the UNA-SUS was to offer a specialization course in family health for physicians, dentists and nurses of the Family Health Program (PSF), (Brasil/MS, 2008).

In 2010, ESP-Ce in partnership with Elderly Care Center, Federal University of Ceará, developed a dPBL course for training family doctors aiming at the implementation of strategies to approach elderly with dementia. The design and

evaluation of this programme were part of this thesis. A description of this course is presented in the next paragraph.

The Course Clinical Approach for Elderly with Dementia

In this section, we describe in detail the *Course Clinical Approach for Elderly with Dementia*. The description includes the rationale of the course, the learning objectives, the learning method, the educational strategies, the course structure, the estimated workload, and the learning and course system evaluation. This course was designed as part of a proposal for continuing education for professionals working in elderly care at the level of primary health care (PHC), especially those that are part of the Family Health Program (FHP). The course was designed specifically for physicians, since it covers aspects related to diagnosis and treatment of dementia in the elderly, with emphasis on Alzheimer's Disease.

Rationale of the course: Why training health professionals in elderly care in Brazil Brazil is currently faced with a rapid process of aging of its population (IBGE, 2008). It is estimated that in less than thirty years, it will be the sixth country in the world with the highest number of elderly people, which would imply a large impact on health services (WHO, 2008; Wong & Carvalho, 2006). The clinical problems prevalent in the elderly are usually chronic and multiple, requiring continuous multidisciplinary monitoring (WHO, 2002). The elderly are the largest users of health services; they occupy more often hospital beds, and have a longer hospital stay when compared with other age groups (WHO, 2008). Therefore, the development of elderly care is presented as an urgent task to the health sector.

There is evidence of the effectiveness of many interventions that reduce the impact of the aging population on health services, and that contribute to improved quality of life in old age (Brasil/MS, 2006a). The absence of specific strategies for healthcare for the elderly results in lower quality of care, increased morbidity and

mortality and increased costs.

Several initiatives in this regard have already been developed in different states in Brazil. In 1999, the Ministry of Health launched the National Policy for the Elderly. It was proposed to encourage the creation of centers of geriatrics and gerontology in institutions of higher education and to stimulate the training of multidisciplinary teams. (Brasil/MS, 1999). In 2006, the Ministry of Health reinforced and updated this policy (Brasil/MS, 2006b).

In 1999, the first population study tracing the multidimensional profile of the elderly in Ceará, specifically in the city of Fortaleza, was published (Coelho Filho & Ramos, 1999). The high level of physical and mental morbidity among the elderly in Ceará reinforces the urgent need for the design of actions specifically targeting this age group.

The lack of health professionals specialized in geriatrics and gerontology, as well as of primary health care professionals able to provide appropriate care for the elderly are some of the important limiting factors to the development of services and programs for the geriatric population. The need for professional development in this area involves not only training specialists in geriatrics, but also, more importantly, training health professionals working in primary health care, mainly those who are part of the Family Health Program (PSF) (WHO, 2008). The *course “Clinical Approach for Elderly with Dementia”* is meant to be a first initiative that composes the continuing education programme in the elderly care for family medical doctors in the State of Ceará -Brazil.

Curriculum Design

The course *“Clinical Approach for Elderly with Dementia”* was conceived and executed by the School of Public Health of Ceará – Brazil and the Elderly Care Center of the Federal University of Ceará – UFC. It is a web-based refresher course offered to physicians working in primary health care, particularly family health doctors of the various municipalities of the State of Ceará – Brazil.

A differential aspect of this course, in our context, is the approach used for the design of its curriculum, which was based on the model called Competence-based Education (CBE). This model is one of the types of outcome-based education in which institutions are expected, to each curriculum, to have set out learning outcomes (competences), educational strategies that enable students to reach them and assessment tools to demonstrate the achievement (Harden, 2002). The first step in this approach is the identification of a *list of competencies* that are expected to be acquired by the student during the course. Competence can be defined as the ability to do a task, action or activity, which includes a set of knowledge, skills and attitudes to be developed in an educational programme (Harden, 2002). The concepts regarding CBE are discussed in more detail in Chapter 3.

The preparation of the list of competencies was based on the analysis of new epistemological, social and health system contexts, an analysis of community needs and the needs analysis of potential participants with regard to health care for the elderly with dementia in primary care. From the *list of competencies*, learning objectives were formulated and educational strategies established.

We considered the specific *competencies* of the physician who must act on primary care in our context. A multidisciplinary team comprising a specialist in distance education, computer technicians (webmaster and web designer) and content specialists (geriatrician and a public health specialist) was responsible for the design of the curriculum.

The basis of this whole process was established by the guiding documents for international, national and state health care for the elderly with dementia. These documents provided information about the roles and functions of the health professionals that should guide the definition of competencies expected. Materials already existing of national and international health care programmes for the elderly, as the document of the World Health Organization - Active Ageing: Health

Policy (WHO, 2002), also contributed to the design of the learning objectives and the content of the course. In Table 2.1 we present the list of competences and the learning objectives of the course.

The curriculum structure and delivery

The course is 120 hours long (100 hours at distance and 20 hours face-to-face). Participants were expected to perform the course activities at a mean rate of 10 hours per week, with a total duration of 12 weeks (3 months). Each group should determine a work schedule with their tutor, including deadlines for completion of each educational activity. Students experienced a period of adaptation (one week) to the online environment. Other elements of course structure and delivery are presented in Table 2.2.

Three face-to-face meetings were included in the schedule, at the beginning, at the middle, and at the end of the course, aiming at, respectively, introducing the course (first meeting), monitoring the learning process and skills training (second meeting), and evaluating students' learning and the curriculum (third meeting). The curriculum was structured into five Units. The face-to-face meetings, the units and estimated workload are presented in Table 2.3.

The method used in the course

The teaching and learning method used in the course was based on the combination of two innovative approaches to education - Problem-Based Learning and Distance Education – dPBL. These approaches are discussed in detail in Chapter 3. The PBL method was based on the *PBL* approach described by Barrows (2002), and on the seven steps model presented by Schmidt (1983) adapted to distributed, web-based context. The *PBL* described by Barrows includes four keys: (a) Real world based, unresolved ill-structured problems are presented to the learners at the beginning of learning cycle, stimulating free inquiry; (b) PBL is a learner-centered method, so learners should assume responsibility for their own learning process; (c) The teacher has to act as

facilitator of the learning process, rather mere transmitter of knowledge; (d) The problems presented to the learners should be based on real world context, “making PBL an authentic learning process”. The seven steps model, described by Schmidt (1983), is presented in Figure 2.1.

Table 2.1. Competences and learning objectives

Competences

Ability to provide health care for elderly with dementia, including:

- A multidimensional assessment of elderly with dementia.
- The diagnosis and management of the main dementia syndromes.
- Development of individual and collective actions for the prevention of dementia.
- Promoting the health of the elderly with dementia.
- The organization of health care for the elderly with dementia.

General learning objectives

At the end of the course participants should be able to:

- Understand the clinical and social implications of population aging and dementia in Brazil.
- Use procedures for the diagnosis of cognitive decline in elderly people.
- Perform differential diagnosis among the leading causes of dementia in the elderly
- Understand the procedures for the basic pharmacological management of the main causes of dementia (Alzheimer's Disease, Vascular Dementia, Bodies Lewy Dementia).
- Understand the procedures for non-pharmacological management of the main causes of dementia in the elderly and the strategies to promote the health of elderly with dementia.
- Understand the strategies for the organization of integrated care for the elderly with dementia.

Table 2.2. Elements of course structure and delivery

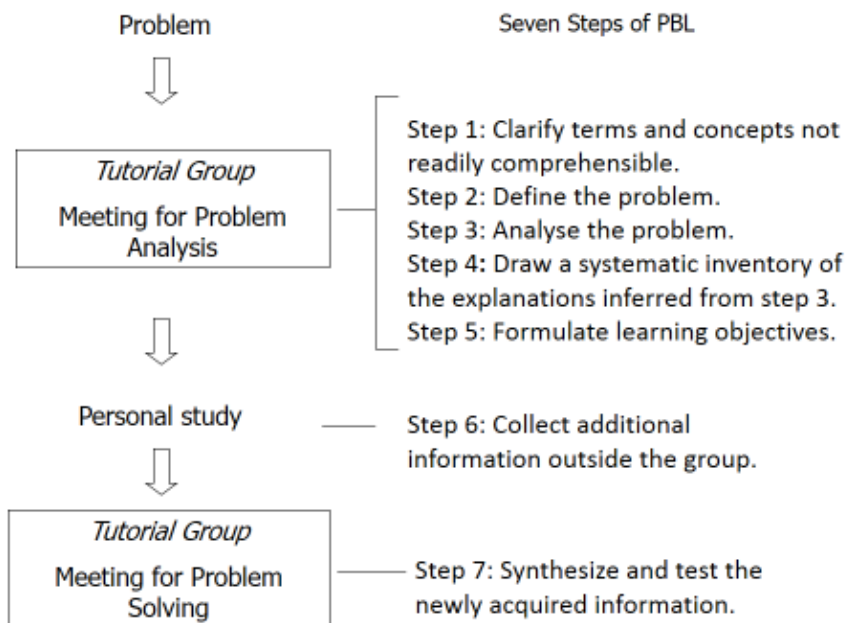
1. The group size was 12 to 15 participants per group.
2. It is a competence-based curriculum, that is, the curriculum outcomes are competences – a set of knowledge, skills and attitudes.
3. Some of the learners' characteristics were previously investigated.
4. Three face-to-face encounters occurred for contributing to learner communication and social presence in dPBL, to skills training and knowledge and skills assessment.
5. The problems were based on real context and elaborated previously by specialists.
6. Course Manual and Unit Guidelines were provided in the online environment.

Table 2.3. Course Structure – the face-to-face meetings, the Units and the estimated workload

Units	Estimated Workload
Face-to-Face Meeting 1: Course Introduction	12h
Unit 1 – Aging and Dementia: clinical and social implications	16h
Unit 2 – Cognitive Decline in the Elderly: Diagnostic Procedures	24h
Face to Face Meeting 2: Monitoring activities	4h
Unit 3 – Treatment of Dementia: Pharmacological Management	24h
Unit 4 – Treatment of Dementia: Non-Pharmacological Management and Individual and Collective Action for Health Promotion	20h
Unit 5 – Models of Health Care for the Elderly with Dementia	16h
Face to Face Meeting 3: Evaluation	4h
Total	120h

In sum, the PBL process (Figure 2.1) works as follows: from analysis and reflection of a problem situation presented, the participants in small groups (Tutorial Groups) identify their key knowledge gaps and establish what they need to learn (learning goals) to solve the problem. During the study of the problem situation participants have to rely on literature research, personal study, consultations with specialists, if necessary, and seminars available on the Internet, in order to achieve the learning objectives, and at the end of cycle, solve the problem (Schmidt, 1993). This entire process occurs in seven steps.

Figure 2.1. The PBL process



The dPBL model applied in the course works as follows. *Virtual Tutorial Groups (VTGs)* are created. Each VTG is formed by groups of 10 to 15 participants, supervised by a facilitator. The VTGs are the main strategy for reaching the cognitive learning objectives. The VTGs are performed in virtual forums in which the students could communicate with each other asynchronously. The virtual forum works as a whiteboard, in which the group records ideas and hypotheses, acquired information and pursued learning issues. Synchronous communication tools (chats) are also used when needed for complementing the discussion or concluding the problem solving.

Just like in face-to-face tutorial groups, there are three phases in the VTG: Problem Analysis, Individual Study and Problem Solving, and the students have to follow the seven steps proposed for PBL (see Figure 1). The detailed description

of each step of the PBL is presented in the General Guidelines for Study (Tomaz, 2010), further in this chapter. In each VTG meeting, one student exercises the role of chair, and another participant fulfils the role of scribe. The chair is responsible for conducting the discussions, and the scribe has to prepare a report describing the results of the discussions during problem analysis and problem solving. Participants are expected to dedicate around eight hours (three hours for Problem Analysis, two for Individual Study and three hours for Problem Solving) to complete the PBL cycle. Because of difficulties with access to libraries and learning resources, some basic literature is available in the virtual library, but students are encouraged to seek additional references. Before the beginning of the course, students should attend a four hours face-to-face workshop to learn how the VTG works.

The problems are ill structured and elaborated by course planners previously, taking into account the real context. Questions for reflection are included in order to focus and orient the online discussion. See an example in Appendix 3.

The facilitator's main role is to promote the learning process of the students, to ensure the proper implementation of the dPBL cycle and a good interaction between students, so that learning objectives are met and skills are developed. Moreover, the tutor has to keep the flow of discussions in order to avoid deviations, detect possible misinformation, provide feedback, promote the development of each individual and the group as a whole, and assess student achievement (formative and summative). Three geriatricians are the facilitators; each one is responsible for tutoring a group of 10 to 15 participants. They are trained in "how dPBL works", including the use of mediating technology through three training sessions of two hours. Continuing education meetings occurs at least twice a month. In these meetings, the tutors and the course coordinator discuss the main problems and difficulties in tutoring.

Complementary educational strategies are used, such as clinical skill trainings, team and individual projects and community practice in order to accomplish the

development of the competences. A Course Guide, including General Guidelines for Study at Distance (Tomaz, 2010), and Study Guides for each Unit are provided in the course website in order to support learning. A CD-ROM with part of the course material is also given to participants at the beginning of the course.

The course is funded by the School of Public Health of Ceará and the students do not have to pay fees. The facilitators are paid for the job.

The distance education tools

The course uses DE tools, particularly the Internet, with the aim of facilitating access to all professionals working within the field of care for the elderly in different municipalities of Ceará. In sum, we use as DE tools a website, a Learning Management System (LMS), virtual forum, chat and email. In addition, video-lectures are available on the website and a CD-ROM with the video-lectures and texts are distributed to the participants. The website was specially designed for the course. The LMS used is MOODLE®, version 1.96, a worldwide used free software programme for collaborative learning support. Three kinds of virtual forums are used as asynchronous communication tool. A first type of virtual forum is used during the virtual tutorial groups (VTGs) for group interaction during problem analysis and problem solving. The course coordinator and the tutors used a second type of forum to evaluate the process of the course. A third forum can be used by the participants for free interaction – a kind of “hallways chat” - in order to stimulate socialization among them. Chat is used as synchronous communication tool. It is used as a complementary tool. It can be used by some tutors to complement and to deal more deeply with a specific issue discussed in the virtual forum. The email is used mainly for communicating with participants who are absent in the virtual environment of the course in order to bring them back to the course.

Educational strategies and learning resources

In the course, we use Virtual Tutorial Groups – VTG, Interactive Virtual Seminars, Skills Training, Projects, Practice in the Community (PC), General Guidelines for

Study and Tutoring as educational strategies and learning resources. They are briefly described as follow:

Virtual Tutorial Group – VTG

The VTG is a tutorial group that occurs at distance under the supervision of a tutor. How this educational strategy works in general was already describe previously in this chapter. We describe in more detail in this section how the three phases (Problem Analysis Meeting, Individual Study and Problem Solving Meeting) and the seven steps adapted to web environment work (See Figure 2.1).

Phase 1 - Problem Analysis Meeting - aims at stimulating reflection and discussion about a given problem situation, using the forum of the Unit (Topic - Problem Analysis) and thereby activate the student's knowledge about the topic under discussion. For this purpose, the group must follow step 1 to step 5. In *Step 1 - Clarify terms and concepts not readily comprehensible* - the students must undertake a critical reading of the text of the problem, seeking to give greater attention to the points they find most relevant. If there is a term that they do not understand very well, students should write it down and try to elucidate it in a dictionary or, if any, provided in the literature itself. If not, what normally should not occur, the students should seek help from their peers. If no member can clarify, the group may request clarification from the facilitator. In *Step 2 - Define the problem* - each group of students must come to consensus on what the problem is to be discussed. In case of difficulty, the facilitator should help. The aim of this step is to focus discussion and to avoid the group to discuss issues outside of the learning objectives proposed for the VGT. After defining the problem, students should go to *Step 3 - Analyse the problem*. In the beginning of this step, they should make individually a reflection and analysis on matters they consider relevant in the problem, based on notes made while reading. They should use their prior knowledge and prior experience on the topic. To help students in this task some questions after the text of the problem situation are proposed. Students then should write down the points and relevant issues on which they reflected, as well as their hypotheses to explain the problem. Then, after this initial reflection,

the students should participate in the analysis of the problem in their VGT, sharing their thoughts and assumptions. This entire process takes place within the virtual forum (topic- Analysis of the problem), via Internet and is accompanied by their facilitator. After analyzing the problem, the group should systematize the discussion in *Step 4 - Draw a systematic inventory of the explanations inferred from step 3*. In this step, they should try to organize the topics and hypotheses discussed in the previous step and remove what is not relevant to this issue. Phase 1 ends with the *Step 5 - Formulate learning objectives*. In this last step of problem analysis, the group has to produce the specific learning objectives, based on the knowledge gaps identified during the discussion of the problem.

Phase 2 – Individual Study - includes *Step 6 - Collect additional information outside the group*. At this point, students should acquire the information necessary to solve the problem under study, through searching and reading of texts and articles. Participants must individually seek information from various sources that helps to focus their attention on those aspects that answer the questions made during the analysis of the problem. In the Virtual Library of the course, the student can find a basic bibliography on the topic. However, students are also encouraged to seek other sources to enrich their study material.

During the individual study, it is recommended that the student prepares a proposal for solving the problem (individual synthesis), based on the newly acquired information and answers to the questions proposed.

The last phase of the PBL cycle - *Phase 3 – Problem Solving Meeting* - includes *Step 7 - Synthesize and test the newly acquired information*. In this step, based on the search and acquisition of new information / knowledge, the group, using the forum (topic – Problem Solving), should share and discuss their proposal for solving the problem, based on the individual summaries, and test their hypotheses. At this point, the contributions of each participant should be based on evidence gathered from the textbooks and articles studied.

Interactive Virtual Seminar

Interactive Virtual Seminars (IVS) consist of virtual exhibitions on videos or CD-ROMS of topics related to the cognitive learning objectives. The IVS are performed by specialists and have a duration ranging from 15 to 30 minutes. They are in the form of lectures or interviews. Digital handouts with copies of the presentations of themes approached during the IVS including the related bibliography are available in the Virtual Library. Comments can be made and questions may be clarified in specific virtual forums (see General Guidelines for the Study further in this section).

Skills Training

The Skills Training (ST) is an educational strategy that aims at training the diagnostic and treatment skills to be acquired during the course. Each skill is presented and demonstrated through video or slides show. The cognitive part of the skill can be learnt in VTG or IVS.

Projects

The Projects are intended to meet the more complex learning objectives, such as the understanding of the procedures for non-pharmacological management of the main causes of dementia in the elderly and the strategies to promote the health of elderly with dementia. They are elaborated at distance under the assistance of the facilitator. Guidelines for each Project are available. The Projects are also a component of the student assessment system.

Practice in the Community (PC)

This strategy is intended to provide an opportunity for students to apply the knowledge and skills acquired during the course in their workplace. It is done individually or in groups. Guidelines are available for every PC. Students have the guidance of the facilitator. Participants must prepare a report on each PC that also comprises the student assessment system.

General Guidelines for Study

In each unit there is a Unit Guide that orients the study during the course. The guide follows the order of the educational strategies proposed in each unit. It can be observed that, in general, the logic is to have the Problem (Virtual Tutorial Group - VTG) as a starting point for learning, followed by other complementary strategies such as the Interactive Virtual Seminar (IVS) and Skill Training (TH), concluding with the application of knowledge and skills acquired - Team or Individual Project and Community Practice (PC).

Tutoring

There is a tutoring system to facilitate and monitor the process of teaching and learning. Within this system, there is a facilitator (tutor) for each group of 10 to 15 students.

The main general roles of facilitators are:

- Guiding the students to study remotely stimulating the acquisition of autonomy in learning.
- Helping the students in the identification of literature relevant to the themes of the course.
- Guiding the students in their questions quickly and objectively, without giving answers, encouraging them to develop the capacity for self-learning.
- Following the students on accomplishment of each educational strategy proposed in the course including the PBL steps.
- Interacting with students through various means, principally the LMS (Learning Management System). Exceptionally, other means may be used, such as email, fax or phone.
- Creating empathy with their students, knowing each one of them (study habits, expectations, motivations to study, etc. ...).
- Assessing the students and participate in course evaluation.

Course Assessment System and Certification

Finally, we present some comments regarding the Course Assessment System and Certification. The system of student assessment is formative and summative. Several assessment tools are used, such as essays and reports, testing and evaluation of cognitive abilities. There is also a cognitive pretest and a posttest in order to assess the degree of achievement of learning objectives at the beginning and at the end of the course. As stated previously, in each of the Units of the Course, the projects and PC are used as assessment tools.

Finally, there is a Course Evaluation System, which uses a questionnaire to identify the positive aspects as well as those that need improvement. Students and faculty should fill in the questionnaire after the conclusion of the course.

At the end of the course, participants who complete all the units and who achieve the minimum score established (70%) receive a certificate issued by the School of Public Health of Ceará.

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*Chapter 3 – Review of literature:
Distance Education (DE),
Constructivism and
Problem-Based Learning (PBL)*

Abstract

In this chapter, we present the most relevant concepts and principles involved in this thesis related to three themes: Distance Education (DE), Constructivism and Problem-Based Learning (PBL). It has the purpose of providing the reader with an optimal understanding of the theoretical framework, the concepts, and research evidence that underlie the studies described in this thesis. This review of the literature also gives insights into the ideas that were incorporated in our own research. It is divided into three sections. *Section I – Distance Education: learning without limits* describes a review of DE literature and research. It addresses the theme of DE as an important modality of education that promotes access to learning without limits. It starts with a review of the concepts and characteristics of DE, making, in some moments, a parallel with face-to-face education. Afterwards some reasons and limitations to implement DE programmes are presented and a relevant aspect for the DE course design is addressed: the learners. Finally, we describe what research says about the effectiveness of DE programmes. In *Section II – Constructivism in Distance Education: an old approach to a new era*, we describe the main concepts and principles of this educational theory. Initially, the definitions, origins and main characteristics of constructivism are presented. Then, the implications of constructivism for learning and instruction, in particular at distance are analysed. Next, the main constructivist strategies for distance education are described, focusing on those relevant for the studies developed in this thesis. This second section ends with an analysis of the new roles and characteristics of teachers in a constructivist perspective. The third section - *Problem-based Learning: a constructivist educational innovation* – is dedicated to the description of PBL as an alternative to conventional education and as the conceptual foundation for PBL at distance. It starts with the presentation of the description, origins, processes and characteristics of PBL. In addition, we introduce the debate on what PBL is and what it is not. We believe that this discussion is relevant for this dissertation because our proposal is to design and evaluate a “real” PBL distance education course. After that, we describe in detail the main concepts used in this thesis regarding the combination of PBL and DE as educational approaches. This combination has been called distributed problem-based learning (dPBL). In the description, we present a summary of the research and evaluation literature on dPBL, focusing on the main findings of the studies. The third section ends with some comments on the theoretical basis for the competence-based dPBL curriculum design and implementation, focusing on the competence-based education (CBE) approach.

Section I – Distance Education: learning without limits

In this first section, we present a review of DE literature and research. The theme of DE is addressed as an important modality of education that facilitates access to learning. In the beginning, we made a review of the concepts and characteristics of DE, comparing DE, in some moments, with face-to-face education. Afterwards, we present some reasons and limitations to implement DE programmes and address a relevant aspect for the DE course design: the learners. Finally, we describe what research says about the effectiveness of DE programmes.

Distance education: concepts and characteristics

The fundamental concept of distance education is simple enough: students and teachers are separated by distance and sometimes by time (Moore & Kearsley, 1996). Many authors use different terms and different perspectives in distance education. Rowntree (1992), from The Open University in the UK, for instance, makes a difference between *open learning* and *distance learning*. *Open learning* is a philosophy – a set of beliefs about teaching and learning; and a method – a set of techniques for teaching and learning. *Distance learning* is learning while at a distance from one's teacher – usually with the help of pre-recorded, pre-elaborated, packaged learning materials. The learners are separated from their teachers in time and space but are still being guided by them. Keegan (1990) (cited in Rowntree, 1992) prefers using the term *distance education* because it includes both *distance learning* and *distance teaching*.

Moore and Kearsley (1996) proposed the following working definition of DE:

“Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organisation and administrative arrangements.” pp 2.

In reality, although distance education may seem like a recent development, it is more than a century old. Distance education has evolved through a number of different stages, or generations, starting in independent correspondence study, passing through Open Universities in the early 1970s to broadcast/teleconferencing and, finally, a new generation is emerging based on computer conferencing networks and computer-based multimedia workstations (Moore & Kearsley, 1996).

Keegan (1991) summarises the main elements involved in the concept of DE:

- Physical separation between teacher and students;
- Utilisation of technical communication media in order to join the teacher and the students and transmit the educational content;
- Existence of a double-via of communication; and
- Opportunities for occasional meetings with didactic and socialisation purposes.

In order to differentiate DE from residential education and to set the boundaries of DE, based on his studies on higher distance education, Armengol (1987) describes the main characteristics a real DE programme should have. It is important to highlight that some of the presented characteristics are not exclusive of DE programmes. Yet, they are strongly related to DE in comparison with face-to-face education.

The first group of characteristics is related to the students. A first relevant characteristic is that DE is student-centred, that is the student is the centre of learning process. Although collaborative learning is also crucial in DE and in education in general, individual learning is a strong DE characteristic. DE students are (or should be) more autonomous and independent in their studies and have more opportunities to establish their own rhythm than residential students. In fact, education and learning is a process that occurs “inside the individual” and so it can only be started by the individual, although through interaction with others and the

environment (Chaves, 1999). In addition, the population of students is relatively dispersed in different regions. Therefore, it is very usual that in DE programmes the group is formed by students with different cultures and social economic backgrounds. Moreover, generally the group of students is huge – hundreds or thousands. This is very important for the cost-effectiveness of DE programme (Moore & Kearsley, 2012).

Another aspect is that adults usually compose the group of students. Regarding this aspect, Nunes (1994) comments that, in reality, it is very difficult to combine work, family responsibilities and study for those who have a profession and work full time. DE could be an adequate alternative to facilitate such situations. Besides that, as the population of students is formed by adults, the distance course design planners should take into account the aspects related to andragogy – that is they should include strategies that facilitate adult learning such as valuing individual previous experiences, culture and background (Nunes, 1994).

Another group of characteristics is related to the specific course characteristics. First, DE courses should be self-explaining, that is, the instructional material should be elaborated for individual and collaborative learning, including clear learning objectives, educational activities, exercises, suggested literature and assessment. It should also include a detailed study guide for students and a tutor guide. Nunes (1994) comments that the processes of preparation of the material in DE and in residential courses are different, since the DE student is separated physically from the teacher. The DE material should be made by a multidisciplinary/transdisciplinary team, including experts in content, in education and in information and communication technology (ICT). Another DE characteristic is the “multimedia approach”. Different kinds of media should be used in order to achieve the educational goals according to the domain of those goals and the individual students’ preferences. Another important characteristic is the kind of interaction between students-tutor-students and students-students. In DE these interactions occur in different manners by writing, telephone, mail, radio,

computer, videoconference, or even sometimes face-to-face. Another aspect that is common in DE programmes is the flexibility. The structure of the curriculum is flexible via units or modules so that these permit a more adequate adaptation to the students' needs and aspirations.

The last but not least aspect is that DE programmes, more than traditional programmes, are strongly incorporating new information technology such as Internet. Scriven (1991) affirmed that information is not education, but that students' knowledge is based on information. Hawkdrigde (1983) explains that DE is based fundamentally on three new technologies: computation, microelectronics and telecommunication. These three technologies have been revolutionising the field of DE over the last decades. One example is the recent boom of web-based courses being offered in different formats and in several different scientific disciplines.

Why Distance Education?

Why distance education? The most agreed answer to this question is about opening up learning opportunities to a wider range of people and enabling them to learn more congenially and productively. This involves reducing barriers to access and giving learners more control over their own learning (Rowntree, 1992). In fact, in a broad way, DE is recognised as a relevant strategy to democratise the knowledge and information. Dymond, Navas-Sabater and Juntunen (2002) recognise the importance of access to information (and DE can provide not only access to information but also to education) as an element within the agenda of economic development and poverty reduction.

In more specific terms, Chaves (1999) argues that the question "*Why distance education?*" may seem baffling for some people who could answer simply "*Why not?*"; but he thinks that there are good reasons to discuss it. Defenders of DE argue that there are some advantages of DE in comparison with face-to-face education: more far-reaching, more cost-effective and more flexible (as much for teachers as for students) in terms of time and space. Among reasons for using DE

approach cited by Moore and Kearsley (2012) it can be highlighted: (a) increasing access to learning and training, (b) providing opportunity for updating skills of workforce, and (c) expanding the capacity of education in new subject area.

However, we should be aware that distance education is not a panacea that will solve all educational problems. The crescent use of technologies in DE has contributed a lot for its quality. Yet, DE has many limitations and difficulties. Therefore, DE course designers should know those limitations and difficulties very well in order to avoid possible setbacks during the realisation of the course. We will discuss these limitations in the next paragraph.

Limitations and difficulties of Distance Education

One of the main limitations is the fact that DE has more often than not merely replicated the ineffective traditional methods that limit learning in face-to-face education (Turoff, 1995). In general, this leads to a lack of quality in a significant part of DE programmes. In some countries, as Brazil, DE is considered a low quality type of education. Something as “paid-passed”, that is, who is able to pay for the course, receives the diploma, although in the last decades this way of thinking is being changed (Belloni, 2002).

In addition, many DE programmes have been designed mainly by personnel linked to Information, Communication and Technology (ICT) without the participation of experts in education. Schieman, Taere, & McLaren (1992) also raise the concern of using ineffective traditional methods in DE. According to them, many teachers and instructional designers come to DE from traditional backgrounds, bringing with them assumptions about teaching and learning that are not theory-based and do not translate well to technologically mediated instruction.

Another relevant limitation is the usual distant learners' distress with a Web-based Distance Education course. Studies have revealed some students' persistent distressing experiences (such as frustration, anxiety and confusion) due to

communication breakdowns and technical difficulties during web-based distance course (e.g. Besser, 1996; Hara & Kling, 2000; Tuncay, 2010; Wegerif, 1998). One of these studies - a qualitative case study of a web-based distance education course at a major U.S. university (Hara & Kling, 2000) - revealed the following distresses:

Working Alone at Night

It is common for students in many on-line courses to work alone, often at home in the evenings or weekends. However, it is hard for students who work under these conditions to resolve some of the kinds of potentially frustrating ambiguities that can be resolved more readily in a face-to-face class meeting.

Interactive Communication Tool: E-mail

In most DE courses, the students and instructor relied upon e-mail as a primary means of communication. In fact, the instructor often requires that students post e-mail to the class discussion forum several times during the course. Normally, a web-based course syllabus also asks participants to check the list daily.

On the surface, the volume of discussion indicates a lively class. However, there can be some underlying problems with the reliance on e-mail. First, it is very common that some students do not read other people's postings before writing their own e-mail messages. Second, some students are unable to make time to read and post e-mail during short intensive discussion periods. For example, some students do not post any comments when the other students intensively discussed a particular topic for some days during the course. Some of the students' difficulties may be a byproduct of using e-mail differently than the more conventional way. In the "standard view," students read their e-mail on-line and reply immediately from their computers. For those who do not have a computer printer at home, for example, working with e-mail is more complex.

The research literature shows this complication of asynchronous computer-mediated communication (CMC). Wegerif (1998) also describes a student's comment of being behind reading messages. In asynchronous CMC, it is very demanding for students and instructors to read all their messages (Hara, Bonk & Angeli, 2000; Hiltz, 1998; Kang, 1988; Wiesenbergr & Hutton, 1995). Sometimes the instructor spends all day doing nothing but reading and responding to e-mail messages. However, asynchronous CMC has the advantage of reducing the constraints of time and location (Ahern & Repman 1994; Burge, 1994; Harasim, 1990; Mclsaac & Gunawardena, 1996).

Complexities of Working Alone

In a web-based distance education course, students do not see each other or their instructors unless they use a video-link (Besser, 1996). Most web-based courses have no video support, and the absence of physical cues led to some confusion and anxiety for the students (Hara & Kling, 2000)

Technological Problems

It is usual that web-based course students report frustration with technological problems and the absence of personnel to provide technical support. Many research studies (e.g. Burge, 1994; Gregor & Cuskelly 1994; Kang, 1988; Wiesenbergr & Hutton 1995; Yakimovicz & Murphy, 1995) report students' frustration with technology during the evaluation of their DE courses, but such frustration was not thoroughly investigated. However, other research studies (e.g. Kling & Jewett, 1991; Kling, 1999) have reported the importance of computer support for professional work and even the public's use of the Internet. In fact, understanding students' distresses will enhance the process of the instructional design issues, instructor and student preparation, and communication practices that are needed to improve web-based distance education courses.

All that factors have led to an urgent need to conduct more effectiveness studies of DE programmes and review the way DE courses are designed. In fact, we need

to know if or to what extent, the DE programmes are effective. The debate is around how to design a constructivist learning environment in DE. How constructivism can help DE teachers and designers re-conceptualise DE by using new technologies (Morrison & Lauzon, 1992). Joanassen, Mayes & McAleese (1995) proposed a manifesto for a constructivist approach in higher education. The purpose is to promote well-designed, constructivist DE programmes in which technologies can be used to create communities of learners and practitioners and to facilitate the interactions and activities necessary for solving real-world problems (Burge & Roberts, 1993).

In the next section, a relevant first step for designing constructivist DE programmes is addressed: understanding the learners.

Understanding learners in DE

Unfortunately, most educational programme designers are concerned only with *what* should be taught, rather than with *to whom* it should be taught. In fact, it is very important in whatever kind of training or circumstances to know the learners (Evans, 1994). Understanding learners is an important step in DE course design. Without any doubt, we can assume that it is very uncommon to find a group of students that is completely homogeneous. Certainly, there are a lot of differences between them in terms of age, social and educational background, beliefs and so on. To ensure effective teaching and learning, course designers should consider those differences. This fact is crucial and more difficult to deal with in distance education if we compare it with traditional face-to-face training. Generally, in DE courses there are hundreds or even thousands of students from different places, with different ages, with different learning styles, etc. In the case of the State of Ceará, for instance, the study carried out by Andrade (1998) showed the important diversity among the family health professionals. According to the results, in Ceará, 67.1% of the family physicians were male and 86.6% of the nurses were female. On average, the family physicians were 36 years old, and the nurses 30. Regarding the change of workplace, around one third - 38% - of the family

physicians had changed their workplace twice or more and only 24.5% of the nurses did. More than half – 61.8% - of the family physicians and around half – 51.5% - of the nurses were enrolled in the Family Health Programme for a year. Regarding the place of graduation, 41.0% of the family physicians were graduated in the State of Ceará, the rest of them in other states. Most family nurses were graduated in Ceará.

In addition, distance learning is supposed to be learner-centred. Traditional education has long been “teacher-centred”. Students more and more expect courses and training that are tailored to their needs (Rowntree, 1992).

In terms of learning processes, in distance education most students’ learning occurs independently of the teacher’s presence, but dependently on the course material and media the teachers have prepared. If such material and media do not fit the students’ profile and preferences, learning can be affected. In fact, most distance teachers have to make complex educational decisions, write very clear and have to be very explicit about the learning goals. In summary, they should have empathy with the learner at distance. Thus, knowing more about learners would help remove barriers to the learning.

Finally, knowledge about our distance learners may help us in: (adapted from Rowntree, 1992)

- Counselling prospective learners about their programmes.
- Preparing packaged learning materials that relate to their needs and preferences.
- Planning a support service and delivering it in a humane and responsive way once learners have begun on their programmes.
- Adjusting the programme to suit the needs of different individuals.
- Counselling learners about ways of building on what they have learned.

But what do we need to know about the distant learners? The short answer to this question is anything we might use to help them enjoy the most productive and satisfying learning experiences (Rowntree, 1992). In fact, to understand learners it is necessary to recognise several aspects (Evans, 1994). The most relevant ones extracted from the literature are described next and some comments about their implications for learning are made. The aspects are grouped into four categories: (a) personal data, (b) distant learners' educational background, (c) characteristics of the distant learners in terms of access to learning resources, existing abilities, family and work context and circumstances, power and control, and leisure time, and (d) perceptions of distant learners on course design and implementation. We used these categories in one of our studies in this thesis aiming at understanding our prospective students in DE (Chapter 4).

One of the aspects of the first category is age. Older students typically have different study circumstances and learning approaches than younger students. This is partly due to changes in memory and concentration abilities. According to Glisky (2007), the basic cognitive functions most affected by age are attention and memory. Sometimes older students believe that they spend more time studying than their younger counterparts. Of course, these facts have implications for education and learning. The more self-paced nature of distance education courses suits older students particularly well (Evans, 1994). In addition, Evans (1994) stated that age affects learning mainly through misconceptions existing in a person's beliefs about learning. Older students tend to maintain their commitment and confidence in their studies when they receive support and encouragement from younger members of their families or from their younger colleagues. In fact, designing instructional material for elderly learners requires special care, in particular when the goal is to master complex subject matter (Van Gerven, 2002). On the other hand, the profile of the virtual student success is usually composed of people over age and maturity. These students have conditions to better assess the actual need to do a distance learning course knowing that they will have to

study most of the time without the accompanying of a teacher (Ferreira & Mendonça, 2007).

The second category involves the distant learners' educational background. The previous learning experiences that people have form a basis upon which their subsequent learning takes place. Attitudes and values about their learning, as well as the knowledge and skills with which they learn, have their roots in previous educational experiences (Evans, 1994). The distance educators should know such roots in order to better understand their learners. One of the studies undertaken in this thesis (Chapter 4), conducted by Tomaz & Van der Molen (2011), aimed to understand family health professionals as prospective students in DE. The authors found that most family health professionals had no prior experience in distance education, but those who have had such an experience appreciated it and had good relations with tutors.

The third category includes characteristics of the distant learners in terms of access to learning resources, existing abilities, family and work context and circumstances, and leisure time (Evans, 1992). The access to learning resources is of paramount importance in distance course design. We can imagine how difficult it would be for distant learners if the course demanded some learning resource, a computer for instance, to which they do not have easy access or no access at all. Distant educators should keep that in mind while selecting media for the distance course, mainly in low resources setting (Ramos, Tajú & Canuto, 2011).

Another important characteristic of prospective students in DE is their existing abilities in using the learning resources (Evans, 1994). Distant educators should keep in mind the students' skills for using the selected media as a learning tool. In fact, we may need to teach our learners how to learn from the medium before you can teach them anything else with it. The access to learning resources and existing skills are crucial to the implementation of DE programmes (Valaitis,

Sword, Jones & Hodges, 2005; Ramos et al., 2011). Valaitis et al. (2005) stated that for effective use of PBL at distance tutors and students need to develop online literacy skills to facilitate their transition to an online PBL environment.

Regarding the family circumstances, the DE approach is supposed to facilitate the education improvement of those who have young children and are responsible for domestic activities (Evans, 1994). It is expected that such people face more difficulties in attending a residential course than in attending a distant course. Regarding the relationship between work and study, we can affirm that the use of DE at work is well established (Evans, 1994). DE has become the basis for approaches to education and training in the workplace and for developing and providing courses that reflect professional or workplace needs and issues. For the learners, however, a concern remains about how to balance work and study (often with family responsibilities too). Many adults opt to study in order to enhance their work circumstances. In reality, one feature of contemporary societies is the increased demand for education and training on the part of employers. Employed people are pressured to enter into the 'qualifications chase'. DE is seen as the best and adequate way to get it (Paula, 2007). On the other hand, one context in which one might expect that balancing work and study would be less of a problem is where the education takes place in the workplace. That is, a blend of educational activities at the workplace and distance education can bring together a more equal investment in terms of time and money. So, rather than the employer being virtually the total investor in education and training through the provision of courses on-site and during work-time, and rather than the employees assuming the total investment, there is a realisation that such balance could be the better alternative.

Aspects regarding the topic *power and control* are also relevant for distant learners. Generally, in most educational models the balance of power, authority and control is usually tipped in favour of the teacher rather than of the student (Evans, 1994). Even in DE, sometimes, the instructional design provides students

with little control over their own learning. For instance, in many cases students have to attend a course in which both curriculum and teaching are not to their liking. However, in DE the students have at least the power to study at a place and time of their choosing (Tomaz & Van der Molen, 2011). In Evans' (1994) study, several students were aware of their powerlessness in their learning situations. In addition, the results showed that the respondents desired to share the power and control with teacher and institution, by manifesting their desire of participating on the course planning, for instance. Therefore, distant educators should set strategies to minimise the powerlessness of students. Possibilities are including professionals' representatives in the distance course planning; deciding with them what should be taught/learning, during what periods, in what contexts and how it will be assessed; taking care that one always provides an answer to students' claims, through email, telephone, letter or whatever; and keeping contact with students' organisations.

The last aspect of the third category is leisure time. The relationship between education and recreation is not often explored, unlike the relationship between education and work. Yet, in DE, most learners are dedicating a significant proportion of their leisure time to their studies. Educators and trainers (not only distant educators) could benefit from dwelling on the learning that people ordinarily pursue in their lives as part of their leisure time. Taking one example from Evans (1994), people who are avid followers of football teams can often recount facts and figures from their teams' histories with surprising accuracy and can comment on the strategies and performances of recent games with analytical skill. In fact, the different forms of leisure-based learning are mediated in much the same sorts of ways in which distance education are mediated. Tomaz and Van der Molen (2011) have found that a reasonable proportion of family health professionals as prospective students in DE like to study during leisure time. This is an important indication that they may be successful in DE (Evans, 1994).

The fourth category includes perceptions of distance learners on aspects related to course design and implementation. A first aspect is the desire of participating in a distance course and the reasons for that. For most adult learners education and training are often portrayed as vehicles for self-improvement in material, social and intellectual ways. Many of them opt to study in order to enhance their work circumstances, such as increasing employability, returning to work, improving career and promotion opportunities, developing professional or occupational skills, changing jobs, etc. Some decide to study for their own pleasure. Taylor (1983) has identified four common attitudes – or orientations to studying. These were *vocational attitudes* – concerned with the learner’s present or hoped-for job; *academic attitudes* – concerned with interest in study or education for its own sake; *personal attitudes* – these have to do with developing oneself as a person; and *social attitudes* - concerning partying, playing sports and having a good time. All of them (except the social) can be pursued either for “intrinsic” or “extrinsic” purposes.

Another relevant aspect of DE course design is the media. Distance education depends on the use of media. Throughout history, various media have been used in DE. The most common was printed material. Other technologies were also used, such as audio-visual material – especially audiocassette tapes, and slides, radio, TV. Quite often, moving pictures in the form of video or film have been used (Ely, 2003). Nowadays, a variety of computer-based systems is used in DE (Holden & Westfall, 2010). But how shall we choose media? We have to take many criteria into account to make such a decision – congruence with learning objectives, availability (accessibility), convenience for learners to use, helpfulness in motivating learners, comfort for teachers, existing learners’ skills for use it, affordability, learners’ preferences, etc. What we know about our learners may influence our media choice in a number of ways, mainly the learners’ accessibility and preferences to media and the learners’ existing skills to use them. Another factor we might consider in choosing media is how to combine them to the best effect. Rarely one medium can provide everything that a learner needs in a

learning programme of any duration (Rowntree, 1992). Norenberg and Lundblad (1987) give some suggestions for an effective media selection in a given situation. The media selector should take into account the following aspects: objectives of the organisation, initial costs, personnel, users, anticipated use, level of interactivity desired, technological infrastructure already in place, legal considerations, topographical context, equipment compatibility, governmental and institution jurisdictions, and costs of operation. Most of these aspects were involved in the selection of media and evaluation of our curriculum.

The perception of the distant learners about the financing of the DE course is another important aspect in the DE course implementation. The distant learners' willingness to pay and the amount they are willing to pay for tuition fees, learning material and communication are important information distance course planners should get. In general, the implementation of any educational programme costs a substantial amount of money. The activity of estimating the costs is central to the planning and development of educational systems, including distance education. Unfortunately, many people are put off by the mere mention of costs, but as Rumble (1997) points out, there is nothing intrinsically difficult about costing. All it requires is a certain degree of logic and care. The question is: Who will provide the funds to establish and maintain the programme? In general, governments have seen distance education as a cheaper and efficient way of providing educational expansion and training programmes (Rumble, 1997). But even when governments hope that a greater proportion of the overall costs of distance education will be carried by the students, start-up capital is needed in advance of any enrolments to pay for the development of the infrastructure and course material.

Within any national economy, the costs of education need to be met by various parties involved. Typically, the state absorbs most of the costs such as in most European nations and Australia and New Zealand (Evans, 1994). The balance of the costs is met by students, their sponsors (employers, scholarships, etc.) and by

foundations, earnings, grants, sponsorships, etc. which the institutions obtain. In Brazil, the Ministry of Health has invested in DE programmes for training health professionals since the implementation of the National Policy on Continuing Education for the workers of the Unique Health System (SUS) in 2004 (Brasil/MS, 2004a).

Finally, the perception of distant learners on the course structure is important information that course planners should get before designing the DE programme. We will focus here on three aspects that can be considered fundamental in distance education: Flexibility of the date of the assignment submission, the use of face-to-face sessions such as study groups and tutorials in the distance course and the skills training preferentially carried out as face-to-face sessions. One of the aims of distance education is to enable learners to work at their own pace (Rowntree, 1992). So, the flexibility of the date of the assignment submission should be a feature of all distance education. However, it will depend on how open the distance course is. In fact, many factors are involved in this respect, mainly regarding to the teachers, the institutional schedule, and so on. The use of face-to-face sessions is fundamental in the learning process. People often find they are better able to challenge received ideas, and struggle towards new ideas of their own, when they can do so together with other learners. In fact, over the last decade dPBL programmes have used a blended format, that is, included face-to-face encounters aiming to support the authentic PBL method used in the curriculum (Cameron, Barrows & Crooks, 1999), to enhance the collaborative learning and interaction between students and to positively impact student learning outcomes (Taradi, Taradi, Radic, & Pokrajac, 2005).

On the other hand, some group commitments may provide a constant source of difficulties for students who have to balance work and learning. An alternative is to set such activities as optional ones. Finally, some simple skills training in distance education can be very effective through a well-designed package. However, when it comes to complex skills, face-to-face sessions and tutoring are necessary in

order to facilitate the learning process. Degiorgio (2009) examined counseling skill acquisition for Rehabilitation Counseling education of students enrolled in a distance education course. The author has found positive results. However, it was found that a majority of the participants indicated they would have preferred a traditional approach to learning counseling skills, although they perceived distance education to be an effective use of their time. These findings may show the need for including face-to-face meetings for skills training in courses delivered at distance.

Finally, we present some suggestions on how to get the information about distant learners. Rowntree (1992) gives three main ways of building up a picture of our prospective learners. The choice of the method depends on one's goals and circumstances. His recommendations are:

1. Reflect on the previous experience of the learners, or broadly similar ones, and consult colleagues.
2. Meet some of the prospective learners and discuss with them what they would like from the programme, and what they already know/feel about the subject.
3. Send a questionnaire to prospective learners, trying to elicit the information you need.

In the next paragraph, we describe what research says about the effectiveness of DE programmes.

Effectiveness of Distance Education - What does the research say about?

In the last decades, studies have shown that, in general, DE can be effective in bringing about learning (e.g. Baturay & Bay, 2010; Chagas, Faria, Mourato, Pereira & Santos, 2012; Mattheos, 2001; Moore & Kearsly, 2012; Poon, Reed & Tang, 1997). However, there still are many questions to be answered about how this happens and what to do to make it happen.

The majority of the studies in DE are focused on the effectiveness of the communication technology. According to Moore and Kearsly (1996), there are two main bodies within this technology-effectiveness research: descriptive case studies and learner achievement studies. Descriptive reports can be found about programmes that use every kind of technology, such as correspondence, audio-teleconferencing, computer conferencing, fibre-optic and microwave transmissions etc. In these descriptions, researchers are simply explaining their personal discovery of teaching at a distance using one or a pool of communication media and trying to show that teaching through such communication media could work. Such studies are interesting only when they describe an untested technology, which is rare, or a new way of using it, which is also unusual, or a population or content that has not been described already. We believe that our study is interesting exactly because it focuses on an evaluation of a DE curriculum that used PBL - a constructivist learning method - in a low-resources setting. In addition, it focuses on a population – family health doctors and nurses in a poor region of Brazil – and on a content – strategies for approaching elderly with dementia – that, to our knowledge, has not been studied already in our context.

Regarding the learner achievement (as measured by grades, test scores, retention, job performance), most studies compare the results of teaching and learning in a conventional residential environment with teaching and learning in a distant environment. The majority of the results of these studies have shown that there are no significant differences between learning in the two diverse environments. These results are independent on the nature of the content, the educational level of the students, or the media involved. In some of these studies, distant students have performed better in terms of learning achievement (post-test scores) than those of face-to-face classroom (Valore & Diehl, 1987; Chute, Balthazar & Poston, 1989). Regarding the comparison of the effectiveness between residential and DE courses in terms of learner achievement Moore and Kearsly (1996) conclude that:

“1. There is insufficient evidence to support the idea that classroom instruction is the optimum delivery method; 2. Instruction at a distance can be as effective in bringing about learning as classroom instruction; 3. The absence of face-to-face contact is not in itself detrimental to the learning process; and 4. What makes any course good or poor is a consequence of how well it is designed, delivered, and conducted, not whether the students are face-to-face or at a distance.” (pp. 65).

The purpose of this thesis was not the comparison between face-to-face and DE course, because we were interested in investigating whether PBL at distance, as a constructivist learning approach, is acceptable for students (family doctors) and effective in terms of the enhancement of knowledge and diagnostic skills. To do this, we included measurements of the learner achievement as part of the evaluation of the programme itself and as part of the evaluation of the curriculum effectiveness.

Studies on students' satisfaction or perception of a particular DE programme are also done to evaluate its effectiveness (St. Pierre & Olsen, 1991). This aspect was also included in this thesis.

Another aspect often included in most studies about DE effectiveness, and of a particular relevance for this thesis, is how effective the course design is (Scripture, 2008). In fact, the core of the present thesis is the design and evaluation of the effectiveness of a problem-based, web-based curriculum. In this way, the evaluation of aspects concerning instructional design such as elaboration of learning objectives, the structuring of the course, the production of learning resources, problems construction, elaboration of tutor and student guides, communication media selection, student and course assessment systems are of paramount importance for this study.

Research on the process of selecting a medium of communication has shown that this process has a major impact on the effectiveness of a DE programme. The

findings have indicated that media selection must be *content-driven* rather than *technology or hardware-driven* (Dutton & Lievrouw, 1982; Wagner & Reddy, 1987). This means that media, to be effective, must be selected for specific content, particular learning outcomes desired and pedagogical purposes. Norenberg and Lundblad (1987) gave some suggestions for an effective media selection in a given situation, already described previously in this section.

A last but not least important aspect of the effectiveness of course design is the evaluation of how effective the teacher in DE is. Many variables have been studied in order to evaluate the effectiveness of the distant teacher, such as the frequency of the following teaching techniques: instructor-initiated interaction, student-initiated interaction, waiting time, level of questioning, statements of expectations for students, and corrective feedback (Barker & Patrick, 1988). Moore and Kearsly (1996; 2012) suggest that, to be effective, the distant teacher should take full advantage of the interactive nature of the media and resist the temptation to lecture. The teacher should bring learners frequently into action by asking questions, encouraging students' participation, stimulating interaction between students, and involving them fully in the learning process. Note that these teacher's roles are very similar to the new roles of teachers in a constructivist perspective described in the Section II of this Chapter (Table 3.3, p. 64).

Another series of studies have been carried out with respect to the cost-effectiveness of distance education. Most studies on this issue have shown that DE can be extremely cost-effective and even cheaper than residential courses, since it is done on a fairly large scale to amortise the costs of the investment in technology and design time (Moore & Kearsly, 1996). This aspect was not included in this thesis, but it will be addressed in further research.

Table 3.1 presents a list of variables that influence the effectiveness of distance education courses according to Moore and Kearsly (1996; 2012).

All together, the literature leads to the conclusion that DE can be effective mainly when effectiveness is measured by learning achievement, by the attitudes of students, and by cost-effectiveness. However, Moore and Kearsly (1996) highlight, among others, an important problem related to the quality of most distance education research – the lack of a theoretical framework. This serious problem may call into question the effectiveness of the majority of distance education studies. Most studies aim at solving particular problems or evaluating a particular course. They are unrelated to any theoretical framework, and this means it has little or no general value. In this context, as stated in Chapter 1, our thesis is based on the combination of three well-established theoretical frameworks – constructivism, Problem-based Learning and web-based distance education.

Table 3.1. Variables that determine the effectiveness of DE courses

- Number of students at learning site (individuals, small groups, large groups)
- Length of class/course (hours, days, weeks, months)
- Reasons for student taking class/course (required, personal development, certification)
- Prior educational background of student (especially experience with self-study or distance education)
- Nature of instructional strategies used (lecture, discussion/debate, problem-solving activities)
- Kind of learning involved (concepts, skills, attitudes)
- Type of pacing (student determined, teacher defined, completion dates)
- Amount and type of interaction/learner feedback provided
- Role of tutors/site facilitators (low to high course involvement)
- Preparation and experience of instructors and administrators (minimal to extensive)
- Extent of learner support provided (minimal to extensive)

In the following section, we present a discussion about constructivism in DE in order to provide a theoretical basis for the development of the DE-PBL course that has been developed and evaluated within the framework of this dissertation.

Section II – Constructivism in Distance Education: an old approach to a new era

In this second section, we describe the main concepts and principles of constructivism. Initially, its definitions, origins and main characteristics are presented. Then, the implications of constructivism for learning and instruction, in particular at distance are analysed. Following, the main constructivist strategies for distance education are described, focusing on those relevant for the studies developed in this thesis. This section ends with an analysis of the new roles and characteristics of teachers in a constructivist perspective.

Constructivism: definition, origins and characteristics

Before describing the constructivism in distance education, we present briefly the concept of constructivism, its roots and the two major lines of thought regarding this learning theory.

There are in the literature several definitions of constructivism. One of them, very simple and intelligible, according to Sushkin (1997), is:

“Constructivism is an educational philosophy which holds that learners ultimately construct their own knowledge that then resides within them, so that each person's knowledge is as unique as they are.” pp.2.

Among its key precepts are:

- *situated or anchored learning*, which presumes that most learning is context-dependent, so that cognitive experiences situated in authentic activities such as project-based learning, cognitive apprenticeships, or problem-based learning environments result in richer and more meaningful learning experiences.
- *social negotiation of knowledge*, a process by which learners form and test their constructs in a dialogue with other individuals and with the larger society.
- *collaboration* as a principal focus of learning activities so that negotiation and testing of knowledge can occur.

- *student-centredness*, the emphasis is placed on the student rather than the teacher. The learner interacts with objects and events and thereby gains an understanding of the features held by such objects or events. The learner, therefore, constructs his/her own conceptualizations and solutions to problems. Learner autonomy and initiative is accepted and encouraged.

Constructivists view learning as the result of mental construction. Students learn by fitting new information together with what they already know. People learn best when they actively construct their own understanding (Piaget, 1985). In constructivist thinking, learning is also affected by the context and the beliefs and attitudes of the learner. Learners are encouraged to invent their own solutions and to try out ideas and hypotheses. They are given the opportunity to build on prior knowledge.

See in Table 3.2 the summary of the main characteristics of constructivism.

Table 3.2. The main characteristics of constructivism

Constructivism...

- emphasises learning and not teaching
- encourages and accepts learner autonomy and initiative
- sees learners as creatures of will and purpose
- thinks of learning as a process
- encourages learner inquiry
- acknowledges the critical role of experience in learning
- nurtures learners natural curiosity
- takes the learner's mental model into account
- emphasises performance and understanding when assessing learning
- bases itself on the principles of the cognitive theory
- makes extensive use of cognitive terminology such as *predict, create and analyse*
- considers *how* the student learns
- encourages learners to engage in dialogue with other students and the teacher
- supports co-operative learning
- involves learners in real world situations
- emphasises the context in which learning takes place
- considers the beliefs and attitudes of the learner
- provides learners the opportunity to construct new knowledge and understanding from authentic experience

Adapted from Sushkin, (1997).

But what are the origins of Constructivism? Constructivism is not a new concept. According to Hanley (1994), it has its roots in philosophy and has been applied to sociology and anthropology, as well as cognitive psychology and education. Perhaps the first constructivist philosopher, Giambattista Vico commented in a treatise in 1710 that "one only knows something if one can explain it" pp.53 (Yager, 1991). Kant further elaborated this idea by asserting that human beings are not passive recipients of information. Learners actively take knowledge, connect it to previously assimilated knowledge and make it theirs by constructing their own interpretation (Cheek, 1992).

Constructivist approaches to teaching and learning have emerged from the work of psychologists and educators such as Vygotsky (Vygotsky, 1978), Piaget (Piaget, 1985) and Bruner (Bruner, 1986). There are, however, many different schools of thought within the constructivist theory, all of which fall within the same basic assumption about learning, that is actively constructing new knowledge. The two major strands of the constructivist perspective are *cognitive constructivism* and *social constructivism*. These two strands are different in emphasis, but they also share many common perspectives about teaching and learning.

Cognitive constructivism is based on the work of Swiss developmental psychologist Piaget. Piaget's theory has two major parts: an "ages and stages" component that predicts what children can and cannot understand at different ages, and a theory of development that describes how children develop cognitive abilities (Piaget, 1985; Van Ryneveld, 1997). The theory of development is the major foundation for cognitive constructivist approaches to teaching and learning. In summary, Piaget's theory of cognitive development proposes that humans cannot be "given" information which they immediately understand and use. Instead, humans must "construct" their own knowledge. They build their knowledge through experience. Experiences enable them to create schemas - mental models in their heads. These schemas are changed, enlarged, and made more sophisticated through two complimentary processes: assimilation and

accommodation (Piaget, 1985). Another important characteristic of the cognitive constructivism is that it approaches learning and knowing from the perspective of the individual, that is, cognitive constructivists describe the mind in terms of the individual, restricting its domain to the individual's head.

On the other hand, social constructivism comes from the work of another cognitive psychologist, Vygotsky who shared many of Piaget's assumptions about how children learn, but placed more emphasis on the social context of learning (Vygotsky, 1978). Piaget's cognitive theories have been used as the foundation for discovery learning models in which the teacher plays a limited role. In Vygotsky's theories, both teachers and older or more experienced children play very important roles in learning.

There is a great deal of overlap between cognitive constructivism and Vygotsky's social constructivist theory. However, Vygotsky's social constructivism theory leaves much more room for an active, involved teacher. For Vygotsky, the culture gives the child the cognitive tools needed for development (Vygotsky, 1978). The type and quality of those tools determine, largely than they do in Piaget's theory, the pattern and rate of development. Adults such as parents and teachers are conduits for the tools of the culture, including language. The tools the culture provides a child include cultural history, social context, and language. Today they also include electronic forms of information access.

Vygotsky's "zone of proximal development" is probably his best-known concept. It argues that students can, with help from adults or children who are more advanced, master concepts and ideas that they cannot understand on their own (Vygotsky, 1978).

In addition, as opposed to the cognitive constructivism, social constructivism describes the mind as a distributed entity that extends beyond the bounds of the body into the social environment (Paas, Van Merriënboer, & Van Gog, in press). In this perspective, learning is a social activity. Learning is intimately associated to

the connection with other human beings, teachers, peers, family as well as casual acquaintances, including the people before us or next to us at the exhibit.

Teachers are more likely to be successful in their efforts to educate if they recognise this principle rather than try to avoid it. Much of conventional education, as Dewey pointed out is directed towards isolating the learner from all social interaction. According to him, traditional education is directed towards seeing education as a one-on-one relationship between the learner and the objective material to be learned (Dewey, 1938). In contrast, progressive education recognises the social aspect of learning and uses interaction with others and the application of knowledge as an integral aspect of learning.

Of course, all these concepts have relevant implications for learning and teaching. In the next paragraph, we discuss some of these implications, in particular in DE context.

Implications of Constructivism for learning and instruction, in particular at distance

Constructivism potentially has profound implications for how current 'traditional' and DE instruction is structured. Several highly appreciated educational trends became prevalent because of the theoretical perspectives such as constructivism. These trends includes the transition of the teacher's role from source and transmitter of knowledge to facilitator and coach; enabling learners to learn how to learn; more open-ended evaluation of learning outcomes; and, of course, co-operative and collaborative learning skills (Sushkin, 1997).

Within the field of educational computing, a well-known cognitive constructivist theoretician is Papert (1993), who characterises behavioural approaches as "clean" teaching whereas constructivist approaches are "dirty teaching". The contrast emphasises the differences between approaches that isolate and break down knowledge to be learned (clean) versus approaches that are holistic and authentic (dirty).

In a cognitive constructivism perspective, students must be given opportunities to construct knowledge through their own experiences. They cannot be "told" by the teacher. There is less emphasis on directly teaching specific skills and more emphasis on learning in a meaningful context. Technology, particularly multimedia, offers a vast array of such opportunities. With technology support such as videodisks and CD-ROMs, teachers can provide a learning environment that helps expand the conceptual and experiential background of the reader. Although much of the educational software created in the 1970s and 1980s was based on behavioural principles, much of the nowadays multimedia educational software is based on constructivist theories. Technology provides essential tools with which to accomplish the goals of a constructivist classroom (Chen, 1999).

The social constructivist approach generates a set of general implications for learning and instruction. According to Chen, (1999), if Vygotsky is correct and learners develop their knowledge in social or group settings, the use of technology to connect rather than separate students from one another would be very appropriate. A constructivist teacher should provide a context for learning in which students can become engaged in interesting activities that encourage and facilitate learning. However, the teacher does not simply stand by and only watches how students explore and discover. Instead, the teacher should guide learners when they approach problems. He should encourage them to work in groups to think about issues and questions, and should support them with encouragement and advice as they tackle problems, adventures, and challenges that are rooted in real life situations that are both interesting to the students and satisfying in terms of the result of their work. Teachers thus facilitate cognitive growth and learning as do peers and other members of the learners' community.

All learning environments in which instructional strategies compatible with social constructivist approach are used do not necessarily look alike. The activities and the format can vary considerably. However, three principles should be applied: (a)

Learning and development is a social, collaborative activity. (b) Learning should occur in a meaningful context and not be separated from learning and knowledge student develop in the "real world." (c) Out-of-school experiences should be related to the learner's school experience.

According to Chen (1999), technology provides essential tools with which to accomplish the goals of a social constructivist learning environment. Below are a few examples of the way information technology can support social constructivist teaching and learning:

- Telecommunication tools such as e-mail and the Internet provide a means for dialogue, discussion, and debate - interactivity that leads to the social construction of meaning. Students can talk with other students, teachers, and professionals in communities far from their classroom. Telecommunication tools can also provide students access to many different types of information resources that help them understand both their culture and the culture of others. (Further in this Section, we present some constructivist strategies based on technology for distance education).
- Networked writing programs provide a unique platform for collaborative writing. Students can write for real audiences who respond instantly and who participate in a collective writing activity.
- Simulations can make learning meaningful by situating something to be learned in the context of a "real world" activity such as running a nuclear power plant, writing up "breaking" stories for a newspaper, or dealing with the pollution problems of local waterways.

Chen (1999) also gives some examples of social constructivist learning environments, such as: Collaborative Learning, Anchored Instruction, Games, Simulations, Case-based instruction, Problem Solving, etc.

As stated previously, according to constructivists, knowledge is constructed through two processes - by connecting new information to old information and by

interacting with others. Thus, good instructional design should create an environment that facilitates both processes to solve real world problems. Constructivist theory provides a set of guiding principles to help designers and teachers create learner centred, collaborative and contextual environments that support reflective and experiential processes. Jonassen, Davidson, Collins, Campbell, & Hagg (1995) propose four general attributes that should be taken into account while building the learning environments: context, construction, collaboration, and conversation. In fact, constructivist environments should engage learners in knowledge construction through collaborative educational activities, based on features of the “real world” setting (context) and through reflection on what has been learned through discussion (conversation) with other learners.

In the next paragraph, some types of constructivist learning environments relevant for our thesis will be explored including a description of the instructional approach and the presentation of some software that supports knowledge construction in DE context.

Constructivist strategies for distance education

Constructivist approaches to technology in DE are not yet commonplace. In fact, many technology-based learning environments do not provide knowledge construction. Such environments are strictly content-based and driven by cognitive and behavioural objectives.

Fortunately, a number of promising constructivist approaches has emerged in the last decades. Jonassen et al. (1995) propose a number of technologies which have encouraged innovative approaches to the design of distance learning, such as: computer-mediated communications, computer-supported collaborative work, computer learning environments, case-based learning environments, and computer-based cognitive tools. According to Turoff (1995), such technologies have contributed to a movement away from the duplication of traditional

instructional methods in distance education towards a more constructivist approach to instruction that puts the student in the centre of the teaching/learning process.

Jonassen et al. (1995) named the set of new technologies Technology-Supported Environments (TSE). In their opinion, such environments can offer the field of DE alternative approaches to promote learning and replace the traditional teacher-centered model of DE with contextualised and collaborative learning environments that support the knowledge construction. Although an exhaustive description of the different TSE is beyond the scope of this dissertation, the most relevant ones for our studies in this thesis will be briefly presented.

The most used and known TSE is the Computer-Mediated Communication (CMC) which refers to the use of networks of computers to facilitate interaction between geographically separated learners, such as electronic mail, forums (asynchronous/delayed), computer conferencing (synchronous/real time), and online databases. Electronic mail, forums and computer conferencing are extremely capable of supporting conversation and collaboration – two main constructivism general attributes. Small groups can work together to analyse and solve problems, interact with peers and tutors using this simple technology.

Knowledge construction occurs when learners are discussing, analysing, proposing hypotheses, testing hypotheses, exchanging experiences, negotiating meaning, taking positions, arguing, reflecting and re-evaluating their positions. Yet, an interesting fact occurs in consequence of the use of such technologies: the communication is written rather than verbal. Studies developed by Dunkin and Biddle (1974) and McDonald and Elias (1976) show that in a traditional classroom the teacher contributes up to 80% of verbal exchange. In online computer conferencing, instructors contribute with only 10-15% of the message volume (Harasim, 1987; Winkelmann, 1988). This is coherent with the new role of the teacher in the constructivist perspective and is an example of the constructivist

design model of reciprocal teaching proposed by Palincsar, Ransom and Derber (1989), for teaching poor readers, in which the dialogue between teacher and student is written rather than verbal. Based on that method it is suggested that in an online environment the teacher alternates the control of the dialogue with students allowing them to generate questions, summarise content and clarify points.

Therefore, among the diverse constructivist learning environments the Computer Supported Collaborative Work (CSCW) is one of the most promising. Within that technology is included the Collaborative Problem Solving (IBIS). According to Olson, Olson & Kraut (1992), CSCW combines communications and computer technologies to support various activities in groups of different size, structure and permanence. Jonassen et al., (1995) describe the CSCW as following:

“CSCW tools help groups structure work through group decision support systems, project management tools, electronic conferencing systems, and shared editors. CSCW technologies can support groups across a distributed environment. For example, collaborative problem solving in corporations can be supported by the IBIS hypertext environment (Conklin & Begeman, 1987), which provides an argument structure including issue, position, and argument nodes. Users add their comments about the problem under discussion, producing a logical discourse that usually results in an effective and acceptable solution. These environments help collaborative groups construct a common understanding of the problem being solved and negotiate the most appropriate solution to that problem. Construction and negotiation are the hallmarks of constructive learning”, (pp. 17-18).

A combination of both TSE models (CMC and CSCW) was used in the dPBL course evaluated in this thesis.

Other TSE models can also be used in constructivist DE programmes, such as Video Transmission (VT) and Computer-supported Intentional Learning

Environments (CSILEs). VT is a technology that has been explored within CSCW (Heath & Luff, 1992). The idea is using two-way real-time video transmission in which learners can interact remotely with other learners and tutors during an activity of problem analysis or problem solving. In CSILEs, diverse types of information (text, graphs, images, etc.) are stored in a common database where they are available to retrieval, review, and contribution (Scardamalia, Bereiter, McLean, Swallow, & Woodruff, 1989). CSILEs promote intentional control over learning by providing an environment that requires students to plan, monitor, set goals, and solve problems.

To conclude this second section, we analyse the new roles and characteristics of teachers in a constructivist perspective. We included the evaluation of the tutor's roles in our programme evaluation study.

The new role and characteristics of teachers in a constructivist perspective

The last but not least important aspect that is worth discussing in a constructivist perspective is the role of the teacher. In fact, the role of the teacher changes completely in such new context. The teacher should move from podium to sideline, from leader to coach, from owner of the knowledge and the truth to facilitator of personal meaning making (Romiszowski & De Haas, 1989; Beaudoin, 1990; Guanawardena, 1992; Burge & Roberts, 1993). Sushkin (1997) adds that the teacher's role should change from "sage on the stage" (fount/transmitter of knowledge) to "guide on the side" (facilitator, coach).

Moreover, in a constructivist approach, as a fundamental principle, the teacher should not give ready answers nor intervene excessively. In an online environment such as electronic mail, forums, and computer conferencing, for example, it is recommended that the teacher should alternate the control of the dialogue with students, allowing them to generate questions, summarise content and clarify points (Jonassen et al., 1995).

In Table 3.3, Brooks and Brooks, (1993) suggest a summary of some characteristics of a constructivist teacher:

Table 3.3. Characteristics of a constructivist teacher

1. Become one of many resources that the student may learn from, not the primary source of information.
2. Engage students in experiences that challenge previous conceptions of their existing knowledge.
3. Allow student responses to drive lessons and seek elaboration of students' initial responses. Allow student some thinking time after posing questions.
4. Encourage the spirit of questioning by asking thoughtful, open-ended questions. Encourage thoughtful discussion among students.
5. Use cognitive terminology such as "classify," "analyse", and "create" when framing tasks.
6. Encourage and accept student autonomy and initiative. Be willing to let go of classroom control.
7. Use raw data and primary sources, along with manipulative, interactive physical materials.
8. Do not separate knowing from the process of finding out.
9. Insist on clear expression from students. When students can communicate their understanding, then they have truly learned.

In this new context, we think that PBL can be included. The description and analysis of PBL as a relevant constructivist learning environment are presented in the next section.

Section III - Problem-based Learning: a constructivist educational innovation

This third section is dedicated to the description of PBL as an alternative approach to conventional education and as the conceptual foundation for PBL at distance. It starts with the presentation of the description, origins, processes and characteristics of PBL. In addition, we introduce the debate on what PBL is and what it is not. We believe that this discussion is relevant for this dissertation because the proposal is to design and evaluate a “real” PBL distance education course. Next, we describe in detail the main concepts used in this thesis regarding the combination of PBL and DE as educational approaches. This combination has been called distributed problem-based learning (dPBL). Moreover, we present a summary of several examples of the use of dPBL in different contexts, in the last two decades, its benefits and limitations and the main findings of the studies showing that, in general, dPBL has positive impacts in students’ learning. This section ends with some comments on the theoretical basis for the competence-based dPBL curriculum design and implementation, focusing on the competence-based education (CBE) approach.

PBL in a face-to-face environment

Problem-based Learning can be defined as the learning which results from a process oriented to the understanding and resolution of a specific problem (Barrows & Tamblyn, 1980), or more precisely as a teaching and learning approach in which students deal with specific problems in small groups under the supervision of a tutor (Schmidt, 1993). According to Schmidt (1990), the six PBL central components are: the problem, the tutorial groups, the tutor, the individual study, the student assessment and the blocks or units of curriculum.

In the last decades, PBL has been considered one of the most important innovations in the field of health profession education and has been implemented in many countries around the world (Boud & Felletti, 1991; Margetson, 1994; Schmidt, Van der Molen, Te Winkel, & Wijnen, 2009). It has been a well-established constructivist educational approach in higher education. In the medical

education field, PBL has been presented as a useful educational alternative to conventional instruction. The first PBL experience occurred in the mid of 1960's in the Faculty of Medicine at McMaster University, Canada. Soon after, three other medical schools adapted the McMaster model of PBL – the University of Limburg at Maastricht in the Netherlands, the University of Newcastle in Australia, and the University of New Mexico in the United States. Initially, it was proposed for medical education programmes, but gradually, it was adopted by different institutions in several fields of knowledge for educating professionals from diverse areas, such as economy, law, psychology, management, etc. (Barrows, 1996; Bligh, 1995; Savery & Duffy, 1995; Schmidt et al., 2009). It has also been used in post-graduation courses and permanent education programmes (e.g. Wiers, Van de Wiel, Sá, Mamede, Tomaz, & Schmidt, 2002).

In Brazil, PBL was adopted in the 90s of the last century by few educational institutions, such as the School of Public Health of Ceará, Faculty of Medicine of Marília, São Paulo, and the Faculty of Medicine in Londrina, Paraná (Mamede, 2001). In 2001, the Brazilian National Council of Education instituted the National Curriculum Guidelines for Medicine Course (Brasil/MEC, 2001). In these guidelines, it was stated that the pedagogical project should be student-centered, the teacher should act as facilitator and mediator of the teaching-learning process and the curriculum should use methodologies that emphasize active student participation in the construction of knowledge. These are basic principles of PBL. So, there was a strong trend of PBL expansion in other Brazilian educational institutions, in particular in the area of health profession education. Nowadays, for instance, about forty Medical Schools use PBL in Brazil (Nassif, 2012). In 2004, it was created the Pan-American Network for Problem-Based Learning (PAN-PBL) aiming at promoting PBL in K-12, undergraduate, graduate, and professional education throughout the Americas (PAN-PBL, 2012). Therefore, PBL is one of the few curriculum-wide educational innovations surviving since the 60s (Schmidt et al., 2009).

According to Schmidt (1993), PBL is a relatively new form of education with a long intellectual history. Its roots are based on the philosophies of rationalism and American functionalism and it is strongly influenced by cognitive psychology (Norman & Schmidt, 1992). Dewey, a respected philosopher, at the beginning of the last century, stressed the importance of learning in response to, and in interaction with, real-life context, emphasized that real life problems are a good starting point for learning and encouraged students to discover the information needed to solve them (Schmidt, 1993).

Based on a number of empirical studies, it is proposed that PBL has the following cognitive effects on student learning (Schmidt, 1993): (a) Activation of prior knowledge; (b) Elaboration on prior knowledge through small-group discussion; (c) Restructuring of knowledge in order to fit the problem presented; (d) Learning in context; and (e) Motivation to learning. By reviewing studies on cognitive and motivational effects of small-group PBL, Dolmans & Schmidt (2006), among other findings, concluded that recall of information, causal reasoning and collaborative learning construction seem to take place in the tutorial group. They also found that group discussion has a positive influence on students' intrinsic interest in the subject matter under discussion.

The learning process starts when students in small groups (8 to 10 students), in the presence of a tutor, are faced to a previously elaborated problem. The problem in PBL is defined as a neutral description of real world phenomena or events, which need explication in terms of processes, principles or underlying mechanisms (Schmidt, 1983). Thus, the problem is the starting point of the learning process.

Summarizing, PBL works as follows: from analysis and reflection of a problem situation presented, the participants in small groups (tutorial groups) identify their key knowledge gaps and establish what they need to learn (learning goals) to solve the problem (Schmidt, 1983). During the study of the problem, participants

have to rely on literature research, personal study, consultations with specialists, if necessary, and other sources of information, in order to achieve the learning objectives, and at the end of cycle, solve the problem. The PBL process is organised in a structured cycle of activities – the problem analysis meeting (tutorial group), the search of information and individual study, and the problem solving meeting (tutorial group) (Schmidt, 1983).

Students should work with the problem following a sequence of procedures initially proposed by Schmidt, (1983) at Maastricht University named The Seven Steps. The PBL process, including The Seven Steps, is presented in Figure 2.1, in Chapter 2. A detailed description of the seven steps was also presented in Chapter 2.

Some final remarks regarding the tutor in PBL. The role of tutor in PBL is extremely diverse from the role of conventional teacher. In general, one of the most important tutor's functions in PBL is to promote the learning process of the students. He or she should ensure the proper implementation of the PBL cycle and a good interaction between students, so that learning objectives are met and skills are developed. In fact, the tutor acts both in and out of tutorial groups. It is important to highlight that the quality and the success of the learning process depend directly on the ability of the tutor to use tutoring teaching skills during the small group discussion (Barrows, 1992).

In the tutorial groups, the tutor should act in two dimensions: the application of the seven steps and the group dynamic. In the former dimension, the tutor should observe the group, stimulate the discussion, keep the right track of the discussion in order to avoid deviations, detect possible misinformation, ask questions, ensure the achievement of learning objectives, provide feedback, promote the development of each individual and the group as a whole, and assess student achievement (formative and summative).

Out of the tutorial group, the tutor has different functions. He should be a mentor, facilitate the achievement of the student learning goals, modelling both in and out (e.g. the health service) of the teaching environment, provide information when need (give lectures, seminars, conduct practical activities, etc.), design educational resources (study guides, didactic material), participate in the curriculum planning and organisation, and evaluate students and the course (Tomaz, 2001).

Thus, the tutor's role is not to transmit information, but to support students in constructing their own knowledge. As the reader may note, in short, the role and characteristics of tutor are very congruent with those presented previously in this dissertation regarding the new role and characteristics of teacher in a constructivist perspective (Table 3.2).

What PBL is and what it is not

The discussion about what PBL is and what it is not is relevant for this dissertation because the proposal is to design and evaluate a "real" PBL distance education course. Thus, it is very important to define, based on the literature, what PBL really is. In fact, PBL has been one of the most emphatically questioned and investigated educational approaches (Margetson, 1991; Maudsley, 1999), perhaps due to relevant and deep changing inherent to it (Mamede, 2001). From the origin at McMaster forty years ago where the model for student-centred, problem-based, small-group learning took shape, adoption of PBL at other medical schools experienced a slow, though gradual increase through the 1970's and 1980's. Now, however, we are seeing an explosion in the use of PBL in its various adaptations. Today, several medical schools in almost every country of the world are implementing (or are planning to implement) PBL in their curricula to a greater or lesser extent (Camp, 1996). For instance, according to Schmidt et al. (2009), most medical schools in the United States and Australia have adopted PBL as their instructional method and curricula based on PBL principles have also been developed in Europe and Asia.

With such an explosion, the concern among educators and defenders of PBL was to keep a minimum of quality based on fundamental principles of learning in which PBL is based on. Thus, investigations have been carried out during the last decades that have resulted in solid evidences that support PBL. Schmidt et al. (2009) demonstrated that constructivist PBL curricula could have positive effects on learning even if they deemphasize direct instruction.

Several authors (Boud & Felletti, 1991; Charlin, Mann & Hansen, 1998; Maudsley, 1999; Schmidt, 1990) have converged to a set of principles and central pre-requisites of PBL. One of the principles considered as 'definers' of PBL is that PBL has to have at least six components: the problem, the tutorial groups, the tutor, the individual study, the student evaluation and the blocks and units that constitute the curriculum (Schmidt, 1990). In addition, Schmidt et al. (2009) stated that there is consensus that PBL curriculum has six defining characteristics: (a) the use of problems as the starting point for learning, (b) small-group collaboration, (c) flexible guidance of a tutor, (d) numbers of lectures are limited, (e) learning is to be student-initiated and (f) ample time for self-study should be available.

Another relevant principle is the comprehension of PBL as an educational approach, an educational philosophy with specific principles, which have to orient the design and structure of the whole educational programme, in particular the curriculum design. Thus, PBL should not be merely a technique or method that can be used in isolated disciplines or units.

The definition of those essential principles of PBL allows the distinction of what PBL is and what it is not. For instance, Ross (1991) proposes the differentiation between PBL-based curriculum, problem-oriented curriculum and problem-solving-directed curriculum. PBL-based curriculum includes the essential pre-requisites described previously, the problem-oriented curriculum has as a basic characteristic the consideration of relevant problems as criteria to select the

content of the course, and the problem-solving-directed curriculum is characterised by the inclusion in the educational programme or training experiences that stimulated the acquisition of problem-solving skills.

The “pure” or “real” PBL contrasts with a variety of other problem or case based approaches (Savery & Duffy, 1995). Most case based learning strategies (Williams, 1992) use cases as a means for testing one’s understanding, that is, the case is presented after the topic is covered in order to help test understanding and support synthesis. In PBL, the problem is the starting point of the learning process. Other case based approaches use the case as an “example” and their focus is not on the development of the metacognitive skills associated with problem solving or with professional life. In contrast, a PBL approach is a cognitive apprenticeship focusing on both the knowledge domain and the problem solving associated with that knowledge domain or profession.

The discussion presented in this section is relevant to the understanding of the dPBL, web-based curriculum design process described in Chapter 2. In addition, this debate is important for understanding the programme evaluation design described in Chapter 5 and the effectiveness evaluation of the dPBL curriculum described in Chapter 6 in the sense that such PBL principles should be included and checked in the evaluation studies.

But, is face-to-face PBL effective? That is a common question among the researchers, educational managers, teachers and even students of PBL programmes. In fact, the effectiveness of face-to-face PBL is well established. Schmidt, Dauphinee & Patel (1987) found that problem-based curricula provide a student-centered learning environment and encourage an inquisitive style of learning in their students as opposed to the rote memorization and short-term learning strategies stimulated by traditional programmes. Hmelo (1998) also found that PBL has positive effects on the early acquisition of cognitive skills in the study of medicine.

A meta-analysis that selected 43 articles conducted by Dochy, Segers, Van den Bossche, & Gijbels (2003) showed that PBL has a robust positive effect on students' cognitive skills. The study also found that students in PBL developed slightly less knowledge, but remembered more of the acquired knowledge. The findings of a qualitative meta-synthesis conducted by Strobel and Van Barneveld (2009) indicated that PBL was superior when it comes to long-term retention, skill development and satisfaction of students and teachers in comparison to traditional forms of instruction. The evidence also suggests that PBL is associated with better clinical skills acquisition and promotes flexible understanding and lifelong learning skills (Hmelo-Silver, 2004; Clark, 2006).

Schmidt, Vermeulen and Van der Molen (2006) studied the long-term effects of problem-based medical training on the professional competencies acquired by graduates in comparison to conventional medical curricula. The findings indicate that PBL affects positively the typical PBL-related competencies, such as the interpersonal skills and cognitive domains, and the more general work-related skills, such as the ability to work more efficiently. Koh, Khoo, Wong, & Koh (2008) also found that PBL has positive effects on physician competency after graduation, mainly in social and cognitive dimensions.

Few studies found negative effects in comparison to conventional education. If negative effects were reported, they were that students from PBL acquire quantitatively somewhat less knowledge than those from traditional programmes or revealed no convincing evidence that PBL improves knowledge and clinical performance (Albanese, & Mitchell, 1993; Berkson, 1993; Colliver, 2000; Mergendoller, 2000).

In the next paragraph, we describe the concepts and the main characteristics of dPBL.

PBL in distance education – distributed PBL (dPBL)

Since PBL is classically associated with campus based, small group learning conducted over protracted periods of time, it should not, in theory, be well suited to

the DE mode of learning (Price, 2000). However, the results of the studies that have been evaluating PBL at distance show that it is possible. Of course, many constraints still should be overcome. In this section, we present a summary of the main findings of the studies showing that, in general, dPBL has positive impacts in students' learning. We also describe several examples of the use of dPBL in different contexts and its benefits and limitations. Finally, although research on effectiveness of dPBL has grown in the last decades, we point out the need for developing these kinds of studies in the health area.

In fact, over the past decades, PBL and DE have been combined as educational approaches in higher education. As stated in Chapter 1, this combination has been called distributed problem-based learning (dPBL) (Wheeler, 2006). In dPBL, computer technology mediates learning and students collaborate in a shared, 'virtual' distributed learning environment. The conceptual foundation for dPBL is the PBL theoretical background, processes, methods, and outcomes (Scripture, 2008).

One of the first uses of dPBL using printed material was described in an interesting study realized by Engel, Browne, Nyarango, Akor, Khwaja, Karim & Towle (1992) in the Center for Higher Education Studies, University of London. The Wellcome Tropical Institute of this Center has assisted countries in the tropics to establish viable systems of continuing medical education, particularly for young doctors practising in rural areas, a similar context presented in this thesis. As part of this strategy, the Institute has developed material for use in distance learning. The first attempt to apply the PBL approach to written material for use by an individual learner in the absence of a tutor led to a trial in Ghana, Kenya and Pakistan to compare a conventionally designed module with a PBL module on the same topic for their respective acceptability, effectiveness and efficiency. These three comparative trials have shown positive results for PBL at distance with printed material.

In The Hong Kong Polytechnic University, Poon, Reed & Tang, (1997) presented a study during the 5th International Conference on Modern Industrial Training, Jinan, China, describing an experience of using PBL at distance. According to the authors, the approach was particularly suitable for distance learning education involving the acquisition and development of disciplinary knowledge and management skills. The values are supported through well-structured PBL problems which challenge students to achieve higher-level critical thinking. They also observed the important role of local tutors in facilitating student-centred learning in distance learning mode.

One relevant attempt of using dPBL in the undergraduate medical education field was piloted by Southern Illinois University School of Medicine in spring 1999 to support the authentic PBL method used in the curriculum (Cameron et al., 1999). The authors used traditional face-to-face tutor group sessions associated with dPBL in which the group participated from distributed sites. The pilot provided a list of observations, technological issues and future plans. Among the observations were the changes in the role of the facilitator and the value of being able to review virtual tutorial groups transcripts from any place and time. The technological issues included collaborative software functionality and presentation of the problem in a way that supports free inquiry. A platform-independent software and a database that presents the problem in a more intuitive, responsive manner were included in the future plans.

Edwards, Hugo, Cragg & Peterson (1999), from the School of Nursing, University of Ottawa, Canada, described an experience of integration of PBL strategies in distance education. The authors explored the redesign of a traditional distance nursing education program to integrate PBL strategies. Using pre- and post course questionnaires, learners' satisfaction was compared between students who attended the PBL course face-to-face and those who received the course via audio-teleconferencing. Audio-teleconference is a DE technology that requires voice or touch-activated multidirectional microphones to facilitate nondisruptive

communication. Tutor and student perceptions of PBL via audio-teleconferencing were also described. Study results suggested that audio-teleconferencing is an effective means of delivering PBL by distance education.

Another study, carried out in Canada by Pelletier, Ness & Murphy, (2001), investigated a PBL curriculum using Web-Based group discussions. The purposes of this study were to incorporate computer technology into parts of an undergraduate exercise physiology course, to motivate students, to get them actively involved in the learning process and to enhance learning. Two classes of third year students were investigated; the first was taught using PBL activities with online discussions on a course web page, while the second was taught using traditional lectures. Student perceptions about the use of technology and PBL were collected. Moreover, data related to student knowledge, comprehension, and application of course material were collected. The teaching methods resulted in similar grades on exam questions and final course marks. This project verified the viability of these teaching methods and demonstrated their acceptance by undergraduate students. The results have shown a positive learning experience for undergraduate students of a physiology course.

Mattheos & Attstrom (2002) has asked a similar question set in this thesis: Web-based PBL, is it possible? The authors have developed pilot studies related to the use of PBL in a web environment in the Centre for Oral Health Sciences, Malmö University, Sweden. The Centre has been working towards developing and evaluating a PBL model for network based teaching. One of the findings was that, considering the limitations of such pilot studies, it would be possible to conclude that a fully Internet-based PBL is possible and might be beneficial in comparison to didactic approaches in Internet-based teaching, if properly organized. However, such a model might constitute a compromise over the quality standards of in-classroom PBL, at least with the currently available knowledge and technology. The authors also add that a hybrid model, which will combine in-classroom sessions with interaction over the Internet, appears to be the safest and most

beneficial approach right now. They finalize affirming that in the future, the learning effectiveness of these models and Internet-based learning in general, has to be further evaluated on a research basis. In particular, the student gains in terms of knowledge, skills and learning attitude have to be tested in comparison to the conventional in-classroom teaching methods. One of the studies of this thesis evaluated the effectiveness of a dPBL curriculum in terms of the gains of knowledge and skills and showed positive effects. The results are presented in Chapter 6.

Findings from the study of Ronteltap and Eurelings (2002) involving students in the Faculties of Medicine and Law at the University of Maastricht in The Netherlands show that dPBL allows more group interaction time and facilitates the submission of reports independent of time and place in comparison with the face-to-face sessions used in the same courses. Wertsch (2002) found that dPBL gives the learners more time to reflect in comparison with traditional PBL. In the health area, Bowdish, Chauvin, Kreisman & Britt (2003), using a quasi-experimental, post-test only research design compared the virtual problem-based learning (VPBL) exercise delivered via Internet and a text-based version of the same PBL exercise on students' achievement and their perceptions of the learning environment. The authors concluded that the VPBL is as effective as the text-based version for improving students' learning and their learning environment in small group discussion.

Valaitis et al. (2005) performed another interesting study in dPBL in the health area. In their project, the authors investigated health sciences students' perceptions of their experiences in online PBL, focusing on the learning and group process in the online environment. The results showed that the students felt that dPBL increased their flexibility for learning, and enhanced their ability to deeply process content, although they had perceived a heavy workload and had difficulties making group decisions online. A similar programme used a blended PBL approach that combined a traditional face-to-face approach with Web Based

Learning (WBL) (Taradi et al., 2005). The authors found that such a combination positively influenced student learning outcomes and satisfaction in an acid-base physiology course.

Atan, Sulaiman & Idrus (2005) investigated the effectiveness of PBL in the web-based environment for the delivery of an undergraduate physics course. The authors compared the academic performance and perceptions of two groups of participants randomly exposed to two different learning sessions: web-based PBL approach and web-based content-based learning (CBL). The results revealed that students from the experimental web-based PBL approach achieved better academic performance than students from the controlled web-based CBL approach.

Raupach, Muenscher, Anders, Steinbach, Pukrop, Hege & Tullius (2009) used a randomized controlled design to investigate the effect of a virtual collaborative online module on clinical reasoning acquisition in comparison with traditional PBL tutorial group. The findings suggested that virtual collaborative learning was as effective as conventional PBL regarding the acquisition of clinical reasoning skills, although it was less well accepted by the participants (fourth-year medical students) than traditional PBL sessions. Degiorgio (2009), who examined counseling skill acquisition for Rehabilitation Counseling education of students enrolled in a distance education course, has found positive results. However, this author also found that a majority of the participants indicated that they would have preferred a traditional approach to learning counseling skills, although they perceived distance education to be an effective use of their time.

Sendag & Odabas (2009) have found no significant effect on the content knowledge acquisition scores of a dPBL course about the use of computers in education for teacher trainees at the Department of Primary School Mathematics Teaching in Anadolu University Education Faculty, Turkey. However, they found that dPBL had a significant effect on increasing the critical thinking skills. Baturay

& Bay (2010) by evaluating the effectiveness of a web-based dPBL curriculum in Computer Science area have also found positive results. The authors divided the group of participants into two groups, namely an experimental and a control group, and compared the achievement of both groups of students. Students from the experimental group worked on collaborative PBL project assignments, besides online tutorials and asynchronous discussion. Students from the control group were taught using the standard online tutorials for the course and through synchronous meetings. The results showed that students involved with dPBL activities felt much more 'connected' to other colleagues when compared to the control group and obtained higher scores on knowledge at the post-test.

Chagas et al. (2012) evaluated the impacts of a dPBL course on health education on students' active participation, based on the analysis of their interactions. They found that there was a great variability in the degree of participation of each member of the group. The results also showed that the development of a group dynamic did not appear to depend on the activity of each tutor. In addition, in most groups, the participation of the tutors decreased during the semester. However, regarding the ways students participated, and although the individual variability observed, most students kept actively involved in the work contrarily to what research has shown about the unequal students' participation in online courses.

In fact, different models of PBL for teaching at a distance have been used and tested in different fields and places around the world, such as Medicine and Law in the Netherlands (Ronteltap & Eurelings, 2002), Education in the United Kingdom (McConnell, 2002), Computers in Turkey (Baturay & Bay, 2010), Social Economy in Sweden (Bjorck, 2002), Public Health (Tomaz, Mariano, Fonseca, Cavalcante, & Nogueira, 2004), Biochemistry (Perez, 2006), Engineering (Kalatzis, 2008) and Nursing (Silveira, Catalan, Neutzling, & Martinato, 2010) in Brazil, just to cite some examples. The models vary. For example, there are models in which students participate in a program structured around traditional small-group meetings (Ronteltap & Eurelings, 2002), whereas in other approaches students engage with

problems independently and negotiate solutions online in discussions moderated by a tutor (Steinkuehler, Derry, Hmelo-Silver & Delmarcelle, 2002). PBL has been also used in a quasi-distance education mode, for example by using the Internet for part of the course delivery (Treadwell & Leach, 1998). In general, most of the models use a variety of relatively simple tools to support interaction among learners (Koschmann, 2002). Overall, these studies showed positive results in terms of the learning process and student learning and accomplishment.

Several benefits of dPBL are described in the literature. Learners from different locations can study together, collaboratively, even when there are impediments related to geographic distance, weather, family issues or work (Barrows, 2002; Koschmann, 2002; Ortiz, 2004). Some of the advantages of dPBL demonstrated by Treadwell and Leach (1998) were that the use of technology broke down geographic barriers, gave the students a chance to meet, and that it enabled different perspectives to enlighten the students' innovative thinking and solutions. According to Schiller and Ostwald (1994), *"PBL is in fact well suited to distance learning, since the flexibility of distance learning is a closer reflection of the problem-solving processes that occur in the workplace"* (p. 220). For a variety of reasons, dPBL is attractive from an instructional point of view since it creates the possibility that participants share their learning in different locations and time (Koschmann, 2002). Barrows (2002) agrees that the creation of effective dPBL will enhance the value of PBL. According to Durrington, Berryhill, and Swafford (2006) dPBL can promote student interactivity and provide students with a meaningful learning experience.

On the other hand, there are a lot of constraints and challenges for implementing dPBL. Results from Taplin's (2000) study were disappointing in the sense that the change of educators' views about the use of PBL in distance education appeared to be a very slow process. Orrill (2002) highlighted some difficulties in the transition from face-to-face to online PBL, related to the need for appropriate tools to support collaborative problem solving in a distributed context. Björck (2002) also

noted that the development of computer environments for supporting the pedagogical ideas and PBL procedures is an important challenge for implementing dPBL. Barrows (2002) raised concerns regarding the application of authentic PBL in a distributed form. These concerns include questioning about the need for synchronous communication, the need of new skills for the dPBL tutor as facilitator and the development of adequate mediating technology.

Facilitating virtual teams in dPBL courses takes time, effort and requires significant staff training (Brodie & Porter, 2008). According to Halonen (2008), the implementation of dPBL programmes requires significant pre-planning and development of learning resources. Brodie (2009) identified several barriers to student participation and learning in a dPBL engineering course that utilizes virtual teamwork. These barriers were categorized in three main areas - time, technology and learning. Chagas et al. (2012) highlighted the difficulty of promoting all students active participation and involvement in the learning activities in dPBL contexts. The authors suggested the need for investigating the different dynamics of the dPBL groups and the possible factors responsible for this differentiation, including the use of technology and the clarification of the role of the tutor in these different situations.

Therefore, we can observe that research and evaluation literature on the development of dPBL have grown considerably in the last decades, and possible limitations and / or advantages of this combination have been identified. An interesting initiative to obtain more evidence and deeper insight in how to use PBL in DE was the symposium entitled, "*Studying Collaboration in Distributed PBL Environment*" at the 2001 Annual Meeting of the American Educational Research Association in Seattle, Washington - USA. Its aim was to explore some of the research issues that arise in developing new models of dPBL. The papers presented at the symposium constituted an international sampling of current work related to dPBL (Koschmann, 2002).

However, most studies have focused mainly on participants' and tutor's experiences with computer-mediated dPBL. Few studies have focused on the dPBL design and implementation from the planner's perspective (Scripture, 2008). In addition, most studies have focused on program evaluation and case report. Few studies have used a pretest–posttest control group design such as the present study (e.g. Atan, Sulaiman & Idrus, 2005; Sendag & Odabas, 2009; Baturay & Bay, 2010) that assesses dPBL effectiveness on knowledge and skills acquisition. Moreover, thus far, to our knowledge, although research on effectiveness of dPBL has grown in the last decades, more of these kinds of studies are needed, particularly in health area and in low-resources settings such as Latin America, including Brazil.

Finally, from the studies, a set of relevant questions has emerged in order to establish what the best practices on dPBL design and implementation are. The questions include a variety of dPBL curriculum design issues that should be better investigated, such as the ideal group size, the learning effects of the curriculum, the design of problems, the profile and role of online tutors and tools of interaction (synchronous and asynchronous), for example (Scripture, 2008). The present study, to a certain extent, addressed most of these questions by evaluating the dPBL curriculum from the participants' perspective.

In the next paragraph, we present briefly the concepts regarding an important approach for curriculum design – the competence-based education (CBE) – that we used for designing our course.

A competence-based dPBL curriculum design and implementation

The design of dPBL programmes is still a challenge for curriculum planners and it is an area that needs to be more explored (Savin-Baden, 2003). The findings of the studies on dPBL design have contributed to the improvement and refinement of this online learning methodology.

In higher education, in the health area, competence-based education (CBE) has been an important approach for curriculum design. CBE is one of the types of outcome-based education in which institutions are expected, for each curriculum, to have set out learning outcomes (competences), educational strategies that enable students to reach them and assessment tools to demonstrate the achievement (Harden, 2002). In the past decades, competence-based medical curricula have been implemented in several countries in response to the new demands of health care (Cate, 2006). In general, competence has been defined as the ability to perform a task, action or activity, which includes a set of knowledge, skills and attitudes to be developed in an educational programme (Mast & Davis, 1994; Harden, 2002). The Webster dictionary defines being competent as the quality of having sufficient knowledge, judgment, skill, or experience for some purpose. In medical education, *competence* can be defined as what the doctor is able to do; unlike *performance* is what the doctor actually does in day-to-day practice (Norman, 1985). According to Burg, Lloyd, & Templeton (1982), a clinically competent doctor would be someone who has the knowledge, judgment, skill, and experience to make a correct diagnose and provide appropriate treatment.

Developing medical competencies has been a great challenge for educators. The design process of a competency-based curriculum requires a proper definition of clinical competence and its components. The first step for designing a competency-based curriculum (CBC) is the identification of a *list of competencies* that are expected to be acquired by the student during the course (Wiers et al., 2002). The preparation of the list of competencies should be based on the analysis of epistemological, social and health system contexts, analysis of community needs and the needs analysis of potential participants with regard to health care. From the *list of competencies*, learning objectives are formulated and educational strategies established as well as assessment tools. In the present thesis, we used CBC approach for designing the course “*Clinical approach for elderly with dementia*” described in Chapter 2.

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*Chapter 4 - Understanding family
health professionals as prospective
students in distance education¹*

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Abstract

Since 1994 a family health model has been implemented in the State of Ceará and in Brazil through the named Programa Saúde da Família - PSF (Family Health Programme) aiming to provide primary health care to the whole population. Priority is given to those at risk of becoming sick or of dying. An important constraint to its implementation has been the lack of sufficient qualified professionals. In addition, there are important difficulties to train the family health professionals since they work mainly in distant rural areas. Distance Education (DE) could be an adequate educational strategy since one of its aims is opening up learning opportunities to a wider range of people and reducing barriers to access to the educational programmes. However, an adequate evaluation should be carried out in order to assess its acceptability, effectiveness and efficiency before one implements such an approach. The goal of this first study was to investigate one of those three factors – the acceptability. A cross-sectional survey using self-administered questionnaires was carried out in 28 municipalities of the State of Ceará. In total 255 questionnaires were sent to the potential participants in DE programmes, with a response rate of 81.9%. The findings showed that in general the respondents have positive perceptions and attitudes towards DE and are very motivated to participate in a distance course. A list of recommendations was derived to help the distance course planners, in particular to our DE programme designers.

Key words: Distance Education, acceptability, Student's perception, Family Health Programme.

Introduction

What would you do if you were responsible for training a considerable number of people (around thousand people) living in different places, some of them hundred kilometres from your institution in a short period? Distance Education (DE) could be the answer. However, generally DE programmes are not so easy to implement and usually the initial costs are high (Rumble, 1997). Unfortunately, sometimes programmes are implemented, huge changes of educational strategies are made without adequate evaluation of its feasibility and a lot of money and effort are wasted. Therefore, three questions should be answered before one implements a distance education programme (Engel, Browne, Nyarango, Akor, Khwaja, Karim & Towle, 1992). First, how acceptable would this approach (DE) be for students? Second, how effective would this approach be in helping learners to master the

educational objectives of a distance education programme or module? Third, even if the distance education programme proved to be acceptable and effective, how efficient would it be – how realistic and worthwhile would the expenditure of time, energy and actual cost be on the part of the user and the provider of the programme? The present study is an attempt to investigate the first of the three questions.

Purposes of the study

The purpose of this study is to contribute to provide information required to develop a continuing education programme for family health teams – consisting of family medical doctors and nurses – in the State of Ceará. This study focused on a probable introductory course in family health using a distance education approach for family medical doctors and family nurses. An extended purpose is to provide a framework that can be used in other Brazilian states aiming to collect information for the elaboration and implementation of a continuing education programme for family health professionals.

However, the main objective of this research is to describe the family health professionals' characteristics, perceptions, opinions and attitudes as prospective students in a distance education course within the State of Ceará – Brazil.

The main research question is: Is distance education an acceptable educational strategy to train the family health professionals in the State of Ceará under their perspective? For answering this question some specific questions were investigated:

1. Who are the family health professionals? Which are their main characteristics in terms of age, sex, marital status, profession, number of children, educational background, etc. and their relationship with distance education within the State of Ceará?
2. Which are the main family health professionals' perceptions in terms of their needs, preferences and context and their relationship with distance education in the State of Ceará?

3. Which are the main family health professionals' attitudes towards distance education as a method of continuing education within the State of Ceará?
4. Which recommendations in the light of the results can be proposed in order to help the planners in the design of the distance education course turning it more acceptable?

The first three questions can be answered by the survey. The fourth has to be deduced from these answers.

Method

This study was a cross-sectional survey. The design was partly adapted from the work carried out by Evans (1994) from the Faculty of Education, Deakin University, Australia. His work was based on several students' stories collected over the years that he has been involved in research and evaluation projects in open and distance education. In the course of these projects, he has surveyed thousands of students, using questionnaires, and he has interviewed hundreds of them, mostly in their homes or workplaces, but sometimes by telephone. In his work he allowed distant learners to recount their experiences in their own words covering in detail a variety of themes ranging from the learners' social and educational backgrounds (family and schooling, learners' experiences as teachers), to important aspects of students' lives and the interrelationships with their broader contexts. These included issues of money, sex, power, age, work and leisure.

The present study was structured in a framework that starts with the investigation of the diversities, which the distance educator can expect in the learners' educational backgrounds. Next, a variety of aspects of students' lives, needs and context were addressed. Afterwards we investigated aspects related to the course design (the distance Diploma Course for Family Health Professionals (DCFH) and finally, we examined some general aspects related to motivation and interest. The present study and Evans' differed, however, in two important aspects: Evans' study was carried out among those who already had experienced a distance

education course and used both quantitative and qualitative methods. Our study focused on prospective students in distance education and used only a quantitative method.

Participants

The population of the study consisted of all family doctors and all family nurses from the PSF - Family Health Programme - of State of Ceará, excluding those who attended to or are attending to the DCFH offered by Escola de Saúde Pública do Ceará – ESP-Ce (School of Public Health of Ceará). We decided to exclude this group because we assumed that they would not feel motivated to participate in the study, because they already have attended or are attending the DCFH. According to information provided by Secretariat of Health of State of Ceará (SESA) there were 588 family health teams, but not all of them were complete. Some of them missed professionals, mainly physicians. The exact number of family health professionals was: 486 family doctors and 575 family nurses, thus 1061 professionals in total (SESA, 2000). Excluding those who had attended or were attending the DCFH – around 180 professionals – our final number of professionals in Ceará was 881.

Sampling

Because it was very difficult to obtain the list of all family doctors and family nurses and to identify those who had attended or are attending to the DCFH, we decided to select our sample following the next procedures. Our concern was to guarantee a most accurate representation of the population from which it was drawn and to reach an adequate power of our analysis. Thus, our primary sampling unit consisted of the municipalities of Ceará. First, we elaborated a list of the 148 municipalities of the State of Ceará who have implemented the PSF up to November 1998 and grouped them by Departamentos Regionais de Saúde – DERES (Regional Health Departments). There were 14 DERES in State of Ceará. Since each DERES had a different number of municipalities, we decided to select randomly 20% of the municipalities of each DERES. Our concern was keeping an adequate geographical representativeness, an important factor in distance

education. For example, the 1st DERES had 29 municipalities, hence 6 municipalities were selected randomly. The 2nd DERES had 9 municipalities, so 2 municipalities were chosen. In this way, we obtained a list of 31 municipalities (Appendix 1) with 255 family health professionals in total, which represents 28.9% of the total population of this study (255 of 881). Those municipalities not selected were eliminated and not included in the study. Finally, the number of all family medical doctors and family nurses for each selected municipality was identified which consisted of 115 family medical doctors and 140 family nurses.

The questionnaire

A self-administered questionnaire was developed specifically for the purpose of this study. It was organised into five blocks: 1. Personal data; 2. Prospective students' social and educational background; 3. Prospective students' needs, perceptions and context. 4. Course design; and 5. General questions. It included several aspects based on Evans' (1994) work, such as: schooling, learner's experiences as teachers, money (course fees, payment for learning resources and activities), gender, power and control in DE (confronting teachers, confronting institutions), work (study for work, balancing work and study, education at work). It also included play/time (education as leisure, leisure as education, education as a loss of leisure), and age (learning styles, learning beliefs and approaches for older students). Other relevant aspects were included as well. These were: profession, marital status, last participation in training/course, previous experience in distance education, existence and type of disability, access to learning resources, existing abilities, reasons for participating in the distance course, media preferences, access to media, flexibility of the deadline of assignments submission, use of face-to-face sessions, skills training, motivation and interest in the course subject.

Most questions were closed and elaborated in different formats. In those questions which are supposed to measure attitudes and perceptions a five-point Likert scale was used (Crowl, 1996). Other questions were constructed in a yes/no format, others asked for a direct answer such as age, profession and sex. In Appendix 2 the whole questionnaire is presented.

A pre-test was performed with four family professionals: two physicians and two nurses who were not included in the study. Based on that information the layout was modified. Furthermore, three questions were rephrased because they were not very clear. In addition during the pre-test people were asked to observe how much time they used to answer the questionnaire – the average time was 30 minutes. That information was important during the planning of the delivery of the questionnaires and was included in the instructions to the people responsible for the application of the questionnaires.

Procedure

In total, 255 questionnaires were sent to all family doctors (n=115) and all family nurses (n=140) from the 31 selected municipalities, excluding those professionals mentioned before. Although the questionnaire was self-administered, it was filled in 'under supervision'. In fact, we have contacted one person in each municipality by telephone or personally – mostly the local PSF Co-ordinator - and asked him or her to be responsible for receiving, applying, supervising the application and sending back the questionnaires. They were called Local Research Co-ordinators. For those municipalities where we could not find such a person, we sent two Central Research Co-ordinators. Both groups – Local and Central Research Co-ordinators - received instructions about the procedure and the application of the questionnaire and were supposed to be able to clarify the respondents' doubts.

The questionnaires were distributed and administered as follows. Kits with the questionnaires and instructions for each municipality were organised in sealed envelopes. We used several strategies to send the questionnaires to the municipalities: express courier from SESA, handing over the questionnaires to someone from the municipality who came to our institution for other reasons or the Central Research Co-ordinator took them personally. The research co-ordinators handed over the questionnaires to the professionals and waited until they had filled it in.

We could not follow up all the municipalities, but, based on informal information given by the Central and Local Research Co-ordinators and on the first author's own impression (he has visited at least four municipalities) the circumstances in the setting were very adequate and most respondents were motivated to participate in the study. In addition, in spite of the little time available for data collection (around two and a half months) and the period (including Christmas and New Year), we could reach the whole sample of municipalities. We tried to keep the respondents anonymous, so the questionnaire did not ask for their names.

Analysis

All the data were analysed using the computerised statistical software SPSS. We used mainly as descriptive statistical procedures the frequencies, including mean and standard deviation and as inferential statistical procedures the cross tabulation including level of significance (p value).

Results

The response rate of professionals was 81.9% (209 of 255). The response rates by professionals were: among the family medical doctors 70.4% (81 of 115) and the family nurses 91.4% (128 of 140). The respondents represent 23.7% of the total population (209 of 881).

We have observed that an important majority of the respondents was female – 70.3% - (n=147). Regarding the profession the percentage of family nurses – 61.2% (n=128) - was strongly higher than family medical doctors – 38.8% (n=81). Most respondents were single – 45.7% (n=91), or married – 43.2% (n=86).

Respondent's age ranged from 21 to 70. The majority of the respondents was between 25 and 35 years old and the average of age was 32.2 years.

In Table 4.1 we can observe the respondents' answers related to learners' educational background on five-point scales (1= strongly disagree; 5= strongly agree).

An important finding was that almost half of them – 47.4% (n=98) – affirmed they did not like independent learning. Only 18.9% (n=39) answered positively. Besides that the great majority – 90.7% (n=186) did not have any previous experience in distance education.

Table 4.1. Respondent's answers related to their educational background

Item	M	Sd
- I had a positive previous experience as student	4.17	0.84
- My experiences were marked by fear and failure	1.55	1.00
- I have studied in poor quality schools	1.54	1.03
- I liked very much independent learning	2.51	1.12

Regarding the prospective students' needs, preferences, context, perceptions and attitudes relevant results were found. Concerning to the access to learning resources the findings showed that a good proportion of the respondents – 59.3% (n=124) had easy access to a computer, considering at least a version PC 486 or similar or bigger. However, a considerable proportion – 40.7% (n=85) did not. The majority – 71.3% (n=149) did not have easy access to Internet. In addition, 64.4% (n=134) had easy access to libraries or study centres.

In Table 4.2, the respondents' answers related to some existing abilities are displayed. It was observed that almost half of the respondents – 45.9% (n=95) - affirmed that they were not or were definitely not able to read in English. Only 29% (n=70) answered positively.

Table 4.2. Respondent's answers related to their existing abilities

Item	M	Sd
- I am able to read in English	2.64	1.35
- I am able to use the software Word	2.73	1.49
- I am able to use Excel	2.31	1.38
- I am able to use Internet	2.02	1.34

It was observed that regarding the use of the software Word, 47.1% (n=96) answered they were not or definitely not able to use it. Only 35.8% (n=73) answered they were able to. Regarding the software Excel, 58.7% (n=119) answered they were not or definitely not able to use it. Finally, the findings regarding to the use of Internet showed that the great majority – 70.1% (n=143) – answered they were not or definitely not able to use it. Only 18.1% (n=37) said they were able to.

The respondents' answers related to the *Power and Control* are presented in Table 4.3. It was observed that 48% (n=100) of the respondents agreed or strongly agreed that their experience as students reflect models of education in which the balance of the power, authority and control is usually seen in a trend in favor to the teacher instead of to the student. In addition, almost half of them – 46.1% (n=94) - disagreed or strongly disagreed that such models referred to in the previous item are congruent with the independent learning required by distance education.

Other aspects that can be observed is that the great majority of the respondents – 90.4% (188) agreed or strongly agreed that in distance education the student has at least the power of studying in a place and at any time he/she chooses. Besides that an important majority – 83.5% (n=172) - would like or would like very much to

participate in the planning of a probable distance course. Finally practically half of them – 49.2% (n=102) - disagreed or strongly disagreed that in distance education the distance between students and the co-ordination of the course could contribute to the student’s lack of power and control.

Table 4.3. Respondents’ answers related to power and control.

Item	M	Sd
- My experiences as student reflect educational models in which the balance of power, authority and control is usually seen in a trend in favour to teacher rather than the student	3.28	1.17
- Such a models in the previous question are congruent with the independent learning required by distance education	2.52	1.12
- In distance education, the student has at least the power to study in a place and time he may choose.	4.48	0.81
- I, as a potential student of a distance course, would like to participate on its planning	4.31	0.86
- In distance education the ‘distance’ between the students and the institution could contribute to the student powerless and control	2.57	1.28

Regarding the topic *Work, training and education*, more than half of respondents – 56% (n=117) said that on average they work 40 hours a week. Twenty nine point two percent (n=61) work more than 40 and less than 60 hours, and only 7.7% (n=16) 60 hours or more, M=2.37, SD=0.73. Crossing the variables profession and worked hours we found out that a little more than half of the family medical doctors – 51.9% (n=42) - said they work more than 40 hours a week. Among the nurses only 27.3% (n=35) did, p=0. The great majority – 88.9% (n=184) - has only public job. The other – 11.1% (n=23) have both a public and private job.

In Table 4.4, some of the respondents’ answers related to work, training and education are shown. By analysing the findings we notice that 73.6% (n=153) said that, in general, they are able to reconcile work and study, considering in average 20 hours of studying a week. In addition, practically all of them – 98.6% (n=206)

affirmed that there is an important relationship between their work and study, and 99% (n=206) said that in their experience study has influenced their work. We also can observe that a significant percentage of the respondents – 55.6% (n=114) - affirmed that in their experience their employer has facilitated or strongly

Table 4.4. Respondents' answers related to work, training and education

Item	M	Sd
- In general, I am able to reconcile work and study (Consider an average of 20 hours of studying weekly)	4.05	1.46
- In my experience my employer has facilitated my participation on residential courses outside the municipality	3.40	1.42
- Regarding to the previous question, if the course used distance education approach my employer would facilitate more easily my participation	4.05	1.03
- I am able to reconcile group activities such as study groups and tutorials with my work in case such activities are used in a distance course	4.10	0.81
- A blend of distance education with educational activities in work place could be an important alternative for training the family health professionals	4.16	0.80
- My employer gives me some time to study during my work time	2.88	1.37

facilitated their participation on residential courses outside their work place. But an important proportion – 71.9% (n=149) said that they believe if such course used distance education approach their employer would more easily facilitate their participation.

Another finding is that 79.8% of the respondents affirmed they are able to reconcile face-to-face educational activities such as study groups and tutorials with their work in case those activities are used in a distance course. Moreover a very great majority of them – 95.2% (n=199) agreed or strongly agreed that a

combination of distance education and educational activities in their own work place could be an important alternative for training the PSF professionals. Finally, the respondents were split – 39.5% (n=82) disagreed or strongly disagreed and 36.5% (n=76) agreed – on the question of whether their employer has given them some time to study during their work time.

Regarding the *Leisure time and education*, an important majority of them – 68.9% (n=144) - affirmed that they often use most of their leisure activities as a way of self-education or independent learning. Moreover a great majority of them – 85.2% (n=178) - said they feel themselves motivated to use a significant part of their leisure time in order to dedicate it to a distance course. Other findings regarding leisure time and education are shown in Table 4.5.

Table 4.5. Some respondents' answers related to leisure and education

Item	M	sd
- I often use many of my leisure activities as a way of self-education or independent learning	3.82	0.99
- I feel myself motivated to use a significant part of leisure time in order to dedicate it to the proposed distance course	4.30	0.87
- I usually consider educational activities as a pleasure and a leisure moment	4.05	0.92
- Generally speaking I have enough free time to study	3.63	0.92
- I always discuss with my family some subject related to my study/work I consider interesting	4.01	1.01

Table 4.6 displays the results of the topic related to *Age and learning*. A slight majority of the respondents – 42.6% (n=89) - , when asked if they believed that it is easier to retain knowledge when you are younger, disagreed or strongly disagreed with that affirmation. However, 37.3% (n=78) agreed or strongly agreed with it. Another finding is that 51.7% (n=107) asserted that their learning is often supported by the younger members of their families, which contributes to keep their commitment and confidence in their studies.

Table 4.6. Respondents' answers related to age and learning beliefs

Item	M	sd
- It is easier to retain knowledge when you are younger	2.76	1.36
- My learning is often supported by the young members of my family, which contributes to keep my commitment and confidence in my studies	3.51	1.26

Crossing the variables group of age and “retention of knowledge” controlled by profession we found out that among the nurses 50% of those between 20 and 29 years old agreed or strongly agreed with the statement that the retention of knowledge is easier when you are young, and only 15% of those between 40 and 49 years old did. Among the physicians, the findings were similar.

The results related to course design were very relevant. In the present study, the proposal of the design of a course in Family Health, using the distance education approach supported by Ministry of Health is investigated. According to the proposal, it is an 11-month course and it will be based on the residential diploma course offered by ESP-Ce (DCFH).

The findings showed that the very great majority – 89.5% (n=187) said they would like to participate in the proposed distance course. The results related to the reasons why they would like to participate in a course like that are displayed in Figure 4.1. It can be observed that among the seven options proposed in the questionnaire, the top three reasons were: 1. “For my self-improvement in intellectual way” marked by 87.6% (n=163). 2. “In order to obtain qualification to my current job” chosen by 75.3% (n=140) and 3. “For my own pleasure” selected by 66.1% (n=123).

The next question was about the respondents' willingness to pay for distance course. The results show that 56% (n=108) are willing to pay for such a course. Part of the respondents - 22.8% (n=44) - said they are not. A significant

percentage – 21.2% (n=41) answered “don’t know”. Among those who are willing to pay, the great majority – 92% (n=115) said that less than R\$ 150,00 (this is comparable to around 42 euros) by month would be a reasonable cost. In addition, 71.5% (n=103) said that they are willing to pay for educational material, such as books, handouts, etc. and 51% (n=73) are willing to pay for communication costs, such as telephone, post, internet, etc. Of the respondents, 20.3% (n=29) said that they are not willing to. Here an important percentage – 28.7% (n=41) said “don’t know”.

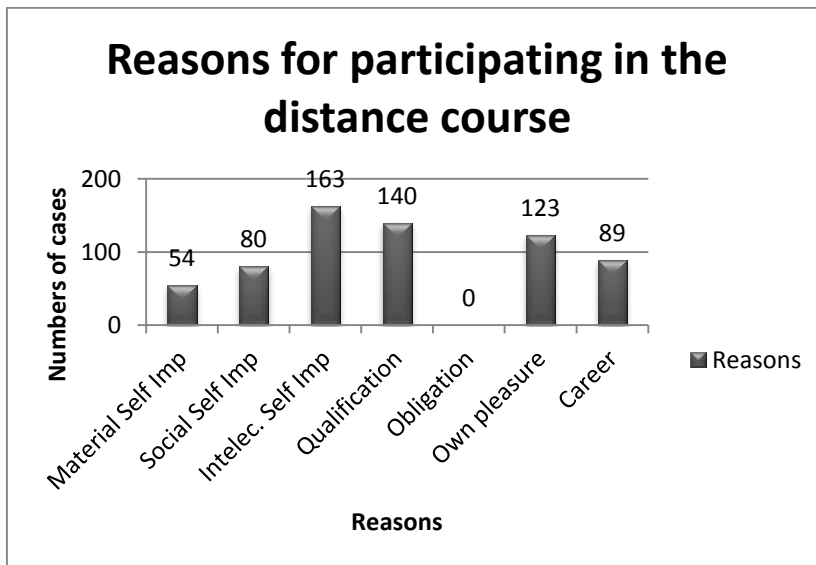


Figure 4.1. Reasons why the family health professionals would like to participate in the distance course

Following, the respondents were asked to choose, from a list of six, the media they would prefer that were used in that distance course. In Figure 4.2, the findings are displayed. It can be observed that the top three were: 1. “Printed material” selected by the very great majority of them – 94.3% (n=197). 2. “Video” chosen by 88.5% (n=185). 3. “Computer” marked by 59.8% (n=125). “Audio-tape”

was marked by only 34% (n=71). In an open question just 1.5% (n=3) would prefer other media besides those above.

The respondents were also asked using the same list which media they consider they have easier access. The findings are shown in Figure 4.3. Notice that the top three were: 1. "Video" marked by the very great majority of them – 96.2% (n=200). 2. "Printed material" again selected by the great majority of them – 93.3% (n=194). 3. "TV" was selected by 75.5% (n=157). "Audio-tape" was chosen by only 41.3% (n=86). "Computer" was marked by 49.5% (n=103). "Videoconference" was selected by only 14.4% (n=30).

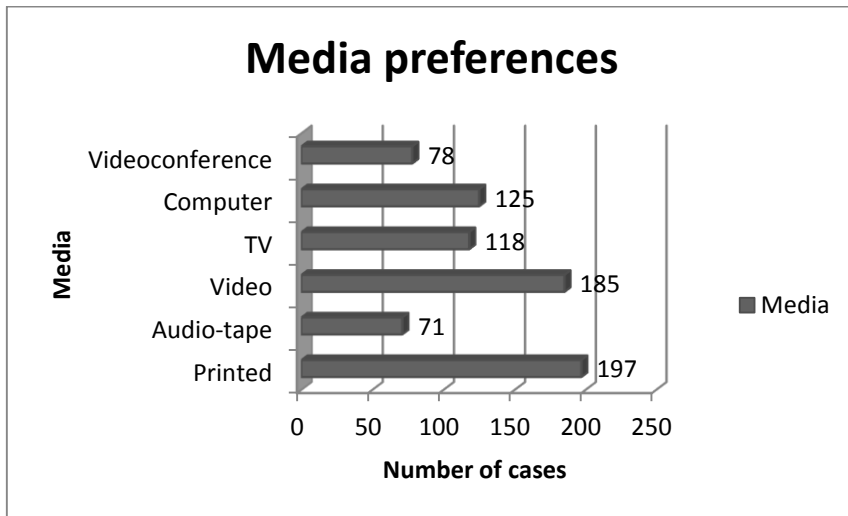


Figure 4.2. Respondents' media preferences

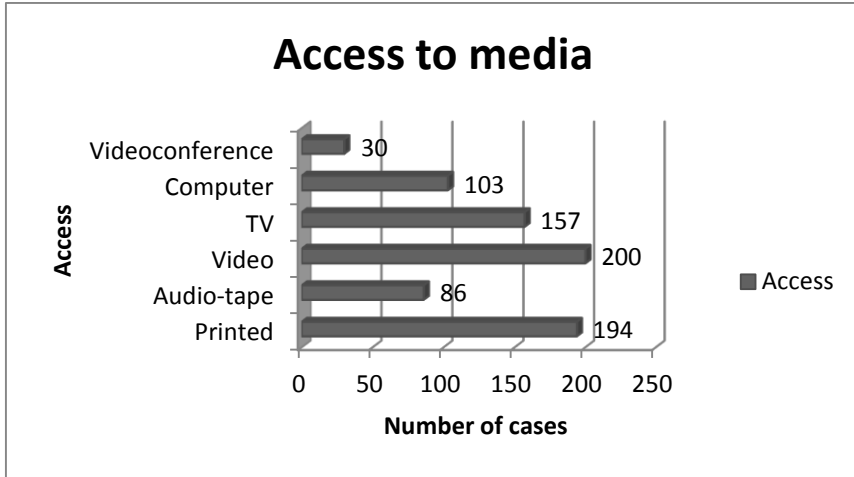


Figure 4.3. Respondents' access to media

In addition, three issues were investigated regarding to the course structure that are fundamental in distance education: the flexibility of the date of the assignment submission, the use of face-to-face sessions and the skills training. Table 4.7 displays the outcomes.

Table 4.7. Respondents' answers related to course structure

Item	M	Sd
- The deadline of assignment submission could be flexible in order to let students work in their own pace according their capacities and circumstances	3.88	1.17
- The face-to-face sessions such as study groups and tutorials should be included in distance course in order to stimulate the contact between peers	4.23	1.03
The skills training should be preferentially carried out as residential courses	3.67	1.14

We observe that 68.9% (n=144) agreed or strongly agreed that the date of the assignments submission could be flexible in order to make possible students study in their own pace according to their capacities and circumstances. In addition, a substantial proportion of the respondents – 80.8% (n=168) agreed or strongly agreed that the face-to-face sessions such as study groups and tutorials should be included in that distance course in order to stimulate the contact between peers. Finally, 58.6% (n=119) agreed or strongly agreed that the skills training should occur preferentially as face-to-face sessions.

Finally, the respondents' answers related to motivation and interest are displayed in Table 4.8. Notice that an important majority of the respondents – 77.7% (n=160) - affirmed that they feel themselves motivated or very motivated to participate in such a course. When asked about the degree of interest in the theme “Family Health”, the very great majority – 98.5% (n=190) said that they are interested or very much interested.

A last interesting finding was that most of the respondents – 67.9% (n=125), if they could choose, would prefer to attend to the proposed course using a distance education approach rather than a traditional (residential) approach - 32.1% (n=59).

Table 4.8. Respondents' answers related to motivation to participated in the distance course and interest in the subject “Family Health”

Item	M	Sd
- I am very motivated to participate in this distance course	4.20	0.99
- I am very interesting in the subject “Family Health”.	4.89	0.34

Discussion

In the first part of this section, we will evaluate the study in general terms, including the framework and the method (the population and the sample, the instrument and the procedures). In the second part, we will discuss the most important outcomes, making comments, making assumptions of alternative

explanations, comparing with previous findings, and including some implications for management or teaching. We will note however that few comparisons with previous findings are made, because we really did not find in the literature many researches addressing our specific question.

The evaluation of the study

The theoretical basis of the study, adapted from Evans (1994) and Rowntree (1992) has been effective for our purpose. Other aspects added, based on our own experience and needs, also seemed to be helpful and adequate. The relevance of all aspects investigated for distance education and the way by which they were grouped facilitated a lot the development of the study and the analysis and discussion of the outcomes, turning them more understandable and didactic. On the other hand, the way by which all the aspects were grouped sometimes made the relationship between them more difficult.

In addition, the high response rate among the sample of the municipalities – 90.3% - (28 of 31) and the professionals – 81.9% - (209 of 255) makes the research outcomes more valid and will permit us to a certain extent draw conclusions unbiased. However, one weak point was the difficulty of reaching the medical doctors. The results showed that the majority of the non-respondents were medical doctors. We do not know whether the possible workload or even the level of motivation for filling in a questionnaire could explain that fact.

Finally, in general, the questionnaire seemed to be adequate and measured what we wanted it measured. In spite of its length, the questions were apparently easy to answer. The pre-test was of paramount importance for the adjustments. The way by which the questions were grouped and sequenced seemed to be very helpful for the respondents.

The outcomes

In this section, we discuss the data that we can really take into consideration for the construction of the DE programme in our context. One of the main findings of this study is related to the course design, particularly regarding the desire of participating in the distance course and the reasons for it. In fact, such findings are of paramount importance for the question whether the distance education is an acceptable approach to be used in the family health professionals' continuing education. The results showed that the very great majority would like to participate in a Course in Family Health using distance education approach.

Analysing the reasons why they would like to participate in such a course, we can observe that two of the top three options selected – “for my self-improvement in intellectual way” and “for my own pleasure” indicate that those respondents have an academic/intrinsic motivation and a personal/intrinsic motivation, respectively, to participate in the course. The other top three options – “in order to obtain qualification for my current job” demonstrate a vocational/extrinsic motivation. Some authors (e.g. Sagar & Strang, 1985; Strang, 1987, cited in Rowntree, 1992) suggest that learners with intrinsic interests tend to get higher grades than those with extrinsic interests. The same authors also found that learners who have several reasons for studying do better than those who have one only. These studies also affirm that the intrinsic motivation stimulates the students to obtain a lifelong learning habit, which should be the aim of whatever educational system.

Another interesting finding related to the course design is the willingness to pay for the course, for the learning material and for communication costs. This fact could be a signal of the respondents' motivation to attend the course. Besides, the course planners and managers could consider this information when they elaborate the budget.

In relation to the media to be used in the course, the top four ones selected by our prospective students in upward order – printed material, video, computer and TV – in terms of their preferences may give important cues to the course planners in the

selection of them. According to the literature (Evans, 1994; Moore & Kearsley, 1996; Rowntree, 1992), printed material was also the main media chosen by students.

For “videoconference”, a lower percentage in terms of preference and access was expected. However, the percentage of the respondents that prefer such a medium – 37.3% (n=78) - can be an indication that people are interested in using it. In fact, a recent governmental programme in the State of Ceará aims to stimulate the use of new technologies in education and in communication, such as videoconferencing.

In general, the family health professionals have a positive attitude towards the three issues investigated regarding the course structure that are fundamental in distance education: the flexibility of the date of the assignment submission, the use of face-to-face sessions such as study groups and tutorials in the distance course and the skills training preferentially carried out as face-to-face sessions. Course planners should consider these findings.

The results related to the prospective students' social and educational background also permit us to make some comments: First, a great majority of the family professionals in general had a positive previous experience as students. This fact is positive, mainly for distance education, because those students tend to be more successful in further courses (Evans, 1994). On the other hand, the majority of the professionals do not have experience in independent learning. This finding is not so positive for distance education, since independent learning is often a feature of that approach. Maybe they have to adapt themselves or be stimulated to use independent learning in case they attend a distance course.

Another aspect that deserves a comment is that the great majority of the family health professionals did not have previous experience in distance education. Nevertheless, in spite of a very small percentage, those who had such experience before liked it very much and had a friendly relationship with tutors. In fact, DE is completely different from traditional education. Students attending a distance

course by the first time should be advised in order to be successful that they have to keep a certain discipline in terms of time, place and reconciliation with family, work and leisure time. The contact with peers (by telephone, internet, or even personally) is also an important strategy to keep on the right track in distance education.

Regarding the prospective students' needs, preferences, context, perceptions and attitudes, in particular, the access to learning resources, the most important results show that a small majority of the family health professionals has access to a computer and to a libraries or study centres. That is a very important point in DE and indicates the possibility of using those learning resources in the course. On the other hand, they have little access to Internet - 28.7% (n=60). The Internet is used in distance education in a variety of ways - communication between peers, peers and teachers, and as an infinite source of information. Maybe some governmental programmes could stimulate the increase of that percentage.

Moreover, in terms of existing abilities, the results show that at least almost half of the family health professionals consider themselves not able to read in English. In fact, many printed material and important information on the Internet are in such language. Therefore, it is important that our family health professionals have a reasonable ability to read English. It could be an important limitation on DE for these professionals. Regarding the other existing abilities investigated – the ability to use the software Word, Excel and Internet – the findings show that in general they have limitations, mainly in the use of Internet. It is interesting to observe that among the respondents, only 35.8% said they are able to use Word software and 18.1% said they are able to use Internet, although 59.3% has access to a computer and 28.7% to Internet. Some strategies could be proposed in order to overcome them, such as the promotion of the translation of the important printed material into English, or the stimulation of the family health professionals to attend English reading courses.

The findings on the topic *Power and control* also show the respondents have a favourable attitude against DE. In fact, they think that distance education provides to the students at least the power of studying at a place and time they may choose, and that distance between students and institutions does not contribute for their powerlessness. They also had disagreed with contents and forms of assessment in past courses they have attended. These findings show to a certain extent that the problem of power and control exists in the educational setting and that distance education could minimise it, at least in some aspects. In Evans' (1994) study a variety of students were also aware of that problem and their powerlessness in their learning situations. In addition, the results show that the respondents desire to share the power and control with teacher and institution, by manifesting their desire of participating on the course planning, for instance.

The findings related to work, training and education are positive when one is thinking to implement a distance education course. The majority of our prospective students, in particular the family nurses, work on average equal or less than 40 hours a week and predominantly have only one public job. Andrade (1998) found out that 85.2% of family physicians and 92.1% of family nurses in Ceará dedicate 40 hours or more a week to the PSF, which is congruent with our findings. However, she detected that 39.4% of the family physicians worked in hospitals. When we compare this with our finding in which 51.9% of the family physicians work more than 40 hours a week, we may assume that family doctors could be overloaded and this fact could affect the available time for studying and for participating in residential courses. DE approach could facilitate the participation of such professionals in educational programmes.

On the other hand, the results show that the family health professionals seem to be able to reconcile work and at least 20 hours of studying weekly, and they feel that study has considerably influenced their work. The positive conclusion is that, to a certain extent, the respondents seem to have enough time to enrol in DE programme.

Analysing the data related to leisure time, the most important finding was the fact that a reasonable proportion of our potential students likes to study during leisure time. This is an important indication that they may be successful in distance education (Evans, 1994).

Finally, another important finding of the present study, maybe one of the most important, is that the respondents are very motivated to attend the course using a distance education approach and highly interested in the topic "Family Health".

Recommendations

One of the objectives of the present study was to identify and propose some recommendations to help the planners in the design of the distance education course turning it more acceptable to the potential students. Some of the recommendations are already proposed in the discussion. In this section, we will try to condense them in order to facilitate the readability and its use and add some other ones. We will focus on the recommendations related on the outcomes. See the list of recommendations below.

- a) When planning the distance course (DCFH) take into account the predominant profile of the prospective students: female, nurse, single and young. Of course, the others should not be forgotten.
- b) As the very great majority of the potential students has not experienced distance education before, on the onset of the course or even during the course, some recommendations should be given to the students as to how one can be a good distant learner (Evans, 1994). Of course, each one has his or her own learning style, but they need to reflect on it. Advise them that they have to keep a certain discipline in terms of time, place and reconciliation with family, work and leisure time in order to be successful in their distance course and in their learning process.
- c) The contact between peers, peers and teachers (by telephone, internet, or even personally) should be stimulated during the distance course. Exchange of experiences and prompt feedback are fundamental for the learning process.

- d) As we consider the computer an important medium in distance education nowadays, we recommend managers or planners to propose to governmental programmes to stimulate and subsidise the acquisition of computers and the access to the Internet for the family health professionals as part of a continuing education project. Libraries and study centres could be included in the project.
- e) In the short term, the translation of the important English printed material into Portuguese should be promoted, and in the medium term, the family health professionals should be stimulated to attend English reading courses, basic computer courses, maybe using distance education approach. At the same time, new texts relevant to the course should be elaborated in Portuguese.
- f) When it is feasible, potential students' representatives should be included in the distance course planning. What should be taught/learned, during what periods, in what contexts and how it will be assessed should be decided with the students. It is also suggested to keep contact with students' organisations. The 'distance' between the institution and the student may contribute to the students' feeling of powerlessness.
- g) We advise to keep in mind that health professionals always have many tasks to accomplish. So, it is recommended not overload them with too many assignments, in particular the medical doctors who already seem to have a lot of extra work.
- h) When selecting the media for the Course, take into account their preference and access. So printed material, video, computer and TV could be the best choice in our case.
- i) Regarding to the course structure, the possibility of giving some flexibility of the date of the assignment submission, using face-to-face sessions such as study groups and tutorials, and planning the skills training preferentially as face-to-face sessions should be stimulated.

Conclusions

This study investigated one of the most important aspects for the implementation of a course based on EAD: the acceptability of the course by potential students, in this case, family health professionals. The theoretical bases of the study, adapted from Evans (1994), proved to be effective for our purpose. Important information was collected, including characteristics, perceptions, opinions, preferences and attitudes of the prospective students.

The results showed that the majority of participants had no prior experience with EAD and, despite having access to a computer, most of them do not have internet access, which can be a limitation in EAD. However, several other findings showed that EAD could be an appropriate strategy for lifelong learning of family health professionals. The desire to participate in the planning of the course, the motivation to participate in a course based on EAD and willingness to pay by it are examples of these findings. Most participants preferred printed material, video and computer as media to be used in the DE course.

Another positive conclusion is that, to some extent, prospective students seemed to be willing to devote time enough to participate in the course based on EAD. All this information should be taken into account by planners when designing the curriculum and teaching materials of the course.

In short, in general, two main conclusions can be drawn from this study: a) Family health professionals have demonstrated positive attitudes and perceptions with regard to EAD and (b) a series of relevant variables should be considered by planners of a course in EAD before implementing it. Future studies should be performed, including opinions and perceptions of other actors involved, such as health care managers and educators.

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*Chapter 5 - The design and programme
evaluation of a distributed Problem
Based Learning curriculum for training
family doctors in Brazil*

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Abstract

Over the past decade Problem-based Learning (PBL) and distance education (DE) have been combined as educational approaches in higher education. This combination has been called distributed PBL (dPBL). However, much more research is needed to obtain more evidence and deeper insight in how to design and implement dPBL. The present study aims at describing the design and the evaluation results of a competence-based, problem-based, web-based curriculum for training family doctors in Brazil. It focuses on a post graduate course “Clinical Approach for Elderly with Dementia” offered by the School of Public Health of Ceará, Brazil. The course has 120 hours, is divided into five units and is available through the Learning Management System (LMS) Moodle. It was offered to two classes of 30 participants. A self-administered questionnaire with closed and open questions was filled in by the participants of the two classes. The questions included various aspects such as the quality of teaching materials, the adequacy of the chosen educational approach, the technologies used for information and communication technology (ICT), the performance of the tutors and the satisfaction of participants and tutors. In general, the results indicated that the competence-based approach for curriculum design was adequate for our proposal and the course was highly rated by respondents. A list of recommendations for designing and implementing dPBL is presented based on the results of this study.

Keywords: Problem Based Learning (PBL); Distributed Problem Based Learning (dPBL); Competence-based curriculum; Distance Education; web-based education; Online Courses.

1. Introduction

The purpose of this paper is to describe the development and the results of the programme evaluation of a competence-based, problem-based, web-based curriculum for training family doctors in Brazil. The main aim is to explore the use of the combination of Problem-based Learning (PBL) and Distance Education (DE) by evaluating the curriculum under the participants' perspectives. An additional purpose is to contribute to the academic literature regarding the design and implementation of PBL at distance.

In this introductory section, we present a brief literature review regarding PBL as an alternative approach to conventional education and as conceptual foundation

for PBL at distance. We also describe briefly its application on the face-to-face format. A more detailed review is presented regarding the use of PBL in a distributed format (dPBL). This review describes different models of dPBL tested in different fields and places around the world and presents the main benefits and challenges of dPBL. We also describe some aspects regarding the design and implementation of a dPBL curriculum. Finally, the purposes and research questions of the present study are presented.

PBL: an alternative approach to conventional education

The conceptual foundation for dPBL is the PBL theoretical background, processes, methods, and outcomes (Scripture, 2008). PBL is a well-established constructivist educational approach in higher education. In medical education, PBL has been presented as a useful educational alternative to conventional instruction. Schmidt (1983) defines PBL as an approach to learning and education in which students deal with problems in small groups under the supervision of a tutor. According to Schmidt (1993), PBL is a relatively new form of education with a long intellectual history. Its roots are based on the philosophies of rationalism and American functionalism and it is strongly influenced by cognitive psychology (Norman & Schmidt, 1992). Dewey, a respected philosopher, at the beginning of the last century, stressed the importance of learning in response to, and in interaction with, real-life context, emphasized that real life problems are a good starting point for learning and encouraged students to discover the information needed to solve them (Schmidt, 1993).

Based on a number of empirical studies, it is proposed that PBL has the following cognitive effects on student learning (Schmidt, 1993): (1) Activation of prior knowledge; (2) Elaboration on prior knowledge through small-group discussion; (3) Restructuring of knowledge in order to fit the problem presented; (4) Learning in context; and (5) Motivation to learning. By reviewing studies on cognitive and motivational effects of small-group PBL, Dolmans & Schmidt (2006), concluded that recall of information, causal reasoning and collaborative learning construction seem to take place in the tutorial group. They also found that group discussion has

a positive influence on students' intrinsic interest in the subject matter under discussion.

Summarizing, PBL works as follows: from analysis and reflection of a problem situation presented, the participants in small groups (tutorial groups) identify their key knowledge gaps and establish what they need to learn (learning goals) to solve the problem (Schmidt, 1983). During the study of the problem, participants have to rely on literature research, personal study, consultations with specialists, if necessary, and other sources of information, in order to achieve the learning objectives, and at the end of cycle, solve the problem. This entire process occurs in two encounters of the tutorial groups; the first one is directed at problem analysis, the second at problem solving. Each encounter occurs with 8 to 10 participants under the supervision of a tutor. In short, while working on the problem, the study group uses a systematic procedure to analyse the problem, to formulate learning objectives, to search for additional information and to solve the problem, taking into account the new information collected. This procedure consists of seven steps (Figure 2.1, in Chapter 2).

PBL in distance education – distributed PBL (dPBL)

Over the past decade, PBL and DE have been combined as educational approaches in higher education. This combination has been called distributed problem-based learning (dPBL) (Wheeler, 2006). Wheeler stated that in dPBL “learning is mediated through computer technology, and a shared, ‘virtual’ distributed learning environment is used to enable students to collaborate” (p.176).

One of the first attempts of using dPBL in the health area was piloted by Southern Illinois University School of Medicine in spring 1999 to support the PBL method used in the curriculum (Cameron, Barrows & Crooks, 1999). The authors included traditional face-to-face tutor group sessions associated with dPBL in which the group participated from distributed sites. Valaitis, Sword, Jones & Hodges (2005), developed another interesting use of dPBL in the health area. In their project, the authors investigated the health sciences students' perceptions of their experiences

in online PBL, focusing on the learning and group process in the online environment. A similar programme used a blended PBL approach that combined a traditional face-to-face approach with Web Based Learning (WBL) (Taradi, Taradi, Radic, & Pokrajac, 2005).

In fact, different models of PBL for teaching at a distance have been used in different fields and places around the world, such as Medicine and Law in the Netherlands (Ronteltap & Eurelings, 2002), Education in the United Kingdom (McConnell, 2002), Computers in Turkey (Baturay & Bay, 2010), Social Economy in Sweden (Bjorck, 2002), Public Health (Tomaz, Mariano, Fonseca, Cavalcante, & Nogueira, 2004), Biochemistry (Perez, 2006) Engineering (Kalatzis, 2008) and Nursing (Silveira, 2010) in Brazil, just to cite some examples. The models vary. For example, there are models in which students participate in a program structured around traditional small-group meetings (Ronteltap & Eurelings, 2002), whereas in other approaches students engage with problems independently and negotiate solutions online in discussions moderated by a tutor (Steinkuehler, Derry, Hmelo-Silver & Delmarcelle, 2002). PBL has been also used in a quasidistance education mode, for example by using the Internet for part of the course delivery (Treadwell & Leach, 1998). In general, most of the models use a variety of relatively simple tools to support interaction among learners (Koschmann, 2002).

The dPBL benefits and challenges

Several benefits of dPBL are described in the literature. Learners from different locations can study together, collaboratively, even when there are impediments related to geographic distance, weather, family issues or work (Barrows, 2002; Koschmann, 2002; Ortiz, 2004). Findings from the study of Ronteltap and Eurelings (2002) involving students in the Faculties of Medicine and Law at the University of Maastricht in The Netherlands show that dPBL allows more group interaction time and facilitates the submission of reports independent of time and place. Some of the advantages of dPBL demonstrated by Treadwell and Leach

(1998) were that the use of technology broke down geographic barriers, gave the students a chance to meet, and that it enabled different perspectives to enlighten the students' innovative thinking and solutions. Wertsch (2002) states that dPBL gives the learners more time to reflect in comparison with traditional PBL. According to Durrington, Berryhill, and Swafford (2006) dPBL can promote student interactivity, enhance students' problem-solving skills, and provide students with a meaningful learning experience.

According to Schiller and Ostwald (1994) *"PBL is in fact well suited to distance learning, since the flexibility of distance learning is a closer reflection of the problem-solving processes that occur in the workplace"* (p. 220). For a variety of reasons, dPBL is attractive from an instructional point of view since it creates the possibility that participants share their learning in different locations and time (Koschmann, 2002). Barrows (2002) agrees that the creation of effective dPBL will enhance the value of PBL.

On the other hand, there are a lot of constraints and challenges for implementing dPBL. Orrill (2002) highlighted some difficulties in the transition from face-to-face to online PBL, related to the need for appropriate tools to support collaborative problem solving in a distributed context. Results from Taplin's (2000) study were disappointing in the sense that the change of educators' thinking about the use of PBL in distance education appeared to be a very slow process. Barrows (2002) has raised concerns regarding the application of authentic PBL in a distributed form. These concerns include questioning about the need for synchronous communication, the need of new skills for the dPBL tutor as facilitator and the development of adequate mediating technology. Björck (2002) also noted that the development of computer environments for supporting the pedagogical ideas and PBL procedures is an important challenge for implementing dPBL. Facilitating virtual teams in dPBL courses takes time, effort and requires significant staff training (Brodie & Porter, 2008). According to Halonen (2008), the implementation of dPBL programmes requires significant pre-planning and development of learning resources. Brodie (2009) identified several barriers to student

participation and learning in a dPBL engineering course which utilizes virtual teamwork. These barriers were categorized in three main areas - time, technology and learning.

Chagas, Faria, Mourato, Pereira & Santos (2012) highlighted the difficulty of promoting all students active participation and involvement in the learning activities in dPBL contexts. The authors suggested the need for investigating the different dynamics of the dPBL groups and the possible factors responsible for this differentiation, including the use of technology and the clarification of the role of the tutor in these different situations.

Research and evaluation literature on dPBL

Research and evaluation literature on the development of PBL in DE is gradually growing, and possible limitations and / or advantages of this combination are being identified (Ortiz, 2004). Most studies have focused mainly on participants' and tutors' experiences with computer-mediated dPBL. Few studies have focused on the dPBL design and implementation from the designer's perspective (Scripture, 2008).

Therefore, more research is needed to obtain more evidence and deeper insight in how to use PBL in DE. An interesting initiative was the symposium entitled, "*Studying Collaboration in Distributed PBL Environment*" at the 2001 Annual Meeting of the American Educational Research Association in Seattle, Washington, whose aim was to explore some of the research issues that arise in developing new models of dPBL. The papers presented at the symposium constituted an international sampling of current work related to dPBL (Koschmann, 2002). Based on these studies Barrows (2002) has raised some concerns regarding dPBL design and implementation, including whether authentic dPBL can occur without synchronous communication, what skills are needed for the dPBL tutor as a facilitator in order to make the method work adequately, and which communication technology can be developed to mediate dPBL without distorting it.

From other studies, a set of other questions also emerged in order to establish what the best practices on dPBL design and implementation are. The questions include a variety of dPBL curriculum design issues that should be better investigated, such as the ideal group size, the ideal course length, the inclusion of face-to-face encounters, the learning effects of the curriculum, the design of problems, the knowledge of learners characteristics, the structure and the use of guidelines, the profile and role of online tutors, how learner centered the curriculum is, what LMS is most appropriate for supporting collaborative learning, tools of interaction (synchronous and asynchronous), and assessment instruments (Scripture, 2008).

The present study, to a certain extent, addressed most of these questions by evaluating the dPBL curriculum from the participants' perspective. The evaluation included the participants's profile and characteristics, the method, the quality of the problems, the virtual group interaction, the DE tools and the communication technology, and other issues regarding the dPBL design and implementation, for example, the inclusion of face-to-face meetings and the course size and length.

A competence-based dPBL curriculum design and implementation

The design of dPBL programmes is still a challenge for curriculum planners and it is an area that needs to be more explored (Savin-Baden, 2003). The findings of the studies on dPBL design have contributed to the improvement and refinement of this online learning methodology.

In higher education, in the health area, competence-based education has been an important approach for curriculum design. Competence-based education is one of the types of outcome-based education in which institutions are expected, for each curriculum, to have set out learning outcomes (competences), educational strategies that enable students to reach them and assessment tools to demonstrate the achievement (Harden, 2002). In the past 15 years, competence-based medical curricula have been implemented in several countries in response to the new demands of health care (Cate, 2006). In general, competence has

been defined as the ability to do a task, action or activity, which includes a set of knowledge, skills and attitudes to be developed in an educational programme. Webster dictionary defines being competent as “the quality of having sufficient knowledge, judgment, skill, or experience for some purpose”. In medical education, *competence* can be defined as what the doctor is able to do, unlike *performance*, which is what the doctor actually does in day to day practice (Norman, 1985). According to Burg, Lloyd, & Templeton (1982) a clinically competent doctor would be someone who has the knowledge, judgment, skill, and experience to make a correct diagnose and provide appropriate treatment.

Developing medical competencies has been a great challenge for educators. The design process of a competency-based curriculum requires a proper definition of clinical competence and its components. The first step for designing a Competency-Based Curriculum is the identification of a *list of competencies* that are expected to be acquired by the student during the course (Wiers, Van de Wiel, Sá, Mamede, Tomaz & Schmidt, 2002). The preparation of the list of competencies should be based on the analysis of epistemological, social and health system contexts, analysis of community needs and the needs analysis of potential participants with regard to health care. From the *list of competencies*, learning objectives are formulated and educational strategies established as well as assessment tools. In the present study, we used that approach for designing the course “*Clinical Approach for Elderly with Dementia*” that is described below.

The Course “Clinical Approach for Elderly with Dementia”

The course “*Clinical Approach for Elderly with Dementia*” was conceived and executed by the School of Public Health of Ceará – Brazil and the Elderly Care Center of the Federal University of Ceará – UFC. It was specially designed to contribute to the enhancement of competences (knowledge, skills and attitudes) of doctors working in an area that still needs improvement in Brazil - health care for the elderly. It is a web-based refresher course offered primarily to physicians working in primary health care, particularly family health doctors of the various municipalities of the State of Ceará – Brazil.

Why training health professionals in elderly care in Brazil

Brazil, like other countries, is currently faced with a rapid process of aging of its population. It is estimated that in less than thirty years, it will be the sixth country in the world with the highest number of elderly people, which would imply a large impact on health services (Wong & Carvalho, 2006; WHO, 2008). Therefore, the development of elderly care is presented as an urgent task to the health sector (WHO, 2008). The need for human resource development in this area involves not only training specialists in geriatrics, but also, more importantly, training health professionals working in primary health care, mainly those who are part of the Family Health Program (PSF) (WHO, 2008). The course “*Clinical Approach for Elderly with Dementia*” is meant to be a continuing education programme for family medical doctors in the State of Ceará -Brazil.

The curriculum design

The design of the curriculum was based on the model called *Design Approach to Competency-Based Curriculum* (Cate, 2006) or *Outcome-based curriculum development* (Harden, 2002) described previously in Chapter 3. According to this model, a list of competences and learning objectives (educational outcomes) were clearly specified. These determined the teaching methods and strategies, the curriculum content and its organisation, the assessment process, the educational environment and the curriculum timetable. A framework for curriculum evaluation was also provided by the educational outcomes. The preparation of the list of competencies was based on the analysis of epidemiological, social and health system contexts, with regard to health care for the elderly with dementia in primary care in Brazil (Wong & Carvalho, 2006; WHO, 2002).

We considered a set of *competences and learning objectives* (Table 2.1, in Chapter 2) of the physician working in primary health care in our context. A multidisciplinary team comprising a specialist in distance education, computer technicians (webmaster and web designer) and content specialists (a geriatrician and a public health specialist) was responsible for the design of the curriculum.

The list of competences and the content of the course were based on the guiding documents for international, national and state health care for the elderly with dementia. Materials already existing of national and international health care programmes for the elderly, as the document of the World Health Organization - *Active Ageing: A Policy Framework* (WHO, 2002), also contributed to design, the content and the learning objectives of the course.

The curriculum structure and delivery

In Table 2.2 (Chapter 2), the elements of the course structure and delivery are presented. The course is 120 hours long (100 hours at distance and 20 hours face-to-face). Participants were expected to perform the course activities at a mean rate of 10 hours per week, with a total duration of 12 weeks (3 months). Each group should go along with their tutor a work schedule, including deadlines for completion of each educational activity. Students experienced a period of adaptation (one week) to the online environment.

Three face-to-face meetings were included in the schedule, at the beginning, at the middle, and at the end of the course, with the aim to introduce the course (first meeting), to monitor the learning process and skills training (second meeting), and to evaluate students' learning and the curriculum (third meeting). The curriculum was structured into five Units, and the content included:

- Unit 1: Aging and Dementia: clinical and social implications.
- Unit 2: Cognitive Decline in the Elderly: Diagnostic Procedures.
- Unit 3: Treatment of Dementia: Pharmacological Management.
- Unit 4: Treatment of Dementia: Non-Pharmacological Management and Individual and Collective Action for Health Promotion.
- Unit 5: Models of Health Care for the Elderly with Dementia.

The method used in the course

The method used in the course was based on the *PBL* approach described by Barrows (2002), and on the seven steps model presented by Schmidt (1983) adapted to distributed, web-based context. The *PBL* described by Barrows

includes four keys: (1) Real world based, unresolved ill-structured problems are presented to the learners at the beginning of learning cycle, stimulating free inquiry and the practice of problem solving skills; (2) PBL is a learner-centered method, so learners should assume responsibility for their own learning process; (3) The teacher has to act as facilitator of the learning process, rather mere transmitter of knowledge; (4) The problems presented to the learners should be based on real world context, “making PBL an authentic learning process”. The seven steps model (Figure 2.1, in Chapter 2) proposed by Schmidt (1983) was already described in detail previously in Chapter 2.

In summary, dPBL applied in the course worked as follows. *Virtual Tutorial Groups (VTGs)* were created. Each VTG was formed by groups of 10 to 15 participants, supervised by a facilitator. The VTGs were the main strategy for reaching the cognitive learning objectives and to practice problem solving skills. The VTGs were performed in virtual forums in which the students could communicate with each other asynchronously. The virtual forum worked as a whiteboard, in which the group recorded ideas and hypotheses, acquired information and pursued learning issues. Synchronous communication tools (chats) were also used when needed for complementing the discussion or concluding the problem solving. Thus, the communication technology was developed in order to mediate the PBL process without distorting it, as it is used in face-to-face small group work. Barrows (2002) stated that the communication technology should be able to present ill-defined problems verbally, visually and auditorially. It should offer both synchronous and asynchronous tools for interaction. It should work as a whiteboard, to ease the discussion and the record of the group’s ideas and learning goals to be achieved. The communication technology used in the course was based on Barrows’ viewpoint.

Just like in face-to-face tutorial groups, there were three phases in the VTG: Problem Analysis, Individual Study and Problem Solving, and the students had to follow the seven steps proposed for PBL. In each VTG, one of the students exercised the role of coordinator, and another participant was the scribe. The

coordinator was responsible for conducting the discussions, and the scribe had to prepare a report describing the results of the discussions during problem analysis and problem solving. Participants were expected to dedicate around eight hours (three hours for Problem Analysis, two for Individual Study and three hours for Problem Solving) to complete the PBL cycle. Because of difficulties with access to libraries and learning resources, some basic literature was available in the virtual library, but students were encouraged to seek additional references. Before the beginning of the course, students attended a four hours face-to-face workshop to learn how the VTG works.

The problems were ill-structured and elaborated by course planners previously, taking into account the real context. Questions for reflection were included in order to focus and orient the online discussion. See an example in Appendix 3.

The facilitator's main role was to promote the learning process of the students, to ensure the proper implementation of the dPBL cycle and a good interaction between students, so that learning objectives were met and skills were developed. More specifically, the tutor had to keep the flow of discussions in order to avoid deviations, detect possible misinformation, provide feedback, promote the development of each individual and the group as a whole, and assess student achievement (formative and summative). Three geriatricians were the facilitators; each one was responsible for tutoring a group of ten participants. All had prior experience with face-to-face PBL, but not with distance education. They were trained in "how dPBL works", including the use of mediating technology through three training sessions of two hours. Continuing education meetings occurred at least twice a month. In these meetings, the tutors and the course coordinator discussed the main problems and difficulties in tutoring.

Complementary educational strategies were used, such as clinical skill trainings, team and individual projects and community practice in order to accomplish the development of the competences. A Course Guide, including General Guidelines for Study at distance, and Study Guides for each Unit were provided in the LMS

(Moodle) in order to support learning. A CD-ROM with part of the course material was also given to participants at the beginning of the course.

The course was offered to two groups of 30 participants (family doctors) in 2010 and 2011. Participants of group 1 were indicated by the municipal health secretary of the three largest municipalities in the state of Ceará. They were chosen because they had easy access to Internet. Participants from the capital of Ceará were not included in this first group for operational reasons. For the second group, a selection process open for family doctors of all municipalities of Ceará, including the capital, was used. The selection criteria included the ability to use information technology, such as Internet, virtual forum, and chats. The course was funded by the School of Public Health of Ceará, and the students did not have to pay fees. The facilitators were paid for the job.

The distance education tools

In sum, in the present study, we used as distance education tools a website, a Learning Management System (LMS), virtual forum, chat and email. In addition, video-lectures were available on the website and a CD-ROM with the video-lectures and texts were distributed to the participants. The website was specially designed for the course [www.ivisa.com.br/cursos]. The LMS used was MOODLE®, version 1.96, a worldwide used free software programme for collaborative learning support. Three kinds of virtual forums were used as asynchronous communication tool. A first type of virtual forum was used during the virtual tutorial groups (VTGs) for group interaction during problem analysis and problem solving. A second type was used by the course coordinator and the tutors to evaluate the process of the course. A third forum could be used by the participants for free interaction – a kind of “hallways chat” - in order to stimulate socialization among them. Chat was used as synchronous communication tool. It was used as a complementary tool. It was used by some tutors to complement and to deal more deeply with a specific issue discussed in the virtual forum. The email was used mainly for communicating with participants who were absent in the virtual environment of the course in order to bring them back to the course.

In the following section, we present the purposes and research questions of the present study.

The present study

As stated at the beginning of this paper, the main purpose of the present study is to explore the use of the combination of PBL and DE. An additional purpose is to contribute to the academic literature regarding the design and implementation of PBL at distance. It will also contribute to the provision of information in order to develop a strategy to elaborate a continuing education programme for family health teams – family medical doctors – in the State of Ceará -Brazil.

Thus far, to our knowledge there are few studies that have evaluated a web-based, *dPBL* curriculum in the health area, in a low resources setting, such as the Northeast region of Brazil. Most studies that have evaluated a *dPBL*-based curriculum, until now, were based on a small number of participants and just during short (one or two) iterations. The methods used in *dPBL* were not sufficiently described, namely, it was unclear whether it was or not 'real' *dPBL* (Barrows, 2002). Moreover, most studies were often directed to students and tutors' experiences with computer-mediated *dPBL*, without addressing aspects related to *dPBL* design and implementation. In the present study, we evaluated a *dPBL* curriculum, based on a larger number of participants ($n=42$) and participants had several opportunities for interacting with colleagues and tutor during the five VTG (one VTG for each Unit of the course) by using virtual forums.

The main research question of the present study was: How does *dPBL* work from the participants' perspective in a low-resources context? For answering this main question a set of specific questions were investigated. These questions were grouped into four blocks: 1. Identification and profile of the participant; 2. Methodological Approach – PBL; 3. Distance Education Tools; 4. General aspects of the course. The specific research questions were:

1. Who are the participants? Which are their main characteristics in terms of personal data, access to learning resources, skills to use computer technology,

and previous experience in Distance Education and PBL? These aspects were based on Evans' (1994) work in which he sought to understand learners in distance education.

2. How does the methodological approach (dPBL) work, including the face-to-face meetings, the problems, virtual group dynamics and application of seven steps of PBL, the skills training, the individual and team projects, the community-based activities, the study guides and texts, the facilitator performance and individual study? These aspects were partly based on the variables proposed by Norman & Schmidt (2000) for evaluating face-to-face PBL curriculum.

3. How do the DE tools that are used in the course work? These aspects were based on literature regarding dPBL, web-based evaluation (Barrows, 2002; Orrill, 2002; Ronteltap & Eurelings, 2002; Steinkuehler et al., 2002). This question included aspects related to information and communication technology, such as the website, the LMS, the use of virtual forum, chats and email.

4. What is the general impression of the participants about the course, including course organisation, content, participant's satisfaction and achievement of learning objectives?

All questions were evaluated through an evaluation questionnaire developed specifically for the purpose of this study and from the analysis of the records made during the regular meetings for continuing education of tutors and course monitoring. Additional information was gathered from the analysis of MOODLE records.

Method

This study used a cross-sectional survey. The design is based mainly on three theoretical strands: competence-based, problem-based and web-based curriculum evaluation. The framework of the evaluation included the structure, process and results, according to Donabedian's (1988) proposal. We were interested in evaluating (1) the curriculum design, (2) the curriculum delivery, focusing on the use of distributed PBL, and (3) some administrative arrangements (Morrison,

2003). Thus, aspects related to the method used in the dPBL course had first prominence in the study including technological and media aspects.

Participants and procedures

The participants of the study were family doctors from the family health teams of State of Ceará who enrolled in the course. We intended to have 60 participants (30 in group 1 and 30 in group 2), but just 70% of the participants (n=42) (22 from group 1 and 20 from group 2) answered the evaluation questionnaires. The most important reasons that could have contributed to the dropout in answering the evaluation questionnaire were the work overload and the length of questionnaire.

So, in total 42 self-administered questionnaires were completed. Part of the evaluation questionnaires (10 of group 1 and 9 of group 2) were completed during the third face-to-face meeting. The remaining questionnaires (12 of group 1 and 11 of group 2) were administered by electronic methods, by email or using the LMS Moodle.

The evaluation questionnaire

The evaluation questionnaire was developed specifically for the purpose of this study. It was organised into four blocks: 1. Identification and profile of the participant; 2. Methodological Approach – PBL; 3. Distance Education Tools; 4. General aspects. The first block included personal data, access to learning resources, skills to use computer technology, and previous experience in Distance Education and in PBL. The second block comprised general aspects related to the use of PBL at distance, the educational strategies, including the face-to-face meetings, the problems, virtual group dynamics and application of seven steps of PBL, the skills training, the individual and team projects, the community-based activities, the study guides and texts, the facilitator performance and individual study. The third block consisted of items related to DE tools. This block included aspects related to information and communication technology, such as the LMS (Moodle), the use of the virtual forum, chats and email. The last block included

the general aspects of the course, such as course organisation, content, participant's satisfaction and achievement of learning objectives.

In total, the questionnaire has 96 items. Most questions (n=88) were closed and elaborated in different formats. In those questions (n=82) which are supposed to measure existing skills, previous experiences, attitudes and perceptions a five-point scale was used (1- totally disagree and 5 – totally agree) (Crowl, 1996). Other questions concerned biographical information (n=6) and asked for direct answers (eg. age, profession and sex). Eight open questions were included in order to gather qualitative information about the course, such as range of participants' expectations, the better things about the course and what should be improved, and the participants' opinion about the methodological approach – the combination of PBL and DE. The programme evaluation questionnaire is presented in Appendix 4.

A pilot was performed with four family doctors who were not included in the study. Based on results from the pilot, the lay-out of the questionnaire was modified, and four questions that seemed to be non-clear were rephrased. During the pilot, the doctors were asked to observe how much time they used to answer the questionnaire – the average time was 30 minutes. That information was important during the planning for administering the questionnaires.

Results

The results of group 1 and 2 are presented together. We aggregated the two groups, because we performed an independent samples t-test between the mean scores of the two groups and found no statistically significant difference between them neither in terms of their profile (e.g. age, marital status, years of graduation and previous experience in DE (*p*-values: 0.10, 0.29, 0.19 and 0.27, respectively) nor in their evaluation of the course (e.g. the use of dPBL was interesting and motivating, the problems were well formulated, the experience of working in a virtual group was nice and the learning objectives were achieved (*p*-values: 0.13, 0.60, 0.28 and 0.32, respectively).

Profile of the participants

In this section, the results regarding the personal data of participants, access to learning resources, existing skills and previous experience in DE and PBL are presented.

Personal data

A slight majority of the respondents was male – 52.4% - (N = 22) and married – 64.3% - (N = 27). The distribution of the age of the respondents ranged from 27 to 66 and the average age was 42.6 years. Among the respondents, 81.0% (N = 34) was working in a family health programme. The respondents had a mean workload per week of 45.6 hours, and an average of 17.6 years of work experience after graduation.

Access to learning resources

Concerning the access to learning resources the findings show that a significant proportion of the respondents – 85.7% (N = 36) - had easy access to a computer, and the majority – 78.6% (N = 33) - had easy access to Internet. However, only 35.7% (N = 15) had easy access to libraries or study centres.

Existing Skills

It was observed that more than half of the respondents – 59.5% (N = 25) - affirmed that they were able to read English. The majority of the respondents asserted that they were able to use a text processor, such as Word (90.5% - N = 38), Power Point (76.2% - n = 32), Internet (95.2% - N = 40), virtual forum (76.2% - N = 32) and email (88.1% - N = 37). However, only 52.4% (N = 22) said they were able to use a chat program.

Previous experience in Distance Education and PBL

A significant proportion of the respondents answered that they had little or no prior experience with Distance Education (57.1% - N = 24), and with PBL (66.7% - N = 28).

Methodological Approach – distributed Problem-based Learning (dPBL)

In this section, the results related to the methodological approach used in the course – distributed PBL – are presented. The results are grouped into different topics, including general aspects of the method, the face-to-face meetings, the problems, the virtual group dynamics and application the seven steps of PBL, the skills training, the projects, the community-based activities, the study guides and texts, the tutors performance and the individual study.

General aspects

The proposal to use dPBL was interesting and motivating for the majority of the respondents – 76.1% (N = 32). However, 38.1% (N = 16) of the respondents preferred to have the course in a more traditional way. Regarding the student assessment system used in the course, 52.3% (N = 22) of the respondents agreed or fully agreed that it was coherent with the PBL approach.

The face-to-face meetings

The face-to-face meetings were essential for the understanding of the method used (dPBL) for 88.1% (N = 37) of the respondents, for comprehension of the Distance Education tools used during the course (virtual forum, chat, etc.) according to 85.7% (N = 36) of the respondents, and for understanding of the course objectives and structure for 85.7% (N = 36).

The problems

Table 5.1 presents the means and standard deviations for respondent's answers related to the problems used in the virtual group discussions. The results indicate that the problems were highly rated by the respondents with emphasis on the fact that they were well formulated ($M = 4.73$; $Sd = 0.44$) and gave the opportunity to study the content in depth ($M = 4.52$; $Sd = 0.59$).

Table 5.1. Means and standard deviations of respondents' answers related to the problems used in the virtual group discussions.

Item	M	Sd
The problems...		
- Were well formulated	4.73	0.44
- Stimulated sufficiently the group discussion	4.07	0.86
- Allowed the formulation of learning objectives according to the subject under study	4.19	0.83
- Stimulated the self-directed learning	4.40	0.70
- Gave the opportunity to study the content in depth	4.52	0.59
- Motivated participants to a deep and meaningful learning	4.09	0.75
- Were adequate to participants' context	4.21	0.78

The virtual group dynamics and application of dPBL seven steps

Table 5.2 shows the means and standard deviations for respondents' answers related to virtual group dynamics and application of the seven steps of dPBL. The results show that the application of the seven steps were clear for the participants ($M = 3.88$), that the atmosphere in the group was considered as pleasant ($M = 3.83$), and that the experience of working in a virtual group was nice ($M = 3.73$). The tasks in the virtual group stimulated the learning activities ($M = 3.54$) and the group meetings were considered to be positive ($M = 3.40$). However, the results also show that several aspects of dPBL were not well rated by respondents, highlighting that they disagreed that all group members contributed actively in the discussions ($M = 2.11$) and that the issues were presented by colleagues in a clear way ($M = 3.35$).

The skills training

The learning objectives of skills training were clear for 95.2% ($N = 40$) of the respondents. The skills to be developed during the course were relevant to participants'

practice, according to 95.2% (N = 40) of the respondents. 23.8% (N = 10) of the respondents agreed or fully agreed that the tasks of skills training were difficult for them.

Table 5.2. Means and standard deviations of respondents' answers related to the virtual group dynamics and application of the seven steps of dPBL

Item	M	Sd
- The group virtual meetings were productive	3.40	0.96
- All group members contributed actively in the discussions	2.11	0.50
- The tasks in the virtual group stimulated my individual study	3.54	1.04
- The virtual meeting stimulated the learning activities	3.38	1.03
- I thought that the experience of working in virtual group was nice	3.73	1.06
- The issues were presented by colleagues in a clear way	3.35	0.90
- I considered the atmosphere in my virtual group was pleasant	3.83	0.82
- Following the discussions in the virtual group was difficult	2.50	1.04
- The application of PBL steps was clear for me	3.88	0.73

The projects

In general, the projects were highly rated by respondents. The learning objectives of the projects were clearly defined for the great majority of the respondents – 81.1% (N = 37). These educational activities were relevant to the application of acquired knowledge in the course participants' workplace context for almost all respondents – 97.6% (N = 41). The tasks proposed by the activities stimulated the self directed learning according to 95.3% (N = 40) of respondents and gave opportunity to study the content in depth for 97.6% (N = 41) of them. However, only 47.6% (N = 20) agreed or fully agreed that the projects stimulated the growth of the group. Also, one third (N = 14) considered the preparation of projects as difficult.

Community Based Activities (CBA)

In general, the *Community Based Activities (CBA)* were also highly rated by respondents. The learning objectives were clearly defined for 78.6% (N = 33). These educational activities were relevant to the application of acquired knowledge in the course participants' workplace context for 95.3% (N = 40). According to 92.9% (N = 39) of the respondents the tasks proposed by CBA stimulated the self-directed learning and gave opportunity to study the content in depth. Only 31.0% (N = 13) considered the realization of CBA as difficult.

Study Guides and bibliography

Almost all respondents – 97.7% (N = 41) agreed or fully agreed that the course guide presented relevant information about the course and that the unit guides gave adequate orientation to learning. According to 88.1% (N = 37), the bibliography enabled the course participants to understand the topics covered in the course. Only 28.6% (N = 12) considered the amount of study texts was above what the course participants could handle.

Tutors performance

Table 5.3 shows the means and standard deviations for respondents' answers related to the tutors' performance. The results indicate that, overall, tutors were well rated by respondents. It can be highlighted that they demonstrated good knowledge of the topics covered in the course ($M = 4.83$), stimulated the group to study ($M = 4.26$) and stimulated group discussion ($M = 4.21$). Regarding tutor feedback, they largely disagreed that it was not useful to their learning ($M = 1.97$).

Table 5.3. Means and standard deviations of respondents' answers related to the tutors performance

Item	M	Sd
- Demonstrated good knowledge in the topics covered in the course	4.83	0.37
- Stimulated the group to study	4.26	0.98
- His/her interventions stimulated group discussion	4.21	0.97
- At regular intervals, assessed with us the group functioning	3.57	1.01
- Gave ready answers about the content during group discussion	3.50	1.15
- The tutor feedback helped me to identify what I could do better	3.83	1.08
- I've identified the learning questions from the tutor feedback	3.97	1.09
- The tutor feedback was not useful to my learning	1.97	1.07

The individual study

The results indicated that 32.4% (N = 14) of the respondents agreed or fully agreed that the time for individual study was sufficient to study and meet the learning objectives. Moreover, 76.2% (N = 32) considered that the individual study contributed to their individual learning and systematization of new information to solve the problem.

Distance Education Tools

The results regarding the distance education tools used during the course are presented in this section. The findings are grouped into virtual learning environment, virtual forum, chat and email.

Virtual Learning Environment

Browsing the course website was friendly for 95.2% (N = 40) of the respondents. Only 19.1% (N = 8) had previously accessed the Virtual Learning Environment (Moodle) used in the course. The course web design was clear and motivating for 92.8% (N = 39) and just 26.2% (N = 11) of respondents considered that they had taken some time to understand how to browse course web pages.

Virtual Forum

According to 83.3% (N = 35) of the respondents, the virtual forum was an appropriate tool for discussion in virtual tutorial groups (VTG). However, only half of the respondents (N = 21) considered that this tool had contributed to the interaction between group participants. Posting learning material in a virtual forum facilitated its spread for 64.2% (N = 27) of the respondents. A significant proportion of the respondents – 80.9% (N = 34) answered that they had accessed the virtual forum frequently during the course and only 19.0% (N = 8) said they had difficulty expressing themselves in the virtual forum during the discussions.

Chat

Chat was an appropriate tool to complement discussion in virtual tutorial groups (eTG) for 57.2% (n = 24) of respondents. About half of the respondents – 52.4% (N = 22) considered that chat had contributed to the interaction between the group participants. Only about a third of respondents – 31.0% (N = 13) - expressed that they had actively participated in chats during the course and 21.4% (N = 9) said they had difficulty expressing themselves in chats during discussions.

Email

According to 64.3% (N = 27) of the respondents, e-mail was an appropriate tool that worked very well for the interaction between groups and tutors.

General aspects of the course

Table 5.4 shows the means and standard deviations for respondents' answers related to general aspects of the course. The results indicate that, overall, the course was highly rated by respondents. It may be noted that they thought to

participate in the course was nice ($M = 4.88$), the content was interesting ($M = 4.64$), relevant ($M = 4.69$) and appropriate to the course participants' previous knowledge ($M = 4.40$), they did not do much effort to follow the course ($M = 4.64$), the course was well organized ($M = 4.28$), and, to a certain extent, the learning objectives proposed by the course were achieved ($M = 3.73$).

Table 5.4. Means and standard deviations of respondents' answers related to general aspects of the course

Item	M	Sd
- Overall, I thought that to participate in this course was nice	4.88	0.38
- The course was in an appropriate level according to my previous knowledge	4.40	0.62
- The Units objectives were clear for me	4.28	0.59
- The course contents were relevant, considering the field of approaching the elderly with Dementia	4.69	0.56
- I thought that the learning of the topics covered in the course was difficult	2.11	0.80
- I did much effort to follow the course	2.59	1.06
- I thought the topics covered in the course very interesting	4.64	0.48
- The course was well organized	4.28	0.67
-The learning objectives proposed by the course were achieve	3.73	0.98

The results of the open questions indicated that participants dedicated to individual study an average of 8 hours a week during the course. Almost all of respondents affirmed that the course had achieved their expectations. Just one participant expressed that the course had achieved partly his expectations, as he hoped there would be some practical activities during the course, such as visiting an outpatient care center for the elderly with dementia. All participants would

recommend this course to colleagues. One example of participant's statement was:

"Yes, I could better understand the diagnosis and management of dementia and I can apply what I've learned in my day-to-day practice".

Discussion

The aim of this study was to describe the design process and the evaluation results of a competence-based, problem-based, web-based curriculum for training family doctors in Brazil from the participants' perspective. Our intention was to explore the use of the combination of Problem-based Learning (PBL) and Distance Education (DE) in the context of the health field. In general, the results indicated that the competence-based approach for curriculum design was very adequate for our proposal and the course was highly rated by respondents. These results indicate that participants perceive the experience of using *dPBL* as favourable, feasible and enjoyable. These findings are in line with most previous evaluation studies on *dPBL*, although there is consensus that more research is needed in this area (Barrows, 2002; Valaitis et al., 2005). Valaitis et al., (2005), for example, explored health sciences students' perceptions of their experiences in online PBL using six steps of the PBL process (Rideout & Carpio, 2001). They focused on the learning and group process in the online environment, and also found that it is feasible to conduct PBL online. However, there are other authors who do not support this approach in online learning and have divergent opinions about its feasibility (Taplin, 2000). The lack of physical proximity and challenges in student support are reasons for this divergence in findings.

Yet, before discussing the results in more detail, it is worth commenting on some concerns expressed by Barrows (2002) regarding the quality of studies in *dPBL* which were based on small numbers of groups and only during few interactions, and the lack of clarity in describing the learning method used. The concerns include questions such as whether the problems were based on real situations, how the group interaction and decision making were structured, what the

facilitators' role was and how they were prepared, and how learner centered the method was. In his opinion the term PBL has been attached to a myriad of differing methods and a usable taxonomic classification for PBL would help with further research into dPBL. Agreeing with the relevance of these concerns, in the present study, we used the *authentic PBL* as described by Barrows (2002) and described the learning method in detail.

The dPBL design

The group size in our course was 12 to 15 participants. This size is not in line with the ideal size proposed for dPBL according to literature, which recommends 3 to 6 participants (Scripture, 2008). In fact, we started with 12 to 15 participants in our course because of three reasons. First, because the dropout rate in DE programmes in our context is high, around 30% (CENSO EAD.BR, 2009; Almeida, 2010). Actually, at the end of the course the groups had around 5 to 8 participants. Second, we based the number of participants on our experience in face-to-face PBL in which groups have 10 to 12 participants. Third, our decision to have a group size of 12 to 15 participants was based on economics reasons.

Our course length (12 weeks) is in line with previous experiences described in the literature, although some authors claim that a shorter duration length is ideal. We noted that 12 weeks seems to be the maximum length, since groups tended to decrease their participation and motivation as the course ran.

The competence-based curriculum designed for our course seems to clarify the outcomes of the curriculum in terms of knowledge, skills and attitudes, for participants and tutors. In addition, the investigation of some of the learners' characteristics previously gave important information for curriculum design, such as the participant profile, existing skills and previous experience in DE and PBL.

The three face-to-face encounters contributed to learner communication and social presence in dPBL, to skills training and to assessment of knowledge and skills. The blended learning approach with dPBL is recommended. The experienced dPBL designers recommend the use of some face-to-face activities,

even in a small amount (Scripture, 2008). However, there could be situations in which the design of strictly 100% or almost 100% dPBL can be recommended, as was the case in the present study. For example, when students live in different municipalities, provinces of the country or even in different parts of the world. It would be too costly to participate in face-to-face encounters. In these cases, the alternative solution would be to use tools of virtual or social presence such as video conference or webconference (Lehman, 2012), although in one study, contrary to the expectations, learning satisfaction did not seem to increase with the introduction of Web videoconferencing (Giesbers et al., 2009).

Profile of the participants

The average profile of participants – male, married, mean age of 42 years old, workload per week of around 46 hours and an average of almost 18 years of work experience after graduation - reflects approximately the real context of the doctors who work in the family health programme in Ceará-Brazil (Machado, 2000).

The easy access to computer and to Internet and the ability of reading in English, using a text processor, using Power Point, Internet, virtual forum and email by a significant part of the participants probably contributed to the success of the course.

On the other hand, the difficulty of access to libraries or study centres experienced by the majority of participants may have been an obstacle to the participation in the course. The difficulty in using chat by a significant part of the participants showed that this tool should be used with parsimony. When used, students should be trained in it at the beginning of the course. This aspect will be discussed in more detail further in this paper. In sum, the access to learning resources and existing skills are crucial to the implementation of DE programmes (Valaitis et al., 2005; Ramos, Tajú & Canuto, 2011). Valaitis et. al. (2005) stated that for effective dPBL, tutors and students need to develop online literacy skills to facilitate their transition to an online PBL environment. In fact, the little or no prior experience with DE and with PBL of a significant proportion of the participants could have

been an obstacle for students to follow the course and showed the need of the reinforcement of the use of DE tools and of the learning method before students were engaging in the course. As described previously, in the Course “*Clinical Approach for Elderly with Dementia*”, in the first face-to-face meeting, participants were trained in using DE tools and in how dPBL works. In addition, these findings corroborate the importance of not using complicated tools of distance education. Moreover, it is recommended to avoid expensive and complex technology to facilitate the feasibility of the DE programmes (Cameron, Barrows & Crooks, 1999). In our study we chose common tools used in DE, such as Moodle, a free Virtual Learning Environment (VLE), virtual forum, chat and email for interaction.

Methodological Approach – distributed Problem-based Learning (dPBL)

In this section, we discuss the results regarding the methodological approach used in the course designed and evaluated in the present study. An important finding of our study is that, in spite of the fact that one third of participants would prefer to have the course in a more traditional way, the proposal to use dPBL was interesting and motivating for a majority of the participants. This result may indicate the feasibility of using such a combination for training of family doctors in Brazil. In a previous cross-sectional survey carried out in State of Ceará – Brazil, aiming to assess the acceptability of a DE-based course among the health professionals who work in the Family Health Programme, the findings showed that, in general, the family doctors and nurses have positive perceptions and attitudes towards DE and are motivated in participating in a DE course (Tomaz & Van der Molen, 2011).

The results regarding the student assessment system used in the course showed that it deserves a review since just half of participants perceived it as coherent with the PBL approach. Scripture (2008) recommends that the use of different assessment instruments should be consistent with the course content and objectives, and that the learner always should be informed about the assessment

criteria. So, it could be recommended that, besides the essay, other assessment instruments should be included in our course.

We also examined the students' perception about face-to-face meetings. The results indicated that, according to the majority of respondents, the three face-to-face meetings were essential for the understanding of the method used (*dPBL*), for comprehension of the DE tools used during the course (virtual forum, chat, etc.) and for understanding of the course objectives and structure. In fact, over the last decade *dPBL* programmes have used a blended format, that is, included face-to-face encounters aiming to support the authentic PBL method used in the curriculum (Cameron, Barrows & Crooks, 1999), to enhance the collaborative learning and interaction between students and to positively impact student learning outcomes (Taradi et al., 2005).

The problems used in the course were highly rated by the respondents. The participants evaluated the problems as well formulated, and considered that they stimulated sufficiently the group discussion, allowed the formulation of learning objectives according to the subject under study, stimulated the self-directed learning, gave the opportunity to study the content in depth, motivated participants to a deep and meaningful learning and were adequate to participants' context. These results are important, since in PBL problems are the starting point of learning and the quality of the problems is crucial to the adequate functioning of the method (Schmidt, 1993). In fact, two of the four keys of the *authentic PBL* described by Barrows (2002), are related to the quality and the format of problems. It is also important to highlight that the problems used in our *dPBL* course were previously designed by course planners (as it is traditionally done in PBL) and seem to have worked well.

However, although the problems were well rated by participants in the present study, our impression is that they could be slightly more ill-defined and generate more discussion. Barrows (2002) and Scripture (2008) emphasized the value of

the unresolved ill-structured problems for stimulating the generation of multiple hypotheses about cause and management and allowing free inquiry by learners.

The present study also contributed to our knowledge on virtual group dynamics in dPBL. In general, the results showed that the participants had a positive perception of the virtual group dynamics, including a pleasant atmosphere in the group, working in a virtual group as a nice experience, and that learning activities were stimulated by the tasks in the virtual group. However, some important aspects of dPBL were not well rated by the participants. Not all group members contributed actively in the virtual group discussion and for a relevant proportion of participants the issues were not presented by colleagues in a clear way. These results are in line with previous studies on collaborative work and learning experiences of students involved in dPBL, although the format, objectives and media used for group interaction were different (McConnel, 2002; Cheng et al., 2004). Brodie (2009) identified several barriers to student participation and hence student learning in a PBL course which utilises virtual teams. These barriers are categorized in three main areas - time, technology and learning – although each of these categories has overlapping and related aspects. In the present study, we suppose that all three categories had, to a certain extent, influenced that negative results. As presented previously, the average workload per week of participants was around 46 hours. Therefore, participants were lacking sufficient time to devote to the course. In addition, a significant part of the participants said they had difficulty in using chat and had little or no prior experience with DE and with PBL. However, in a recent study that evaluates the impacts on students' active participation on a dPBL health education course, the findings showed that most students engaged actively in the course activities (Chagas et al., 2012).

An interesting aspect investigated in our study was the application of the seven steps in dPBL. The results showed that the application of the steps were clear for the majority of participants. These results could be possibly explained by the good tutors' performance in guiding students to follow the steps. The explanation of the

method during the first face-to-face meeting and the detailed description of the seven steps in the course guide also might have contributed to these findings.

However, based on LMS (Moodle) reports and on continuing education meetings records, we perceived that a relevant problem of 'chronology' occurred in the application of seven steps, mainly during the step 3 - Problem analysis. According to the authentic PBL students should analyse and raise hypotheses about problem causes and management, using their previous knowledge (Schmidt, 1993; Barrows, 2002). The pedagogical aim of this step is to activate the students' previous knowledge. So, in the present study during the problem analysis, by using asynchronous communication (virtual forum), students had time to search and read the literature previously. This may have distorted the authentic PBL. Maybe the solution would be using synchronous communication for starting the analysis of the problem and the other steps could be accomplished by using asynchronous communication. We recommend to do further research on this issue.

In general, the results regarding the complementary educational strategies - the skills training, the individual projects and the community-based activities (CBA) indicated that they were highly rated by participants. They were considered to have clear learning objectives, to be relevant to their day-to-day practice and to have stimulated the self-directed learning and given opportunity to study the content in depth. However, it was observed that one third of participants considered the preparation of projects and CBA as difficult. Again we assume that the amount of available time must have been an obstacle to the proper execution of these community-based activities.

Regarding skills training at distance, Degiorgio (2009), who was examining counseling skill acquisition for Rehabilitation Counseling education of students enrolled in a distance education course, has found positive results. However, this author also found that a majority of the participants indicated they would have preferred a traditional approach to learning counseling skills, although they

perceived distance education to be an effective use of their time. These findings may show the need for including face-to-face meetings (as we did) for skills training in courses delivered at distance.

In the present study, the study guides and bibliography emerged as a very important part of curriculum design. According to almost all participants, the course guide presented relevant information about the course and the unit guides gave an adequate orientation to learning, and the bibliography enabled the course participants to understand the topics covered in the course. In fact, well designed study guides and an adequate bibliography are crucial for DE and PBL programmes. Scripture (2008) recommends the provision of a clear structure and course guidelines when designing dPBL programmes. However, course planners should take care of the amount of text that has to be studied by the students. In our study, around one third of the participants considered the amount of study texts above what the course participants could handle. However, the provision of a bibliography or not depends on how learner centered the method used in the course is (Barrows, 2002). In the present study we decided to provide just basic literature through a virtual course library and to stimulate students to search other information sources.

We also examined the participants' perception about the tutor performance. Overall, tutors were well rated by respondents, that is, they demonstrated good knowledge of the topics covered in the course, stimulated the group to study, stimulated group discussion, assessed with participants the group functioning, and gave useful feedback on their learning. In line with our results, Murphy et al. (2011) found that among the most significant skills and qualities of an effective distance learning tutor perceived by students are: be approachable and supportive; know the course materials well and respond promptly to student queries. Also in line with our findings, Edwards et al. (2011) identified, according to students' perception, as the three major qualities of good and exemplary online educators: be challengers, affirmers and persons of influence, including frequent use of feedback and personal email interactions. Giving useful feedback is an

important pedagogical skill. The results of our study indicate that participants perceive the tutors' performance as favourable. These positive results can be explained by the fact that all tutors were very experienced in face-to-face PBL, although they were not experienced in tutoring at distance. The participation in an initial training about "how dPBL works", including the use of mediating technology and online tutor roles and the continuing education meetings may have contributed to enhance tutors' performance.

The only inadequate tutor performance that was perceived by participants was that tutors gave answers on questions about the content during group discussion somewhat too quickly. Of course such practice is not recommended in PBL since it is a learner-centered method (Schmidt, 1993; Barrows, 2002) and DE learners need to be stimulated to take responsibility for their own learning (Scripture, 2008). In addition, online groups tend to spend more time for solving problems comparing with face-to-face groups and in online environments tutors can intervene too quickly, thereby not allowing the learning process to develop adequately (Durrington, Berryhill, & Swafford, 2006). In an online environment, tutors should not interfere overly or overmoderate the discussions (Scripture, 2008). That is a relevant aspect to be reinforced during the online tutor training.

In fact, the tutor performance is one of the most important aspects of the DE programmes, mainly when combined with PBL, and the quality of the online tutoring is crucial in dPBL (Scripture, 2008). In the online environment, important roles of the facilitator are actively promoting socialization and stimulating interaction and meaningful discussion among students (Scripture, 2008). However, what new roles and skills the authentic dPBL facilitators should develop and how they should be prepared are among the major issues that still need to be investigated, according to Barrows (2002).

Constraints regarding tutoring in dPBL described in the literature, such as finding enough teaching faculty who can be used as tutors in small groups of learners and who have the time to undergo the training (Steinkuehler et al., 2002) and relevant

differences in tutors' performance perceived by students (Orrill, 2002) were not investigated in our study.

The results related to individual study showed that participants considered that it has contributed to their individual learning and to systematization of new information to solve the problem. In fact, the individual study is one of the five components and the sixth of the seven steps of authentic PBL described by Schmidt (1983). In this step, students should select relevant sources of information, acquiring new information and prepare the study report (take notes, schematics, diagrams, concept maps). However, just around one third of the participants considered the time for individual study as sufficient to study and to meet the learning objectives. As commented previously, time is one of the barriers to student participation and hence student learning in dPBL (Brodie, 2009).

Distance Education Technology and Tools

The results regarding the distance education technology and tools used during the course are discussed in this section. Tapscott (2007) stated that we are not living in the information age, but on the collaboration and connected intelligence age. Therefore, the use of technology that supports collaboration is crucial when we combine DE and PBL. Communication and social presence as part of a supportive learning environment are central in dPBL, according to Scripture (2008). On the other hand, complex technology can be a relevant barrier to student participation and learning in DE programmes (Brodie, 2009). Authentic and complex real-life work-related problems, for example, can be presented by technology based on computer simulations, but it requires a significant amount of effort, time and resources, and tend to be viewed by the learner as artificial games (Lehtinen 2002). For these reasons, in our study, we chose common and simple technology.

First we examined the students' perception on LMS (Moodle) used in the course and the course website. In contrast with some previous studies in which students found the technology cumbersome, which made interacting with their peers difficult and somewhat impersonal (Barrows, 2002; Orrill, 2002; Degiorgio, 2009),

the results of the present study showed that both VLE and the course website were highly rated by the majority of the participants.

The results related to the asynchronous (*virtual forum*) and synchronous (*chat*) interaction tools used in the course indicated that, in general, the *virtual forum* was perceived as an appropriate tool for *dPBL*, but that *chat* presented some restrictions. That is a relevant aspect of the present study since synchronous and asynchronous interactivity are key to positive learner experiences and instruction in DE programmes (Durrington, Berryhill, & Swafford, 2006). The results also indicated that the *Virtual forum* was perceived as an adequate tool for discussion in virtual tutorial groups (VTGs) for the majority of participants and *chat* for just about half of them, although only half of the participants had the opinion that both tools had contributed to the interaction between group participants. The *Virtual forum* was said to be accessed frequently during the course by a significant proportion of the participants (80.9%), whereas just about one third of the participants expressed that they had actively participated in chats during the course. The *Virtual forum* was also perceived as an alternative tool for facilitating the spreading of learning material. Most positive results regarding this part of the course are in line with literature which states that the use of asynchronous communication tools may be introducing a larger element of change into PBL (Wertsch, 2002). In addition, in asynchronous environments the learner can participate in the online activities according to their own convenience instead of at a fixed time (Scripture, 2008).

Other results showed that most participants had no difficulty in expressing themselves in the virtual forum during the discussions. These results are not in line with the literature which states that communication anxiety is a common challenge associated with asynchronous learning in which students are reluctant to participate due to their fear of making inappropriate postings and being judged negatively by colleagues (De Bruyn, 2004).

The results regarding the synchronous interaction tool (chat) are not totally in line with previous literature which states that synchronous communications can be advantageous by allowing questions to be posed and answered for immediate resolution. This can facilitate collaboration and help forge the learners' identity as a group (Carr-Chellman & Duchastel, 2000; McConnell, 2002). In the study of Valaitis et al. (2005) study chats were valued more positively than in our study.

In fact, it seems that synchronous communication tools are essential to PBL. One of the big questions that remain unanswered is whether dPBL can work without synchronous communication (Barrows, 2002). Moreover, the time dedicated to synchronous interaction is an important detail in using such a mediating tool. It is recommended that, when using synchronous interaction in dPBL, each session should be limited to one hour, because more than that is too exhausting for the participants (Scripture, 2008). In our course, tutors sometimes used more than an hour in chatting and that practice could explain the relative low evaluation of the use of this communication tool.

Finally, results regarding the use of email were very positive, that is, it was an appropriate tool that worked well for the interaction between groups and tutors for more than half of participants. Edwards et al. (2011) identified personal email interactions as a relevant strategy for an exemplary online tutor.

General aspects of the course

The participants' perception of general aspects of the course was also investigated. The results indicated that, overall, the course was highly rated by respondents ($M = 4.88$). In the participants' opinion, the course was nice, well organized, the content was interesting, relevant and appropriate to the course participants' previous knowledge and, to a certain extent, the learning objectives proposed by the course were achieved. Valaitis et al., (2005) have also found positive results in their study by investigating health sciences students' perceptions of their experiences in online PBL. Students felt that it increased their flexibility for learning, and enhanced their ability to deeply process content,

although they had perceived a heavy workload, and had difficulties making group decisions online. All together, the results indicate that students perceived the experience of using *dPBL* as favourable, feasible and enjoyable.

Conclusions

This paper described the programme and the results of a comprehensive evaluation of a *dPBL* curriculum for training family doctors in Brazil. Our intention was to explore the use of PBL in an online environment and contribute to the academic literature regarding the design and implementation of PBL at distance.

Overall, the results show how a *dPBL* programme in the health area works from the participants' perspective in a middle-income country context. Different aspects of the programme were investigated, such as the profile of the participants, the methodological approach - *dPBL* based on the Seven Steps model (Schmidt, 1983) -, the distance education tools and general aspects of the course.

The results indicated that, overall, the course was highly rated by respondents. In the participants' opinion, the course was nice, well organized, the content was interesting, relevant and appropriate to the course participants' previous knowledge. Moreover, the methodological approach was interesting and motivating, the distance education tools were appropriate and worked very well for the interaction between groups and tutors and, to a certain extent, the learning objectives proposed by the course were achieved.

We can assume that the competence-based approach for curriculum design was adequate for our proposal and the students perceived the experience of using *dPBL* as favourable, feasible and enjoyable. Thus, the findings of our study may indicate the feasibility of using such a combination – PBL and DE - for training family doctors in Brazil and maybe in similar contexts.

However, further studies are required to obtain more evidence regarding some relevant aspects that should be addressed before one implements a distance education programme, for example, the effectiveness of *dPBL* on knowledge and

skills acquisition (Engel, Browne, Nyarango, Akor, Khwaja, Karim & Towle, 1992). In order to address that issue, the authors have carried out an effectiveness study described in Chapter 6.

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*Chapter 6 - Effectiveness of a distributed
Problem Based Learning curriculum for
training family health doctors in Brazil²*

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Abstract

Problem-based Learning (PBL) and distance education (DE) have been combined as educational approaches in higher education. This combination has been called distributed PBL (dPBL). However, more research on the effectiveness of dPBL is needed. The present study aims at evaluating the effectiveness of a dPBL curriculum for training family health doctors in Brazil. It focuses on a postgraduate course “Clinical Approach for Elderly with Dementia” offered by the School of Public Health of Ceará, Brazil. We expected the course to increase participants’ knowledge and diagnostic skills in dealing with the elderly with dementia. We used a pretest–posttest control group design in the study. Thirty participants were assigned to the experimental group and the same number to the control group. Three instruments for collecting data were used: a multiple choice question knowledge test, an Objective Structural Clinical Examination (OSCE) for assessing the ability to use the Mini Mental State Exam (MMSE) and a test based on clinical cases for assessing the ability to make an adequate differential diagnosis of dementia. The results show significant effects of the course on participants’ knowledge and diagnostic skills. The main conclusion is that it is possible to design an effective dPBL curriculum for training family doctors, and the method chosen in this training could be auspicious for training other groups.

Keywords: Distributed Problem Based Learning (dPBL); Effectiveness; Distance Education; Web-based Education; Competency-based Curriculum; Family Health.

Introduction

The present chapter reports on a study aimed at evaluating the effectiveness of a competence-based, problem-based, web-based curriculum for training family health doctors in Brazil. In this introductory section, we first present a brief summary of Problem-based Learning (PBL) as an alternative approach to conventional education and its application in the face-to-face format. Then, a more detailed review is offered regarding the use of PBL in a distributed format (dPBL) although the research in this area is still scarce. Moreover, results of some studies on dPBL effectiveness are presented. Finally, the purposes and research questions of the present study are outlined.

PBL in a face-to-face environment

PBL has become a well-established constructivist educational approach in higher education. In the medical education field, PBL has been presented as a useful educational alternative to conventional instruction. Schmidt (1983) defines PBL as an approach to learning and education in which students deal with problems in small groups under the supervision of a tutor. According to Schmidt (1993), PBL is a form of education with a long intellectual history. Its roots are based on the philosophies of rationalism and American functionalism and it is strongly influenced by cognitive psychology (Norman & Schmidt, 1992). John Dewey, at the beginning of the last century, already stressed the importance of learning in response to, and in interaction with, real-life context. He emphasized that real life problems are a good starting point for learning and encouraged students to discover the information needed to solve them (Schmidt, 1993). As an educational approach, Schmidt advocates that PBL should include six main components: the problem, small group discussion, the tutor, individual study, assessment and blocks and units of the curriculum (Schmidt, 1993).

In short, PBL works as follows: from analysis of and reflection on a problem situation that is presented to participants working in small groups (tutorial groups) they identify their key knowledge gaps and establish what they need to learn (learning goals) to solve the problem (Schmidt, 1983). During the study of the problem, participants have to rely on literature research, personal study, consultations with specialists, if necessary, and other sources of information, in order to achieve the learning objectives, and at the end of the cycle, solve the problem. This entire process often occurs through two encounters of the tutorial groups; the first encounter is directed at problem analysis and formulating of learning objectives; the second encounter is directed at discussion of what the students have found in different scientific sources and at problem solving. In the time between the two encounters, students have to find and study the sources that give an answer to the questions related to the learning objectives. Each encounter occurs with 8 to 10 participants under the supervision of a tutor. In short, while

working on the problem, the study group uses a systematic approach to analyse the problem, to formulate learning objectives, to search for additional information and to solve the problem, taking into account the new information collected. In its possibly most well-known format, this approach consists of seven steps (Schmidt, 1983; 1993) (Figure 2.1, in Chapter 2).

Norman & Schmidt (1992) examined critically the potential advantages of PBL for students' learning. The authors concluded that learning in a PBL format may foster, over periods up to several years, increased retention of knowledge and that PBL curricula may enhance both transfer of concepts to new problems and integration of basic science concepts into clinical problems.

They also found that PBL enhances intrinsic interest in subject matter and appears to enhance self-directed learning skills, and this enhancement may be maintained. By reviewing studies on cognitive and motivational effects of small-group PBL, Dolmans & Schmidt (2006), among other findings, concluded that recall of information, causal reasoning and collaborative learning construction seem to take place in the tutorial group. They also found that group discussion has a positive influence on students' intrinsic interest in the subject matter under discussion.

PBL in an online environment – the distributed PBL (dPBL)

The combination of PBL and DE has been called distributed problem-based learning (dPBL) (Wheeler, 2006). Wheeler stated that in dPBL “learning is mediated through computer technology, and a shared, ‘virtual’ distributed learning environment is used to enable students to collaborate” (p.176). The conceptual foundation for dPBL is the PBL theoretical background, processes, methods, and outcomes (Scripture, 2008).

Over the past decades, dPBL has been used as an educational approach in higher education. One of the first attempts of using dPBL in health professions education was piloted by the Southern Illinois University School of Medicine

(SIUSM) in spring 1999 to support the PBL method used in the curriculum (Cameron, Barrows & Crooks, 1999). The use of dPBL in SIUSM included traditional face-to-face tutor group sessions associated with dPBL in which the group participated from distributed sites.

Valaitis, Sword, Jones, & Hodges (2005) developed another interesting use of dPBL in health professions education. These authors investigated perceptions of students in health sciences concerning their experiences in online PBL, focusing on the learning and group process in the online environment. According to the results, the students felt that dPBL increased their flexibility for learning, and enhanced their ability to deeply process content, although they had perceived a heavy workload, and had difficulties making group decisions online. A similar programme used a blended PBL approach that combined a traditional face-to-face approach with Web Based Learning (WBL) in an acid-base physiology course (Taradi, Taradi, Radic, & Pokrajac, 2005). The authors found that the combination of PBL and WBL positively influenced student learning outcomes and satisfaction.

In fact, different models of PBL for teaching at a distance have been tested in different fields and places around the world, such as Medicine and Law in the Netherlands (Ronteltap & Eurelings, 2002), Education in the United Kingdom (McConnell, 2002), Computer Science in Turkey (Baturay & Bay, 2010), Social Economy in Sweden (Björck, 2002), Public Health (Tomaz, Mariano, Fonseca, Cavalcante, & Nogueira, 2004), Biochemistry (Perez, 2006), Engineering (Kalatzis, 2008) and Nursing (Silveira, Catalan, & Martinato, 2010) in Brazil, just to cite some examples. Overall, these studies showed positive results in terms of the learning process and student learning and accomplishment.

Several benefits of dPBL are described in the literature. Learners from different locations can study together, collaboratively, even when there are impediments related to geographic distance, weather, family issues or work (Barrows, 2002; Koschmann, 2002; Ortiz, 2004). Findings from the study of Ronteltap and

Eurelings (2002) involving students in the Faculties of Medicine and Law at the University of Maastricht in The Netherlands show that dPBL allows more group interaction time and facilitates the submission of reports independent of time and place in comparison with the face-to-face sessions used in the same courses. Wertsch (2002) states that dPBL gives the learners more time to reflect in comparison with traditional PBL. According to Durrington, Berryhill, and Swafford (2006) dPBL can promote student interactivity, enhance students' problem-solving skills, and provide students with a meaningful learning experience. According to Schiller and Ostwald (1994) *"PBL is in fact well suited to distance learning, since the flexibility of distance learning is a closer reflection of the problem-solving processes that occur in the workplace"* (p. 220). For a variety of reasons, dPBL is attractive from an instructional point of view since it creates the possibility that participants share their learning in different locations and time (Koschmann, 2002). Barrows (2002) agreed that the creation of effective dPBL would enhance the value of PBL.

On the other hand, there are many constraints for implementing dPBL. The findings of the studies on dPBL design have contributed to the improvement and refinement of this online learning methodology. The effectiveness of dPBL programmes depends directly of the quality of the design and implementation of dPBL curriculum. Orrill (2002) highlighted some difficulties in the transition from face-to-face to online PBL, related to the need of appropriate tools to support collaborative problem solving in a distributed context. Results from Taplin's (2000) study were disappointing in the sense that the change of educators' views about the use of PBL in distance education appeared to be a very slow process. Barrows (2002) raised concerns regarding the application of PBL in a distributed form. These concerns referred to the need for synchronous communication, the need of new skills for the dPBL tutor as facilitator and the development of adequate mediating technology. Björck (2002) also noted that the development of computer environments for supporting the pedagogical ideas and PBL procedures is an important challenge for implementing dPBL. Facilitating virtual teams in dPBL

courses takes time, effort and requires significant staff training (Brodie & Porter, 2008). According to Halonen (2008), the implementation of dPBL programmes requires significant pre-planning and development of learning resources. Brodie (2009) identified several barriers to student participation and learning in a dPBL engineering course that utilizes virtual teamwork. These barriers were categorized in three main areas - time, technology and learning. Moreover, the evidence of the effectiveness of dPBL on knowledge and skills acquisition is still scarce in low-resources settings such as Brazil. In the following sections, a brief literature review about the effectiveness of face-to-face and distributed PBL is presented.

Effectiveness of face-to-face PBL

The effectiveness of face-to-face PBL is well established. Schmidt, Dauphinee & Patel (1987) found that problem-based curricula provide a student-centered learning environment and encourage an inquisitive style of learning in their students as opposed to the rote memorization and short-term learning strategies stimulated by traditional programmes. Hmelo (1998) also found that PBL has positive effects on the early acquisition of cognitive skills in the study of medicine.

A meta-analysis that selected 43 articles conducted by Dochy, Segers, Van den Bossche, & Gijbels (2003) showed that PBL has a robust positive effect on cognitive skills of students. The study also found that students in PBL developed slightly less knowledge, but remembered more of the acquired knowledge. The findings of a qualitative meta-synthesis conducted by Strobel and Van Barneveld (2009) indicated that PBL was superior when it comes to long-term retention, skill development and satisfaction of students and teachers in comparison to traditional forms of instruction. The evidence also suggests that PBL is associated with better clinical and problem-solving skills and promotes flexible understanding and lifelong learning skills (Hmelo-Silver, 2004; Clark, 2006).

Schmidt, Vermeulen and Van der Molen (2006) studied the long-term effects of problem-based medical training on the professional competencies acquired by

graduates in comparison to conventional medical curricula. The findings indicate that PBL affects positively the typical PBL-related competencies, such as the interpersonal skills and cognitive domains, and the more general work-related skills, such as the ability to work more efficiently. Koh, Khoo, Wong, & Koh (2008) also found that PBL has positive effects on physician competency after graduation, mainly in social and cognitive dimensions.

Few studies found negative effects in comparison to conventional education. If negative effects were reported, they were that students from PBL acquire quantitatively somewhat less knowledge than those from traditional programmes or revealed no convincing evidence that PBL improves knowledge and clinical performance (Albanese, & Mitchell, 1993; Berkson, 1993; Colliver, 2000; Mergendoller, 2000).

Effectiveness of distributed PBL

Thus far, to our knowledge, research on effectiveness of dPBL is still scarce, particularly in low-resources settings. Most studies have focused on program evaluation and case report. Few studies have used a pretest–posttest control group design such as the present study (e.g. Atan, Sulaiman & Idrus, 2005; Sendag & Odabas, 2009; Baturay & Bay, 2010) that assesses dPBL effectiveness on knowledge and skills acquisition. Another study by King (2008) compared the performance and experiences of students and instructor in two online (PBL and non-PBL) courses. These studies were outside the health field.

Atan et al. (2005) investigated the effectiveness of PBL in the web-based environment for the delivery of an undergraduate physics course. The authors compared the academic performance and perceptions of two groups of participants randomly exposed to two different learning sessions: web-based PBL approach and web-based content-based learning (CBL). The results revealed that students from the experimental web-based PBL approach achieved better academic performance than students from the controlled web-based CBL

approach. Sendag & Odabas (2009) found no significant effect on the content knowledge acquisition scores of a dPBL course on Computers. However, it was found that dPBL had a significant effect on increasing critical thinking skills. Baturay & Bay (2010) by evaluating the effectiveness of a web-based dPBL curriculum in Computer Science area have also found positive results. The authors divided the group of participants into two groups, namely an experimental and a control group, and compared the achievement of both groups of students. Students from experimental group worked on collaborative PBL project assignments, besides online tutorials and asynchronous discussion. Students from the control group were taught using the standard online tutorials for the course and through synchronous meetings. The results showed that students involved with dPBL activities felt much more 'connected' to other colleagues when compared to the control group and obtained higher scores on knowledge at the post-test.

In the health area, Bowdish, Chauvin, Kreisman & Britt (2003), using a quasi-experimental, post-test only research design compared the virtual problem-based learning (VPBL) exercise delivered via Internet and a text-based version of the same PBL exercise on students' achievement and their perceptions of the learning environment. The authors concluded that the VPBL is as effective as the text-based version for improving students' learning and their learning environment in small group discussion. Raupach, Muenscher, Anders, Steinbach, Pukrop, Hege & Tullius (2009) using a randomized controlled design investigated the effect of a virtual collaborative online module on clinical reasoning acquisition in comparison with traditional PBL tutorial group. The findings suggested that virtual collaborative learning was as effective as conventional PBL regarding the acquisition of clinical reasoning skills, although it was less well accepted by the participants (fourth-year medical students) than traditional PBL sessions.

In fact, more research is needed to obtain more evidence regarding the effectiveness of dPBL on knowledge and skills acquisition. The present study intended to contribute to better understand that issue.

Therefore, the main aim of the present study is to evaluate the effectiveness of a dPBL curriculum in health professionals education. The dPBL curriculum consists of a course based on the Seven Steps model (Schmidt, 1983) adapted to web environment that we have developed to improve physicians' knowledge and skills for the care of elderly people with dementia. In this study, we used a quasi-experiment pretest – posttest - control group design. The evaluation is based on the assessment of knowledge and skills acquired by participants of the dPBL programme.

Thus, the main research question of the present study is: Is a dPBL curriculum effective to improve family doctors' knowledge and diagnostic skills in dealing with elderly with dementia?

Methods

Study Design

This study used a quasi-experiment pre-test - posttest - control group design. We were interested in assessing and comparing the knowledge and skills of both experimental and control group before and after the Course *Clinical Approach for Elderly with Dementia*.

Participants

The aim was to include 60 participants in this study. They were family doctors from the family health teams (FHT) of State of Ceará, Brazil. Ceará is one of the poorest states of Brazil. Its HDI is 0.723, 22nd among the 27 Brazilian states (CEPAL/PNUD/OIT, 2008). The infant mortality rate (IMR) in Ceará is 16.2 deaths/1,000 live births (Brasil/MS, 2010), one of the highest in Brazil. Most participants came from the FHT of the state capital (70%, N=42). The participants

were divided into two groups, namely experimental and control group. Thirty participants were allocated to the experimental group and the same number to the control group. They were not randomly allocated due to practical reasons. We guaranteed that participants from the control group could take the course after the collection of data in order to motivate them. However, we were only able to collect a complete dataset for 50 participants (25 of the experimental group and 25 of the control group). Therefore, we missed 10 participants. Nine participants dropped out and did not follow the whole course. Therefore, their data were not complete. One participant from the experimental group was excluded because his test scores were considered as outliers.

Table 6.1 and 6.2 show the participants' demographic data. We ran an independent samples t-test between the mean scores of the experimental and control groups and found no statistically significant difference between them, in terms of their profile, e.g. age, gender, marital status, time after graduation and weekly work hours (*p*-values: 0.73, 0.40, 0.26, 0.86 and 0.16, respectively).

Table 6.1. Means (*M*) and standard deviations (*SD*) of the participants' age, weekly work hours and time after graduation of experimental group (EG) and control group (CG)

Groups	Age	Weekly work hours	Time after graduation
Experimental Group (N = 25)	37.80 (9.18)	43.12 (11.21)	11.00 (9.78)
Control Group (N = 25)	36.76 (12.10)	47.60 (11.00)	11.54 (11.80)

Table 6.2. Percentages and numbers (N) of the participants' gender and marital status of experimental group (EG) and control group (CG)

Groups	Gender		Marital status			
	Male	Female	Single	Married	Widow	Divorced
Experimental Group (N = 25)	52 (13)	48 (12)	28 (7)	68 (17)	-	4 (1)
Control Group (N = 25)	64 (16)	36 (9)	20 (5)	68 (17)	-	12 (3)

The Course *Clinical Approach for Elderly with Dementia*

The course “*Clinical Approach for Elderly with Dementia*” (CAED) was conceived and executed through a partnership between the School of Public Health of Ceará and the Elderly Care Center of the Federal University of Ceará, in Brazil. The design of the curriculum was based on the model called *Design Approach to Competency-Based Curriculum* (Cate, 2006) or *Outcome-based curriculum development* (Harden, 2002). According to this model, a list of competences and the learning objectives are the expected outcomes of the course. We considered a set of *competences and learning objectives* (Table 2.1, in Chapter 2) of the physician working in primary health care in our context. The course was specially designed to contribute to the enhancement of competences (knowledge, skills and attitudes) of doctors working in an area that still needs improvement in Brazil - health care for the elderly. It is a web-based refresher course offered primarily to physicians working in primary health care, particularly family health doctors of the various municipalities of the State of Ceará – Brazil.

The course is 120 hours long (100 hours at distance and 20 hours face-to-face). Participants were expected to perform the course activities at a mean rate of 10 hours per week, with a total duration of 12 weeks (3 months). Each group should

go along with their tutor a work schedule, including deadlines for completion of each educational activity. Students experienced a period of adaptation (one week) to the online environment. Other elements of the course structure and delivery are presented in Table 2.2, in Chapter 2.

Three face-to-face meetings were included in the schedule, at the beginning, at the middle, and at the end of the course, with the aim of introducing the course (first meeting), of monitoring the learning process and skills training (second meeting), and of evaluating students' learning and the curriculum (third meeting).

The curriculum was structured into five Units, with the following content:

- Unit 1: Aging and Dementia: clinical and social implications.
- Unit 2: Cognitive Decline in the Elderly: Diagnostic Procedures.
- Unit 3: Treatment of Dementia: Pharmacological Management.
- Unit 4: Treatment of Dementia: Non-Pharmacological Management and Individual and Collective Action for Health Promotion.
- Unit 5: Models of Health Care for the Elderly with Dementia.

The didactic approach was based on the *PBL* seven steps model proposed by Schmidt (1983) adapted to distributed, web-based context (see Figure 2.1, in Chapter 2).

In summary, dPBL worked as follows in the course. *Virtual Tutorial Groups (VTGs)* were created. Groups of 10 to 15 participants, supervised by a facilitator, formed each VTG. The VTGs were the main strategy to achieve the cognitive learning objectives and to go through the seven steps approach. The VTGs were performed in virtual forums in which the students could communicate with each other asynchronously. The virtual forum worked as a whiteboard, in which the group recorded ideas and hypotheses, acquired information and pursued learning issues. Synchronous communication tools (chats) were also used when needed for complementing the discussion or concluding the problem solving. Thus, the communication technology was developed in order to mediate the PBL process

without distorting it, as it is used in face-to-face small group work. Barrows (2002) stated that the communication technology should be able to present ill-defined problems verbally, visually and audibly. It should offer both synchronous and asynchronous tools for interaction. It should work as a whiteboard, to ease the discussion and the record of the group's ideas and learning goals to be achieved. The communication technology used in the course was based on Barrows' viewpoint.

Just like in face-to-face tutorial groups, there were three phases in the VTG: Problem Analysis, Individual Study and Problem Solving, and the students had to follow the seven steps proposed for PBL (see Figure 1). In each VTG, one of the students played the role of coordinator, and another participant was the scribe. The coordinator was responsible for conducting the discussions, and the scribe had to prepare a report describing the results of the discussions during problem analysis and problem solving. Participants were expected to dedicate around eight hours (three hours for Problem Analysis, two for Individual Study and three hours for Problem Solving) to complete the PBL cycle. Because of difficulties with access to libraries and learning resources, some basic literature was available in the virtual library, but students were encouraged to seek additional references. Before the beginning of the course, students attended a four hours face-to-face workshop to learn how the VTG works.

The problems were ill-structured and elaborated by course planners previously, taking into account the real context in which the physicians worked. Questions for reflection were included in order to focus and orient the online discussion. See an example of a problem in Appendix 3.

The facilitator's main role was to promote the learning process of the students, to ensure the proper implementation of the dPBL cycle and a good interaction between students, so that learning objectives were met and skills were developed. Moreover, the tutor had to keep the flow of discussions in order to avoid

deviations, detect possible misinformation, ensure the achievement of learning objectives, provide feedback, promote the development of each individual and the group as a whole, and assess student achievement (formative and summative). Three geriatricians were the facilitators; each one was responsible for tutoring a group of ten participants. All had prior experience with face-to-face PBL, but not with distance education. They were trained in “how dPBL works”, including the use of mediating technology through three two-hours training sessions. Regular meetings to monitor the course program implementation occurred at least twice a month. In these meetings, the tutors and the course coordinator discussed the main problems and difficulties in tutoring.

Complementary educational strategies were used, such as clinical skills training, team and individual projects and community practice in order to accomplish the development of the competences. A Course Guide, including General Guidelines for Study at distance, and Study Guides for each Unit, was provided in the Learning Management System (LMS) (MOODLE®) in order to support learning. A CD-ROM with part of the course material was also given to participants at the beginning of the course.

The course was offered to two groups of 30 participants (family doctors) in 2010 and 2011. The selection criteria included the ability to use information technology, such as Internet, virtual forum, and chats.

The School of Public Health of Ceará funded the course and the students did not have to pay fees. The facilitators were paid for the job.

In sum, in the course evaluated by the present study we used as distance education tools a website, a Learning Management System (LMS) (MOODLE®), a virtual forum, chat and email. In addition, video-lectures were available on the website and a CD-ROM with the video-lectures and texts were distributed to the participants. The website was specially designed for the course. The LMS used

was MOODLE®, version 1.96, a worldwide used free software programme for collaborative learning support. Three kinds of virtual forums were used as asynchronous communication tool. A first type of virtual forum was used during the virtual tutorial groups (VTGs) for group interaction during problem analysis and problem solving (Forum Problem Analysis and Forum Problem Solving). The course coordinator and the tutors used a second type of virtual forum (Tutor Forum) to evaluate the process of the course. A third forum (Forum Interaction) could be used by the participants for free interaction – a kind of “hallways chat” - in order to stimulate socialization among them. Chat was used as synchronous communication tool. Some tutors used chat to complement and to deal more deeply with a specific issue discussed in the virtual forum. The email was used mainly for communicating with participants who were absent in the virtual environment of the course in order to bring them back to the course.

Instruments

Three instruments for data collection were used. A paper and pencil test for the assessment of knowledge on dementia, an Objective Structured Clinical Examinations (OSCE) for the assessment of the mastery of diagnostic skills – the use of the Mini-Mental State Examination (MMSE) skill and a test to assess the ability to give an adequate differential diagnosis.

The Knowledge test

The knowledge test consisted of 30 multiple-choice questions (MCQ) covering the knowledge goals of the course (Appendix 5). It was developed especially for the purpose of this study by three geriatricians and revised by an educationalist, according to the quality criteria for MCQ design in the area of health sciences (Case & Swanson, 2002). Two different versions of the knowledge test were made, one as pretest and a second one as post-test, in order to minimize the bias of memorization. The questions reflect the knowledge on and insight in dementia according the learning goals of the course, e.g.

Patient 76 years old, with a good level of education, complaining of forgetfulness for one year, the score on the Mini-Mental State Examination was 18, and with difficulty with some daily activities. Regarding the probable diagnosis of this condition, check the CORRECT item:

- A) This is probably dementia.*
- B) The patient presents with cognitive impairment, but does not meet criteria for dementia.*
- C) It is probably Mild Cognitive Impairment.*
- D) It is likely a benign senescent forgetfulness.*

For each correctly answered question the participant received one point. Therefore, the range of the scores was 0 to 30. We did a linear transformation of the raw scores to a ten-point scale (0 to 10) in order to adapt them to a grade format. Cronbach's alpha of the post-test was 0.68.

The diagnostic skills tests

The mastery of the two diagnostic skills was evaluated by means of an OSCE and a test to assess diagnostic skills. The OSCE was used for the assessment of the mastery of the use of the MMSE and the second test for the assessment of the ability to give a correct differential diagnosis of dementia.

The OSCE has been used to assess clinical competence since 1975 (Harden, Severson, Downie & Wilson, 1975). This method has proved to be reliable and valid for assessing clinical skills (Harden & Gleeson, 1979; Wallace, Rao, & Haslam, 2002; Sullivan, Chao, Russell, Levine & Fabiny, 2008). Harden and Gleeson (1979) stated that the OSCE provides a more valid examination than the traditional approach to clinical examinations. An OSCE has three main characteristics: a simulation of clinical reality using real or standardized patients, direct observation of clinical competence, and the assessment of performance with structured clinical checklists (Van der Vleuten & Swanson, 1990). Many medical schools utilize effectively standardized or simulated patients for teaching

and/or evaluation in OSCEs (Adamo, 2003). The OSCE has also been used in Family Medicine for licensing family physicians in Canada (Maison, 1992) and in Geriatrics for assessing clinical competence, communication and interpersonal skills and clinical reasoning (Karani, Leipzig, Callahan & Thomas, 2004; Sullivan et al., 2008; Bagri, Zaw, Milanez, Palacios, Qadri, Bliss, Roos, & Ruiz, 2009).

The use of the MMSE

In this OSCE, we used a simulated patient who was an elderly actress previously trained for the performance. The simulated patient should follow a script previously elaborated by the specialist and revised by an educationalist to adapt it to the test purposes (Appendix 6). The script describes a case of an elderly with probable dementia. The procedure in this OSCE is as follows. In a room simulating a doctor's office, the participant should perform the use of MMSE. The simulated patient should answer the questions according to the script previously elaborated. Each encounter lasted approximately 10 minutes and was videotaped for further revision by the observers and to facilitate the assessment in case of doubt. Two observers assessed the participant's performance by using a Performance Assessment Checklist (PAC) (Appendix 7). Each observer assessed the performance of 25 participants from both experimental and control group. The inter-rater reliability was very high: 0.95 (Intraclass Correlation Coefficient). Cronbach's alpha was 0.95.

Folstein, Folstein, & McHugh (1975) proposed the MMSE for testing cognitive functioning. It is a short, simplified, standardized and scored form that includes eleven questions and requires only 5-10 minutes to administer. The test proved to be valid and reliable for separating patients with cognitive disturbance from those without such disturbance.

The MMSE is divided into two sections. The first covers orientation, memory, and attention. The second tests ability to name, follow verbal and written commands, write a sentence spontaneously, and copy a complex polygon similar to a Bender-

Gestalt Figure. Maximum total score is 30. The test is presented in Appendix 8. According to Folstein et al. (1975), the mean score for patients with dementia was 9.7, depression with cognitive impairment 19.0, and uncomplicated affective disorder, depression 25.1. The mean score for normal subjects was 27.6.

In order to assess the mastery of use of MMSE we developed a 5-point scale checklist (PAC) (1 = totally disagree to 5 = totally agree). This performance assessment instrument is based on the structure of the MMSE and consists of 30 behavioral items distributed in three blocks. The first block, with 4 items, is about the preparation of the use of MMSE, which includes explanation about the objective and meaning of the test and aspects of doctor-patient relationship. Examples of items in this block are: 'Explained to the patient the objective and meaning of the test' (explanation) or 'Made the patient comfortable' (doctor-patient relationship). The second block has 19 items regarding the measurement of probable cognitive deficits in terms of time and space orientation, recent memory, attention and calculation, evocation and language. Examples of items are: 'Asked the patient to say the day of the week, the date, month, year and approximate time of this day' (orientation) or 'Asked the patient to, starting with 100, subtract 7 (e.g. $100 - 7 = 93$; $93 - 7 = 86$, and so on) (calculation). The seven items of the third block are related to the interpretation of results and conclusion of the meeting. Examples are: 'Established the probable diagnosis correctly' (interpretation) or 'Negotiated with the patient and the caregiver the approach to be adopted' (conclusion). The instrument also includes a question about previous experience in using MMSE in order to verify whether previous experience influences the effect on the dependent variable - ability to use the MMSE adequately. So, the second dependent variable in this study is the score on this OSCE test (range 0-30). As we did in the knowledge test, a linear transformation of the raw scores to a ten-point scale (0 to 10) was made in order to adapt them to a grade format.

Test for the ability to make a correct differential diagnosis

The second test was used to assess differential diagnosis skills (Appendix 9). It consists of five clinical cases, each one related to the five most common causes of dementia. A geriatrician specialized in dementia prepared the cases, which were subsequently revised by an educationalist to adapt them to the test purposes (Karani et al., 2004). Magnetic resonance imaging (MRI) and computed tomography (CT) images of the skull were added to each clinical case. The instrument also includes a question about previous experience in making a differential diagnosis of probable causes of dementia in order to verify whether the previous experience influences the effect on the ability to give a correct differential diagnosis. The procedure in this OSCE is as follows. In a classroom participants were asked to read each clinical case and answer: i) whether it was a case of dementia and if so, ii) which would be the most likely cause. MRI and CT of the skull were projected on a screen for each case. Participants had to answer each case in around five minutes. Cronbach's alpha was 0.80. So, the third dependent variable in this study is the score on this OSCE test (range 0-10 - two points for each correctly answered clinical case).

Procedures

The pretest occurred during the first face-to-face meeting at the beginning of the course. In this phase, we administered the knowledge test for measuring the basic level of knowledge about dementia and the skills tests for assessing the mastery of clinical skills of the participants of the experimental group: the use of MMSE and the differential diagnosis of possible causes of dementia. Three participants who do not live in the capital did the knowledge test online. In these cases, the test was sent by email and participants were asked to send back it in 45 minutes, the average time used by participants to answer the test. We asked them to answer the test without consulting books.

In the last face-to-face meeting, at the end of the course (around four months after the beginning of the course), we administered the post-test. We measured again

the level of knowledge about dementia and mastery of the clinical skills of the participants.

In the control group, the same pre-test and post-test procedures were used. The interval between the pretest and post-test was four months, equal to the duration of the course. Just as in the experimental group, two missing participants of the control group did the knowledge test online, following the same guidelines given to the participants of the experimental group.

Data analysis

The data were analysed using the statistics software Statistical Product and Service Solutions (SPSS). We used descriptive statistics to describe the biographical data and the general profile of the subjects for each group of participants. We also ran an independent samples t-test between the mean scores of both the experimental and control groups, in order to verify if they were comparable in terms of their profile. Cronbach's alpha was calculated in order to measure the internal consistence of the three instruments for data collection.

We computed the frequencies of the responses of participants in the Pre-test and Post-test instruments and checked the effects of the dPBL course on all the three dependent variables: knowledge, use of the MMSE (OSCE) and ability to give a correct differential diagnosis. Multivariate Analysis of Variance (MANOVA) and univariate tests were conducted to see if the difference between the two groups was significant. The effect size was measured by Cohen's *d*.

Results

The main results are presented in Table 6.3 and Figures 6.1, 6.2, and 6.3.

Table 6.3. Means (*M*) and standard deviations (*SD*) for the Pre-test and Post-test and effect size (*d*) on Knowledge and skills for the experimental group (EG) and control group (CG)

Variables	Pretest		Post-test		<i>d</i>
	<i>M</i>	<i>Sd</i>	<i>M</i>	<i>Sd</i>	
Knowledge					
EG	6.38	0.96	7.75	0.95	0.47
CG	6.87	1.28	7.15	0.77	
Use of MMSE					
EG	6.31	1.23	8.22	0.60	1.91
CG	5.93	1.12	6.07	0.98	
Differential Diagnosis of Dementia skill					
EG	5.31	1.71	8.70	0.92	0.86
CG	5.25	2.38	5.66	2.59	

The results indicate that the participants of the experimental group showed more progress on all the three dependent variables, i.e., knowledge, use of the MMSE (OSCE) and ability to give a correct differential diagnosis than the participants of the control group.

The MANOVA showed that the difference between the two groups was significant ($F = 10.38, p < 0.001$). Also the univariate tests showed significant differences on the knowledge test ($F = 17.98, p < 0.001$), the MMSE ($F = 63.47, p < 0.001$) and DD ($F = 43.98, p < 0.001$) all in favor of the experimental group. The effect size

measured by Cohen's d was moderate for knowledge, very large for use of the MMSE (OSCE 1) and large for ability to make a correct differential diagnosis.

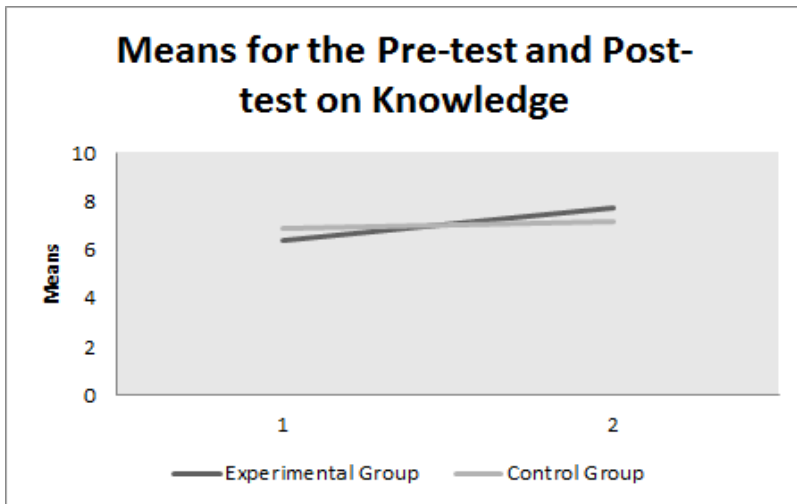


Figure 6.1. Means (M) for the Pretest and Posttest on Knowledge for the experimental group (EG) and control group (CG)

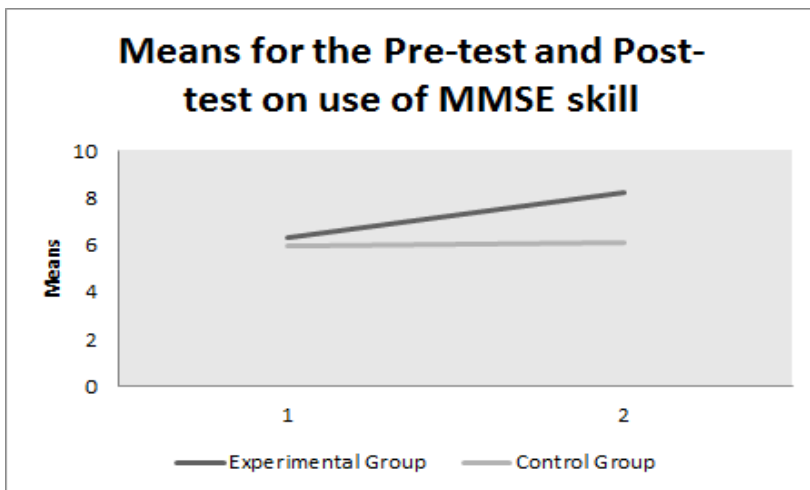


Figure 6.2. Means (M) for the Pretest and Posttest on use of MMSE skill for the experimental group (EG) and control group (CG).

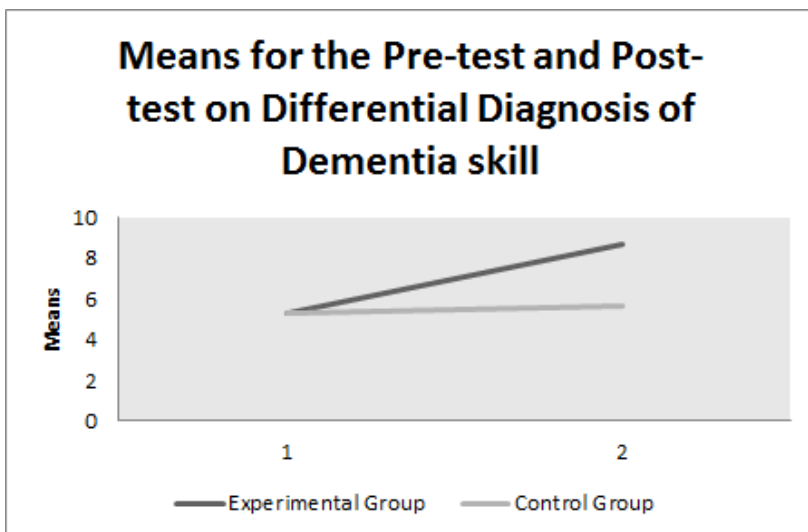


Figure 6.3. Means (M) for the Pretest and Posttest on *differential diagnosis of Dementia skill* for the experimental group (EG) and control group (CG).

Discussion

The main aim of the present study was to evaluate the effectiveness of a dPBL curriculum in health professions education. This study investigated the effects of a dPBL curriculum on participants' knowledge and diagnostic skills after following a course entitled Clinical Approach for Elderly with Dementia. To our knowledge, it is the first study that evaluates the effectiveness of a dPBL curriculum based on the Seven Steps model (Schmidt, 1983) adapted to the web environment in the health area, in a low-resources context. The results indicate that participants in the experimental group who attended the dPBL course had higher scores after following the course on the knowledge and skills tests when compared to control participants. The effect on knowledge can be considered as moderate, the effect on diagnostic skills as large to very large. Therefore, in general it can be concluded that the dPBL course was effective.

These results are partly in line with the outcomes from a few other studies on dPBL effectiveness in other domains. The study by Atan et al. (2005) showed that

students from the experimental web-based PBL approach achieved better academic performance than students from the controlled content-based approach. Baturay & Bay (2010) evaluated the effectiveness of a web-based dPBL curriculum in Computer Science and also found positive results in terms of higher scores on a knowledge post-test in comparison to the control group. However, Sendag & Odabas (2009) have found no significant effect on the content knowledge acquisition scores of a dPBL course about the use of computers in education, although it was found that dPBL had a significant effect on critical thinking skills. The course was offered to teacher trainees at the Department of Primary School Mathematics Teaching in Anadolu University Education Faculty, Turkey.

In the health area, Bowdish, Chauvin, Kreisman & Britt (2003), using a quasi-experimental, post-test only research design compared the virtual problem-based learning (VPBL) exercise delivered via Internet and a text-based version of the same PBL exercise on students' achievement and their perceptions of the learning environment. The authors concluded that the VPBL is as effective as the text-based version for improving students' learning and their learning environment in small group discussion. Raupach, Muenscher, Anders, Steinbach, Pukrop, Hege & Tullius (2009) using a randomized controlled design investigated the effect of a virtual collaborative online module on clinical reasoning acquisition in comparison with traditional PBL tutorial group. The findings suggested that virtual collaborative learning was as effective as conventional PBL regarding the acquisition of clinical reasoning skills, although it was less well accepted by the participants (fourth-year medical students) than traditional PBL sessions.

An interesting result of the present study was the robust gain on diagnostic skills by the experimental group in comparison to the control group. The development of skills at distance is a huge challenge for distance course planners. Few studies have approached that issue. Degiorgio (2009), who examined counseling skill acquisition for Rehabilitation Counseling education of students enrolled in a

distance education course, has found positive results. However, this author also found that a majority of the participants indicated that they would have preferred a traditional approach to learning counseling skills, although they perceived distance education to be an effective use of their time. In our study, we assume that the use of skills training during the second face-to-face meeting could have influenced the high achievement of the participants from the experimental group on the two OSCEs. In this meeting, participants had the opportunity for practicing the skills during a simulated patient based skills training session. It is important to highlight that the cognitive part of the skills (knowing how) was supposed to be grasped during the virtual tutorial groups.

Conclusions

The results of the current study may indicate that innovative pedagogical approaches such as PBL might be effective in an online environment with the advantages and benefits of DE approach. This finding has high relevance for continuing education of health professionals since DE programmes may reach a considerable number of people (even thousand people) living in different places, some of them hundred kilometres from educational institutions in a short period of time. In large countries like Brazil, the use of DE approach is even more relevant. In our context we have to train a significant amount of health professionals, including family doctors, and a well-designed DE based programme could be an effective strategy.

However, three questions should be answered before one implements a distance education programme (Engel, Browne, Nyarango, Akor, Khwaja, Karim & Towle, 1992). First, how acceptable would this approach (DE) be for students? Second, how effective would this approach be in helping learners to master the educational objectives of a distance education programme or module? Third, even if the distance education programme proved to be acceptable and effective, how efficient would it be – how realistic and worthwhile would the expenditure of time,

energy and actual cost be on the part of the user and the provider of the programme?

In our context, the first question was answered through an investigation carried out by Tomaz & Van der Molen (2011). The findings showed that in general the family health professionals have positive perceptions and attitudes towards DE and are very motivated to participate in a distance course. The present study approached the second question and, as presented previously, the results show that dPBL could be effective in helping learners to master the educational objectives in terms of knowledge and skills acquisition. Further research should be designed to investigate the third question.

Moreover, further studies are required with other sample groups and controlling other variables such as tutor's guidance, students' individual characteristics and communication styles, or aspects regarding the course design and implementation. Thus, to generalize the findings of the current study, all these aspects should be taken into account. The comparison with other dPBL effectiveness studies would depend on the learners' characteristics, the tutor's profile and roles, the applied pedagogy, the course content and the instructional design. Although the present study revealed interesting findings about the effect of dPBL on the achievement of knowledge and skills, a better and more definitive understanding of the factors that influence the dPBL effectiveness is still needed. As Dolmans (2003) stated, "we should not only focus our research on the effectiveness of educational interventions, but also on determining why an intervention is effective or not and under which conditions." (p. 1129).

Besides the strength of the experimental design of this study, it has several limitations that must be mentioned. First, we have not been able to allocate the participants randomly to one of both groups, because of practical circumstances. Nevertheless, both groups were quite comparable on demographic variables.

Secondly, a follow-up test has not been included in the design. Therefore, we cannot draw conclusions on the effects of the course on the long term.

In spite of these limitations, we may conclude that it is possible to design an effective dPBL curriculum for training family doctors in Brazil, at least at short term, and this method could be auspicious for training other groups.

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*Chapter 7- Summary of the study
findings, implications and future
directions*

This thesis explored the use of distributed PBL in health professional education in a low-resources context. Our main objective was to contribute to answering the question: Does PBL work at distance in an environment with limited resources? This final chapter has the aim to present a summary of the study findings and to discuss some implications of these findings for the design and delivery of educational programmes based on dPBL in our context. In addition, we point out future directions for further research on the theme.

Chapter 1 provided the reader with an overview of the content and structure of this thesis. It presented the background information, the theoretical framework, and the educational and scientific relevance of the studies conducted in this thesis. In this first chapter, we also introduced the theme of the thesis – the design, the programme evaluation and the effectiveness evaluation of a dPBL curriculum in the health field -, and presented the three central questions studied in this thesis, namely:

1. Is distance education an acceptable educational strategy to train family health professionals in the State of Ceará under their perspective?
2. How do family health doctors appreciate a dPBL course that was developed for them?
3. How effective is this curriculum to achieve its purposes in terms of enhancement of medical knowledge and diagnostic skills?

In Chapter 2, we analysed the urgent need for training family doctors in Brazil and described the scenario where the studies were developed. In this chapter, we presented the dPBL curriculum of the Course “Clinical Approach for Elderly with Dementia” offered by the School of Public Health of the State of Ceará, Brazil.

Chapter 3 presented the theoretical basis of this thesis. It focused mainly on the two educational approaches explored by the studies developed in this thesis: the combination of web-based Distance Education (DE) and Problem-based Learning (PBL), what is known in the literature as distributed PBL (dPBL).

The next chapters reported the three studies conducted in this thesis. Chapter 4 reported the study developed with family health professionals aiming at investigating the first central question. Another study addressed the second question – the programme evaluation - and is presented in Chapter 5. In the following chapter 6 we reported an experimental study conducted with family health doctors, the objective of which was to explore the third question: How effective is this curriculum to achieve its purposes in terms of enhancement of medical knowledge and diagnostic skills?

Summary of the findings

The summary of the findings is described according to the three central questions of this thesis.

1. Is distance education an acceptable educational strategy to train the family health professionals in the State of Ceará under their perspective?

Chapter 2 provided the reader with an overview of the rationale for developing a DE programme for training health professionals in Brazil. Since 1994, a family health model has been implemented in Brazil through the so-called *Programa Saúde da Família* - PSF (Family Health Programme) which aims to provide primary health care to the whole population. Priority is given to those at risk of becoming sick or of dying. An important constraint to its implementation has been the lack of sufficient qualified professionals. In addition, there were important difficulties to train the family health professionals since most were appointed and working in distant rural areas. Distance Education could be an adequate educational strategy since one of its aims is opening up learning opportunities to a wider range of people and reducing barriers to access to the educational programmes.

However, in general, DE programmes are not so easy to implement and usually the initial costs are high (Rumble, 1997). Unfortunately, sometimes programmes

were implemented, huge changes of educational strategies were made without adequate evaluation of its feasibility, and a lot of money and effort were wasted. Therefore, three questions should be answered before one implements a distance education programme (Engel, Browne, Nyarango, Akor, Khwaja, Karim & Towle, 1992). First, how acceptable would this approach (DE) be for prospective students? Second, how effective would this approach be in helping learners to master the educational objectives of such a distance education programme? Third, even if the distance education programme proved to be acceptable and effective, how efficient would it be – how realistic and worthwhile would the expenditure of time, energy and actual cost be on the part of the user and the provider of the programme? This thesis addressed the first and the second question.

In order to address the first question we conducted a study in the State of Ceará, Brazil, with 209 family health professionals (81 family doctors and 128 family nurses), reported in Chapter 4. The goal of this first study was to investigate the acceptability of the DE approach for students. We were interested in describing the family health professionals' characteristics, perceptions, opinions and attitudes as prospective students in a distance education course.

A cross-sectional survey using self-administered questionnaires was carried out in 28 municipalities of the State of Ceará, Brazil. The design was partly adapted from the work carried out by Evans (1994) from the Faculty of Education, Deakin University, Australia. His work was based on several students' stories collected over the years in which he has been involved in research and evaluation projects in open and distance education. In his work he allowed distant learners to recount their experiences in their own words covering in detail a variety of themes ranging from the learners' social and educational backgrounds (family and schooling, learners' experiences as teachers), to important aspects of students' lives and the interrelationships with their broader contexts. These included issues of money, sex, power, age, work and leisure.

This first study was structured in a framework that started with the investigation of the diversities, which the distance educator can expect in the learners' educational backgrounds. Next, a variety of aspects of students' lives, needs and context were addressed. Afterwards we investigated aspects related to the course design and finally, we examined some general aspects related to motivation and interest.

In total 255 questionnaires were sent to the potential subjects leading to a response rate of 81.9%. In terms of the profile and characteristics of participants, the findings showed that the great majority – 90.7% - did not have any previous experience in distance education. This indicated the need for training the participants in the use of DE tools. In addition, students attending a distance course by the first time should be advised in order to be successful that they have to keep a certain discipline in terms of time, place and reconciliation with family, work and leisure time.

The results related to the prospective students' social and educational background showed that a great majority of the family professionals, in general, had a positive previous experience as a student. This fact is positive, mainly for distance education, because those students tend to be more successful in further courses (Evans, 1994). On the other hand, the majority of the professionals did not have experience in independent learning. This finding was not considered so positive for distance education, since independent learning is often a feature of that approach. The conclusion was that such prospective students probably have to adapt themselves or be stimulated to use independent learning in case they attend a distance course.

One of the main findings of this study is related to the course design, particularly regarding the desire of participating in the distance course and the reasons for it. In fact, such findings are important for the question whether DE is an acceptable approach to be used in family health professionals' continuing education.

The top two selected options regarding the reasons why they would like to participate in a DE course – “for my self-improvement in intellectual way” and “for my own pleasure” indicate that those respondents have an academic/intrinsic motivation and a personal/intrinsic motivation, respectively, to participate in such a course. Some authors (e.g. Sagar & Strang, 1985; Strang, 1987, cited in Rowntree, 1992) suggest that learners with intrinsic interests tend to get higher grades than those with extrinsic interests. The same authors also found that learners who have several reasons for studying do better than those who have one only. These studies also affirm that the intrinsic motivation stimulates the students to obtain a lifelong learning habit, which should be the aim of whatever educational system.

In relation to the media to be used in the course, the top four ones selected by our prospective students in upward order – printed material, video, computer and TV – in terms of their preferences gave important cues to the course planners in the selection of them.

In sum, the findings showed that the respondents had positive perceptions and attitude towards DE and were motivated to participate in a DE course. In fact, the majority said they would like to participate in a course in family health using a DE approach.

Finally, a list of recommendations was derived from the findings to help the distance course planners, in particular our DE programme designers. A summary of these recommendations is presented further in this chapter in the implications section.

2. How do family health doctors appreciate a dPBL course that was developed for them?

In our first study, the results indicated that the family health professionals had positive perceptions and attitudes toward a DE approach. Therefore, these findings gave support to the decision of developing a DE-based curriculum for training them. Three main questions regarding the curriculum design aroused: (1) What would be the theme of the course? (2) Which media and other information and communication technology (ICT) tools should be chosen, and (3) What would be the best distance educational approach to be used?

We took into account the findings and recommendations of our first study for deciding about the first and second question, that is, the theme of the course and the ICT tools. Before the beginning of the curriculum design process, we kept contact with a pool of family health doctors and with the Family Health Professionals Association and we chose together “*the care of the elderly people with dementia*” as the theme of the course. The epidemiological data and the national and state health policies for the elderly people also influenced our choice. Based on the family health professionals’ profile, preference and access we selected the computer as the main media for the DE course, since it was among the top four ones selected by our prospective students and and it is one of the most used in DE around the world.

Regarding the third question, we decided to use distributed PBL as the main educational approach. A relevant literature overview, described in Chapter 3, supported this decision (e.g. Baturay & Bay, 2010; Bowdish, Chauvin, Kreisman & Britt, 2003; Cameron, Barrows & Crooks, 1999; Chagas, Faria, Mourato, Pereira & Santos, 2012; Valaitis, Sword, Jones & Hodges, 2005; Wheeler, 2006). Our own experience in using face-to-face PBL for training health professionals has also influenced our choice.

Therefore, we developed a competence-based, problem-based, web-based curriculum for a postgraduate course “Clinical Approach for Elderly People with Dementia”. The course is 120 hours long (100 hours at distance and 20 hours face-to-face) and is available through the Learning Management System (LMS) MOODLE®. The course is divided into five units and addresses themes such as aging and dementia, diagnostic procedures for assessing cognitive decline in the elderly, treatment of dementia (pharmacological and non-pharmacological management), collective action for health promotion and models of health care for the elderly with dementia. Twelve to fifteen participants were supported by a tutor and were expected to perform the course activities at a mean rate of 10 hours per week, with a total duration of 12 weeks (3 months).

Then, to address the second central research question of this thesis we conducted a comprehensive programme evaluation study with 42 family doctors who had participated in the course. This study has been reported in Chapter 5. The aim of this study was to describe the curriculum design process and the evaluation results of the course “Clinical Approach for Elderly People with Dementia” from the participants’ perspective. Our intention was to explore the use of the combination of Problem-based Learning (PBL) and Distance Education (DE) in the context of the health professional education in a low-resources setting.

The participants of the two classes filled in a self-administered questionnaire with closed and open questions. The questions included various aspects such as the quality of teaching materials, the adequacy of the chosen educational approach, the tools used for information and communication technology (ICT), the performance of the tutors and the satisfaction of participants.

In general, the results indicated that the competence-based approach for curriculum design was adequate for our proposal and that the course was highly appreciated by the respondents. A slight majority of the family health professionals participating in the study was male (52.4%) and married (64.3%). Their average

age was 42.6 years, ranging from 27 to 66 years. They had a mean workload per week of 45.6 hours, and an average of 17.6 years of clinical practice. A significant proportion of the respondents (85.7%) had easy access to a computer, and the majority (78.6%) had easy access to Internet. In addition, a significant proportion of the respondents answered that they had little or no prior experience with Distance Education (57.1%), and with PBL (66.7%).

The use of dPBL in the course was interesting and motivating for the majority of the respondents – 76.1% (N = 32). The problems were highly rated by the respondents, who considered them to be well formulated and to give them the opportunity to study the content in depth. The application of the seven steps was clear for the participants and the atmosphere in the group was considered as pleasant. The learning objectives of skills training were clear for 95.2% of the respondents and were relevant to participants' practice, according to 95.2% of the respondents. The tutors demonstrated good knowledge of the topics covered in the course, stimulated the group to study and stimulated group discussion, according to the respondents. Browsing the course website was friendly for 95.2% of the participants. According to 83.3% of them, the virtual forum was an appropriate tool for discussion in virtual tutorial groups (VTG).

The findings regarding the general aspects of the course showed that they thought to participate in the course was nice and considered the content interesting, relevant and appropriate to the participants' previous knowledge. They also thought the course was well organized, and, to a certain extent, the learning objectives proposed by the course were achieved.

An important finding of this study was that, in spite of the fact that one third of participants would prefer to have the course in a more traditional way, the proposal to use dPBL was interesting and motivating for a majority of the participants. This result indicated the feasibility of using such a combination for training family doctors in Brazil. This finding is in line with a previous cross-

sectional survey carried out in State of Ceará – Brazil, aiming to assess the acceptability of a DE-based course among the health professionals who work in the Family Health Programme, reported in Chapter 4. The findings showed that, in general, the family doctors and nurses have positive perceptions and attitudes towards DE and are motivated in participating in a DE course (Tomaz & Van der Molen, 2011).

However, the results also showed that several aspects of dPBL were not well rated by respondents, highlighting that they disagreed that all group members contributed actively in the discussions and that the colleagues presented the issues in a clear way. In addition, only 52.4% of the respondents said they were able to use a chat program and half of them considered that this tool had contributed to the interaction between group participants.

Overall, the findings of this study were in line with most previous evaluation studies on dPBL, although there is consensus that more research is needed in this area (Barrows, 2002; Valaitis et al., 2005). Valaitis et al., (2005), for example, explored health sciences students' perceptions of their experiences in online PBL using six steps of the PBL process (Rideout & Carpio, 2001). They focused on the learning and group process in the online environment, and found that it is feasible to conduct PBL online. However, other authors do not support this approach in online learning and have divergent opinions about its feasibility (Taplin, 2000). The lack of physical proximity and challenges in student support are reasons for this divergence in findings.

Finally, we concluded that the competence-based approach for curriculum design was adequate for our proposal and the students perceived the experience of using *dPBL* as favourable, feasible and enjoyable. Thus, the findings of our study may indicate the feasibility of using such a combination – PBL and DE - for training family doctors in Brazil and maybe in similar contexts.

3. How effective is this curriculum to achieve its purposes in terms of enhancement of medical knowledge and diagnostic skills?

The first two studies of this thesis showed that, in general, DE approach was acceptable for family health professionals and that family doctors appreciated the dPBL course. In order to address the third research question we conducted a quasi-experimental study aiming at evaluating the effectiveness of the dPBL course to enhance knowledge and diagnostic skills on dementia. Chapter 6 reported its results. It focused on the postgraduate course “Clinical Approach for Elderly with Dementia” offered by the School of Public Health of Ceará, described in detail in Chapter 2.

We used a pretest–posttest control group design in the study. Thirty family doctors were assigned to the experimental group and the same number to the control group. Three instruments for collecting data were used: a multiple choice question knowledge test, an Objective Structural Clinical Examination (OSCE) for assessing the use of Mini Mental State Exam (MMSE) skill and a test based on clinical cases for evaluating the differential diagnosis of dementia skill.

The results showed significant effects of the course on participants’ knowledge and diagnostic skills. The findings indicated that the participants of the experimental group showed more progress on all the three dependent variables: knowledge, use of the MMSE (OSCE) and ability to give a correct differential diagnosis than the participants of the control group.

The MANOVA showed that the difference between the two groups was significant ($F = 10.38, p < 0.001$). In addition, the univariate tests showed significant differences on the knowledge test ($F = 17.98, p < 0.001$), the MMSE ($F = 63.47, p < 0.001$) and DD ($F = 43.98, p < 0.001$). The effect size measured by Cohen’s d is moderate for knowledge, very large for use of the MMSE (OSCE 1) and large for ability to give a correct differential diagnosis.

These results are partly in line with the outcomes from other studies on dPBL effectiveness. For instance, the study by Atan, Sulaiman & Idrus (2005) showed that students from the experimental web-based PBL approach achieved better academic performance than students from the controlled content-based approach. Baturay & Bay (2010) evaluated the effectiveness of a web-based dPBL curriculum in Computer Science and also found positive results in terms of higher scores on a knowledge post-test in comparison to the control group. However, Sendag & Odabas (2009) have found no significant effect on the content knowledge acquisition scores of a dPBL course. This last course was about the use of computers in education and was offered to teacher trainees at the Department of Primary School Mathematics Teaching in Anadolu University Education Faculty, Turkey. However, it was found that dPBL had a significant effect on critical thinking skills.

In the health area, Bowdish, Chauvin, Kreisman & Britt (2003), using a quasi-experimental, post-test only research design compared the virtual problem-based learning (VPBL) exercise delivered via Internet and a text-based version of the same PBL exercise on first year medical students' achievement and their perceptions of the learning environment. The authors concluded that the VPBL is as effective as the text-based version for improving students' learning and their learning environment in small group discussion. Raupach, Muenscher, Anders, Steinbach, Pukrop, Hege & Tullius (2009) using a randomized controlled design investigated the effect of a virtual collaborative online module on clinical reasoning acquisition in comparison with traditional PBL tutorial group. The findings suggested that virtual collaborative learning was as effective as conventional PBL regarding the acquisition of clinical reasoning skills, although it was less well accepted by the participants (fourth-year medical students) than traditional PBL sessions.

One important limitation of this study was that a follow-up test has not been included in the design. Therefore, we cannot draw conclusions on the effects of

the course on the long term. However, in spite of this limitation, the results of the current study may indicate that innovative pedagogical approaches such as PBL might be effective in an online environment with the advantages and benefits of DE approach. This has high relevance for continuing education of health professionals since DE programmes may reach a considerable number of people (even thousand people) living in different places, some of them hundred kilometres from educational institutions in a short period of time. In large countries like Brazil, the use of DE approach is even more relevant. In our context we have to train a significant amount of health professionals, including family doctors, and a well-designed DE based programme has now been shown to be an effective strategy.

Implications of the findings

The findings of our studies have scientific and educational implications, according to the purposes of this thesis stated in Chapter 1. In DE, and certainly in other fields, there is an immediate and vital need to develop a more integrated programme of research based on a well-established theoretical framework (Moore & Kearsley, 1996). As described in Chapter 3, the design of our studies is based on at least three theoretical frameworks: constructivism, Problem-based Learning and Distance Education. Therefore, we believe that our findings contribute to the production of knowledge about the relationship of these three relevant fields. To our knowledge, this is one of the first comprehensive programme evaluation and effectiveness studies on distributed PBL in health professionals education in a low-resources context. We proved scientifically that dPBL is effective to enhance theoretical knowledge and diagnostic skills in a low-resources environment.

The findings of our studies may also have general and specific educational implications. In terms of general implications, the results may provide a framework that can be used for the elaboration and statement of effective continuing education policies for family health professionals in low resources settings, such as the State of Ceará, Brazil. The results of this thesis may also have economic

implications and serve individual and collective family health professionals, administrators and community interests. Since the findings showed that dPBL is acceptable and effective, health and educational managers, supported by the results, can take decisions about the implementation of continuing education programmes for family health teams. Taking into account the economy of scale and the benefits of a DE approach, the continuing education programmes can be offered to more professionals simultaneously and at lower costs. In addition, the family health professionals may be more motivated in participating in an interactive and challenging DE programme based on an innovative pedagogy without wasting money and time in travels. Certainly, health administrators would be more satisfied in having the professionals working more time and the community would benefit from the more present and qualified family health professionals.

Regarding the more specific educational implications, a series of recommendations for designing and implementing dPBL curriculum in our context was derived from the findings of our studies. A summary of these recommendations is described below.

When planning a distance course for family health professionals, the planners should take into account the predominant profile and the needs of the prospective students. They should have in mind the variety of learners' backgrounds and need to be able to address them. For example, when selecting the media for the DE course, the planners should take into account the family health professionals' preference and access. So, in our case, printed material, video, computer and / or TV were considered the best choice. It is recommended that what should be taught/learned, during what periods, in what contexts and how it will be assessed should be decided according to the students' needs. It is suggested to keep contact with a pool of prospective students and/or students' organisations (e.g. Family Health Professionals Association) for assessing their needs.

Another recommendation is regarding the previous experience of the students in DE. According to our findings, the majority of the potential students (family health professionals) has not experienced distance education before. Therefore, it is recommended that on the onset of the course or even during the course, some advice should be given to the students as how one can be a good distant learner (Evans, 1994). Of course, each one has his or her own learning style, but they need to reflect on it. The course coordinator and tutors should advise them that they have to keep a certain discipline in terms of time, place and reconciliation with family, work and leisure time in order to be successful in their distance course and in their learning process.

It is also recommended that the contact between peers, peers and teachers (by telephone, internet, or even personally) should be stimulated during the distance course. Exchange of experiences and prompt feedback are fundamental for the learning process.

Another important advice is regarding the choice of the media for delivering the course. It is crucial in DE. Our findings showed that a significant part of the family health professionals said they had difficulties in accessing computer and Internet, mainly in rural areas. The computer is doubtless an important medium in distance education nowadays. Therefore, it is recommended that health managers and planners propose government programmes to stimulate and subsidise the acquisition of computers and the access to the Internet for the family health professionals as part of a continuing education project. Free access to virtual libraries and study centres could be valuable to be included in the project.

The reconciliation of work and study is another relevant aspect that should be taken into account by DE programme planners. Although our potential students said they are able to reconcile work with at least 20 hours of studying weekly, we advise to keep in mind that they have many tasks to accomplish. So, it is

recommended not to overload them with too many assignments, in particular the medical doctors who already seem to have a lot of extra work.

Regarding the course structure, the possibility of giving some flexibility of the date of the assignment submission, using face-to-face sessions such as study groups and tutorials, and planning the skills training preferentially as face-to-face sessions should be stimulated. The inclusion of some face-to-face practical activities during the course, such as visiting an outpatient care center for the elderly with dementia is recommended. When this is not possible, it is suggested to use more authentic learning strategies and technologies of virtual presence, such as videoconferences. This could contribute to approximate the course to the real context and to enhance the participants' learning. Some participants of the course missed this kind of activity.

An important implication regarding specifically the dPBL group dynamic is the possibility of application of the seven steps (Schmidt, 1983; 1993) in dPBL. The results showed that the application of the steps were clear for the majority of participants. So, this well tested method in face-to-face PBL can also be used in dPBL.

Finally, the main implication of our findings is that it is possible to design an effective dPBL curriculum for training family doctors in Brazil, and this method could be auspicious for training other groups in different low resources contexts.

Future directions

We point out, in this section, general and specific future directions based on the findings of our studies. Starting by general future directions, as stated in Chapter 1, overall, DE programmes are not so easy to implement and usually the initial costs are high (Rumble, 1997). Three questions should be answered before one implements a distance education programme (Engel et al., 1992). The first two questions about the acceptability and effectiveness of the DE programme were

explored by this thesis. However, a third question still needs to be addressed: how efficient would it be – how realistic and worthwhile would the expenditure of time, energy and actual cost be on the part of the user and the provider of the programme? Therefore, further research should explore this issue.

In addition, the studies carried out in this thesis are focused on a specific course about strategies to approach elderly people with dementia for family doctors. The other professionals of the family health team (nurse, dentist, auxiliary nurse, community health worker and others) should be included in later research.

In the next paragraphs, we point out the more specific future directions. A first aspect is regarding the quality of studies in dPBL. We think that these studies still need improvement. Barrows (2002) stated that most studies were based on small numbers of groups and only during few interactions, and that there is lack of clarity in describing the learning method used. His concerns include questions such as whether the problems were based on real situations, how the group interaction and decision making were structured, what the facilitators' role was and how they were prepared, and how learner centered the method was. In his opinion, the term PBL has been attached to a myriad of differing methods and a usable taxonomic classification for PBL would help with further research into dPBL. Agreeing with the relevance of these concerns, in the present study, we used a well-tested seven steps PBL model (Schmidt 1983; 1993) and described the learning method in detail. Therefore, it is recommended that further research in this field be designed taking into account these concerns.

In addition, further studies are required with other sample groups and controlling other variables such as tutor's guidance, students' individual characteristics and communication styles, or aspects regarding the course design and implementation. Thus, to generalize the findings of the studies, all these aspects should be taken into account. The comparison between dPBL effectiveness studies would depend on the learners' characteristics, the tutor's profile and roles,

the applied pedagogy, the course content and the instructional design. Although the studies of this thesis revealed interesting findings about the effect of dPBL on the achievement of knowledge and diagnostic skills, a better and more definitive understanding of the factors that influence the dPBL effectiveness is still needed. As Dolmans (2003) stated: "We should not only focus our research on the effectiveness of educational interventions, but also on determining why an intervention is effective or not and under which conditions." (p. 1129).

Regarding the aspects related to the delivery of a dPBL curriculum, the results showed that several issues were not well rated by respondents, highlighting that they disagreed that all group members contributed actively in the discussions and that the issues were not presented by colleagues in a clear way. In our opinion, how to stimulate all group members for active participation in virtual group discussions and how to help them in presenting more clearly the issues are relevant questions of group dynamic that still need to be explored.

Moreover, as discussed in Chapter 6, we perceived that a relevant problem of 'chronology' occurred in the application of the seven steps, mainly during step 3 - Problem analysis. In PBL, students should analyse and raise hypotheses about problem causes and management, using their previous knowledge (Schmidt, 1993; Barrows, 2002). The pedagogical aim of this step is to activate the students' previous knowledge. So, in the present study during the problem analysis, by using asynchronous communication (virtual forum), students had time to search and read the literature previously. This may have distorted the functioning of PBL. The use of synchronous communication (e.g. chat) for starting the analysis of the problem could be a possible solution of this chronology difficulty. The gradual provision of literature in the virtual library could also minimize that problem. However, the effectiveness of these strategies needs to be addressed in further research.

Finally, we cannot draw conclusions on the effects of the course on the long term, because a follow-up test has not been included in the design. Therefore, a further follow-up study would be recommended.

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Appendices

Appendix 1

List of municipalities of the State of Ceará – Brazil included in the study, grouped by DERES (Regional Health Department) with the respective response rates

DERES	Municipality	Number of questionnaires sent	Number of questionnaires returned	%
1ª.	Acarape	3	3	100
	Beberibe	6	3	50
	Fortaleza	26	20	76,9
	Maracanaú	24	18	75
	Maranguape	10	5	50
	Pacoti	2	2	100
	São Gonçalo do Amarante	14	11	78.5
2ª.	Nova Russas	8	5	62,5
	Ipueiras	5	5	100
3ª.	Farias Brito	4	3	75
	Nova Olinda	2	1	50
4ª.	Várzea Alegre	4	0	0
5ª.	Barro	6	6	100
	Juazeiro	6	5	83,3
	Missão Velha	4	4	100
6ª.	Iracema	5	5	100
7ª.	Banabuiú	6	5	83
	Boa Viagem	8	6	75
8ª.	Morada Nova	15	15	100
	Russas	16	16	100
9ª.	Pedra Branca	10	9	90
10ª.	Martinópole	5	5	100
	Sobral	42	34	80
	Meruoca	3	0	0
11ª.	Tauá	6	6	100
12ª.	São Benedito	4	4	100
13ª.	Paracuru	5	4	80
	São Luiz do Curu	4	4	100
	Umirim	4	4	100
	Jijoca	2	1	50
14ª.	Ipaumirim	2	0	0
TOTAL	31	255	209	81,9

Appendix 2

Understanding family health professionals as prospective students in distance education in State of Ceará - Brazil

This questionnaire is part of a study which is a requisite required by the PhD programme in Health Professions Education in Erasmus University - Rotterdam – The Netherlands. This research aims to gather information regarding to the family health professionals' (medical doctors and nurses) characteristics, perceptions, attitudes related to distance education (DE) approach as a method of continuing education in State of Ceará. Such information will be used as basis for the design of a DE-based continuing education programme for training family health professionals in State of Ceará. Your collaboration is very important!

QUESTIONNAIRE

Number 000

Supervisor 00

I. Personal Data

1. Sex 0 Mal 0 Female
2. Age 00 years old
3. Profession 0 Physician 0 Nurse
4. Civil Status 0 Single 0 Married 0 widow(er) 0 divorced

II. Learner's social and educational backgrounds

5. Mark the item that most fit your schooling experience. (Consider mainly high school and university), using a five-point scale where 1 is strongly disagree, 2 – disagree, 3 – neither, 4 – agree, 5. Strongly agree

5.1. I had a very positive experience.

01 02 03 04 05

strongly disagree

strongly agree

5.2. My experience was marked by fear and failure.

01 02 03 04 05

strongly disagree

strongly agree

5.3. In general, I have studied at a low quality school.

01 02 03 04 05

strongly disagree

strongly agree

5.4. I liked very much independent learning.

01 02 03 04 05
strongly disagree strongly agree

6. When did you finish your last training? Consider only those training with at least six month of length.

- 0 1. Recently, less than one year ago
- 0 2. Relatively recently, more than one and less than three years ago.
- 0 3. Several years ago, more than three and less than five years ago.
- 0 4. A long time ago, five years or more.

7. Did you have any previous experience on Distance Education?

Yes 0 No 0 I don't know 0

If yes, continue.

8. When? (Consider the final date of the end of the course)

- 0 1. Recently, less than one year ago
- 0 2. Relatively recently, more than one and less than three years ago.
- 0 3. Several years ago, more than three and less than five years ago.
- 0 4. A long time ago, five years or more.

9. In which area?

- 0 Health
- 0 Education
- 0 Other

10. I liked it very much.

01 02 03 04 05
strongly disagree strongly agree

11. My relationship with tutors was friendly and positive.

01 02 03 04 05
strongly disagree strongly agree

12. Did you have any experience as teacher or trainer?

0 Yes 0 No

III. Some important aspects of prospective students' lives (student's needs and contexts)

Theme: Access to learning resources

13. Do you have easy access to a computer?

Yes

No

14. Do you have access to Internet?

Yes

No

15. Do you have easy access to libraries or study centres?

Yes

No

Theme: Existing abilities

16. I am able to read in English.

01

02

03

04

05

strongly disagree

strongly agree

17. I am able to use the following software:

17.1. Word or similar

01

02

03

04

05

strongly disagree

strongly agree

17.2. Excel or similar

01

02

03

04

05

strongly disagree

strongly agree

17.3. Internet Explorer, Mozilla, Chrome or other

01

02

03

04

05

strongly disagree

strongly agree

Theme: Existence of handicaps

18. Do you have some kind of physical disability that may interfere in some extent on your study?

Yes, but interfere slightly in my study

Yes, and interfere strongly in my study

No

If YES, answer the question 19. If NO, skip to the question 20.

19. Which type of disability?

- Visual disability
- Audition disability
- Speaking disability
- Members disabilities (hands, arms or legs)
- Other

Theme: Family and gender

20. How many children do you have?

- none
- one
- two
- three
- more than three

21. Which is the group age of your children? (You may mark more than one item if necessary)

- 1. Less than one year old
- 2. Kindergarten age
- 3. School age
- 4. Adolescent
- 5. Adult

22. Who is/are responsible for home activities (put the house right, do the shopping, cooking, take care of children, etc.)

- 1. Me
- 2. My partner
- 3. We (me and my partner)
- 4. Other

23. I usually receive support and encouragement in my studies from:

23.1. My parents

- | | | | | |
|-------------------|----|----|----|----------------|
| 01 | 02 | 03 | 04 | 05 |
| strongly disagree | | | | strongly agree |

Theme: course design (media, curriculum, content, assessment, structure, etc.)

The Ministry of Health is planning a Diploma Course in Family Health (DCFH) using Distance Education approach. It is an eleven-month course and based on residential DCFH offered by ESP-CE. Answer the following questions related to this course.

53. Would you like to attend it?

- Yes No I don't know

If YES, continue. If NO skip to the question 59.

54. Why? (You may mark more than one item, if necessary).

- 1. For my self-improvement in material way.
- 2. For my self-improvement in social way.
- 3. For my self-improvement in intellectual way.
- 4. To obtain a qualification for my nowadays job.
- 5. It is obligatory.
- 6. For my pleasure.
- 7. It would help me with promotion and career advancement.

Theme: Financing

55. Are you willing to pay for tuition fees?

- Yes No I don't know

If YES, continue. If NO, skip to the question 59.

56. How much do you think it is a reasonable cost?

- 1. Less than R\$ 100,00 by month
- 2. Less than R\$ 200,00 by month
- 3. Less than R\$ 300,00 by month

57. And the costs of learning material such as books, handbooks, etc. Are you willing to pay for them?

- Yes No I don't know

58. And the costs of communication such as telephone costs, postage, internet and so on. Are you willing to pay for them?

- Yes No I don't know

59. Have you participated on any course that was sponsored fully or partly by your employer?

Yes No I don't know

60. In your opinion, do you think that your employer would pay for a course like that for you?

- 1. Yes, fully.
- 2. Yes, partly.
- 3. No
- 4. I don't know

61. Have you paid for any post-graduation course before?

Yes No I don't know

Theme: Media

62. Which medi(um)a would you prefer that are used in that distance education course?
Mark four you prefer more.

- 1. Print material
- 2. Audio-tape
- 3. Video
- 4. TV
- 5. Computer
- 6. Videoconference
- 7. Other. Specify _____

63. Which medium(a) do you consider you have easier access?

- 1. Print material
- 2. Audio-tape
- 3. Video
- 4. TV
- 5. Computer

69. If you could choose, would you prefer attend to a course at a distance or to face-to-face one?

1. Distance course
2. Face-to-face course
3. I don't know

70. I am very interested in the subject "Family Health".

	01	02	03	04	05
strongly disagree					strongly agree

THANK YOU!

Appendix 3

COURSE CLINICAL APPROACH FOR ELDERLY WITH DEMENTIA

Example of a problem in PBL

Nair and Francisco - Another elderly couple



Ms. Nair, 82 years old, illiterate, married for 50 years with Mr. Francis. She has five sisters, but only two are alive - one aged 85 and other 92 years old - living in the rural area of Ceará. Mr. Francis, 85, retired civil servant (working as a security guard from a federal government department), has three siblings, all deceased. The couple has six children (one woman and five men, two of whom died 30 years ago, victim of automobile accident). Both were born in Ceará (rural) and

lived 45 years in Rio Grande do Sul and São Paulo. They say that when they reached old age, began to miss Ceará, then decided to return to their homeland along with his daughter and two grandchildren. The daughter is divorced, unemployed and has two children (2 and 5 years old), all residing with Mr. Francis and Ms. Nair. Currently living in Fortaleza, in a lower middle-class neighborhood in the west of the city. Not accustomed to leave home except to shop, because they are afraid of muggings. Their main leisure was to watch television and varied readings. Eventually, they visit relatives in the rural area of Ceará, with great memories of childhood. They complain that there the things are very different, although most of their childhood friends are still alive. The family income is three times the minimum wage, the daughter and grandchildren are under the financial responsibility of Mr. Francis and Ms. Nair. Say they have a relatively quiet, except for "the mess that their grandchildren do at home. " Mr. Francis has hypertension, obesity, and had myocardial infarction 3 years, when he was submitted to a revascularization surgery. Currently he uses four drugs continuously. Ms. Nair is also hypertensive, obese and suffering from type II diabetes mellitus and osteoporosis. Uses three drugs chronically. The drugs they consume 25% of monthly income of the couple. Mrs Nair was taken for medical consultation, because the husband comes to realize that is forgotten, no longer interested in the television programs and have difficulty doing tasks that once wielded with great

performance, like cooking. The doctor at the health post raised the possibility of Alzheimer's disease and referred to a specialist service. After Mr. Francis was informed of the possible diagnosis, has evolved with great emotional lability, tearfulness, and uncontrolled hypertension.

QUESTIONS FOR REFLECTION!

1. Which elements of the story (and context) of Mr. Francis and Ms. Nair illustrate the socio-demographic aging of the population?
2. What 'story elements of Mr. Francis and Ms. Nair illustrate epidemiological aspects of aging of the population?
3. Discuss possible consequences on family and care (or caregiver), after Mrs. Nair presented behavioral changes common in Alzheimer's disease, such as aggression, hallucinations, desire to leave home and sleep disturbance (spending several days without sleep and night screaming).
4. Discuss possible risk factors for dementia in this case.

Appendix 4

COURSE CLINICAL APPROACH FOR ELDERLY WITH DEMENTIA

Programme Evaluation Questionnaire

This questionnaire aims at evaluating the course and is part of a series of studies which comprise the PhD programme in Health Professions Education offered by Erasmus University Rotterdam – Netherlands. This evaluation is part of the line of investigation of the author with the objective of assessing the quality and effectiveness of problem based, web based programmes. The results will be used in order to improve the programme. The questionnaire should be filled in individual and anonymously and sent to the researcher. Your collaboration is very important!

I. Identification and profile of the participant

Personal data

1. Age: _____
2. Gender: M () F ()
3. Marital status () Single () Married () Widow () Divorced
4. Main workplace: _____
5. Weekly Workload (media): _____
6. Time of graduation: _____

Access of learning resources

7. Do you have easily access to computer?
() 1 () 2 () 3 () 4 () 5
No, absolutely Yes, easily
8. Do you have easily access to Internet?
() 1 () 2 () 3 () 4 () 5
No, absolutely Yes, easily
9. Do you have access to libraries or study centers easily?
() 1 () 2 () 3 () 4 () 5
No, absolutely Yes, easily

Skills

10. Can you read in English?
() 1 () 2 () 3 () 4 () 5
No, absolutely Yes, I read very well

11. Are you able to use the following software?

11.1. Word or similar

1 2 3 4 5

No, absolutely

Yes, very well

11.2. Power Point or similar

1 2 3 4 5

No, absolutely

Yes, very well

11.3. Internet Browser (Explorer, Mozilla or other)

1 2 3 4 5

No, absolutely

Yes, very well

12. Are you able to use the following tools?

12.1. Virtual Forum

1 2 3 4 5

No, absolutely

Yes, very well

12.2. Chat

1 2 3 4 5

No, absolutely

Yes, very well

12.3. Email

1 2 3 4 5

No, absolutely

Yes, very well

Previous experience in Distance Education and PBL

13. Have you any previous experience in Distance Education?

1 2 3 4 5

No, absolutely

Yes, good experience

14. Have you any previous experience in *PBL (Problem-based Learning –PBL)*?

1 2 3 4 5

No, absolutely

Yes, good experience

Please think about your activities during the course and ask the following questions. To answer the closed questions use the following scale: 1 = Completely disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree; and 5 = Strongly Agree.

II. Methodological Approach – PBL (*Problem-based Learning-PBL*)

		1	2	3	4	5
A)	General aspects					
1	The proposal of using Problem Based Learning at distance was interesting and motivating					
2	The student assessment system was coherent with the PBL approach					
3	I consider easier and suitable to learn the issues related to the theme of the course in a traditional way					
B)	Educational Strategies					
i.	Presential Encounter					
1.	The presential encounter at the beginning of the course was essential for my understanding of the method used – Problem Based Learning (PBL).					
2.	The presential encounter at the beginning of the course was essential for my understanding of the Distance Education tools used during the course (virtual forum, chat, etc.)					
3.	The presential encounter at the beginning of the course was essential for my understanding of the course objectives and structure					
	The Problems...					
4	Were well formulated					
5	Stimulated sufficiently the group discussion					
6	Allowed the formulation of learning objectives according to the subject under study					
7	Stimulated the self-directed learning					
8	Gave the opportunity to study the content in depth					
9	Motivated participants to a deep and meaningful learning					

10	Were adequate to participants context					
	Regarding the virtual group dynamics and application of PBL seven steps:					
11	The group virtual meeting were productive					
12	All group members contributed actively in the discussions					
13	The tasks in the virtual group stimulated my individual study					
14	The virtual meeting stimulated the learning activities					
15	I thought that the experience of working in virtual group were very nice					
16	The issues were presented by colleagues in a clear way					
17	I considered the atmosphere in my virtual group was pleasant					
18	Following the discussions in the virtual group was difficult					
19	The application of PBL steps was clear for me					
ii.	Regarding the Skills Training					
20	The learning objectives were clear					
21	The skills to be developed were relevant to my practice					
22	The tasks of skills training were difficult for me					
iii.	Regarding the Individual and Team Projects					
23	The learning objectives were clearly defined					
24	Were relevant to the application of acquired knowledge in my workplace context					
25	The tasks proposed by individual projects stimulated the self directed learning					
26	Gave the opportunity to study the content in depth					
27	The tasks proposed by team projects stimulated the growth of group					
28	To elaborate the essays proposed by individual and team projects was difficult for me					
iv.	Regarding the Community Based Activities					
29	The learning objectives were clearly defined					
30	Were relevant to the application of acquired knowledge in my workplace context					

31	The tasks proposed by Community Based Activities stimulated the self directed learning					
32	Gave the opportunity to study the content in depth					
33	To elaborate the essays proposed by individual and team projects was difficult for me					
	Regarding the Study Guides and texts					
34	The Course Guide presented relevant information about the course					
35	The Units Guide gave adequate orientation to learning					
36	The study texts (bibliography) enabled me to understand the topics covered in the course					
37	The amount of study texts were above what I could handle					
	Regarding the Tutor					
38	Demonstrated good knowledge in the topics covered in the course					
39	Stimulated the group to study					
40	His interventions stimulated group discussion					
41	At regular intervals, assessed with us the group functioning					
42	Gave ready answers about the content during group discussion					
43	The tutor feedback help me to identify what I could do better					
44	I've identified the learning questions from the tutor feedback					
45	The tutor feedback was not useful to my learning					
	Regarding the individual study					
46	The time was sufficient to study and meet the learning objectives					
47	Contributed to my individual learning and systematization of new information to solve the problem					

III. Distance Education Tools

		1	2	3	4	5
	Regarding the Virtual Learning Environment					
1	Browsing course website was friendly					
2	I've already had accessed previously the Virtual Learning					

	Environment (Moodle) used in this course					
3	The course web design was clear and motivating					
4	I took some time to understand how to browse course web pages					
	Regarding the Virtual Forum					
5	It was an appropriate tool to discussion in virtual tutorial groups (eTG)					
6	Contributed to the interaction between group participants					
7	The posting of learning material in virtual forum facilitated its spread					
8	I've accessed the virtual forum frequently during the course					
9	I had difficulty expressing myself in the virtual forum during the discussions					
	Regarding the Chat					
10	It was an appropriate tool to complement discussion in virtual tutorial groups (eTG)					
11	Contributed to the interaction between group participants					
12	Actively participated in chats during the course					
13	I had difficulty expressing myself in the chats during the discussions					
	Regarding the email					
14	It was an appropriate tool that worked very well for the interaction between groups and tutors					

IV. General aspects

		1	2	3	4	5
1.	Overall, I thought that to participate in this course was nice					
2.	The course was in appropriate level according to my previous knowledge					
3.	The Units objectives were clear for me					
4.	The course contents were relevant, considering the field of approaching the elderly with Dementia					
5.	I thought that the learning of the topics covered in the course					

	was difficult					
6.	I did much effort to follow the course					
7.	I thought the topics covered in the course very interesting					
8.	The course was very organized					
9.	The learning objectives proposed by the course were achieved					

10. I dedicated to individual study an average of _____ hours a week during the course.

Please, present your impressions and comments about the following questions:

1. Did the course achieve your expectations? Please, explain the reasons.
2. Did the course increase your competencies in practice? Please, cite your most important gains.
3. What were the better things about this course?
4. What were the aspects of the course that hindered your learning and should be improved?
5. Do you think that there are topics related to approach of elderly with Dementia that you need learn more in depth? If yes, which are they?
6. If you had to assign a grade to this course (1 to 10), what grade would you give?
7. Would you do another course with the same methodological approach – PBL and DE?
8. Would you recommend this course to a colleague?

Thank you very much for your evaluation!

Appendix 5

COURSE CLINICAL APPROACH FOR ELDERLY WITH DEMENTIA

KNOWLEDGE TEST

Name: _____ Code: _____

Dear participant,

This pre-test aims at checking the level of acquired knowledge on key topics related to Course Clinical Approach for Elderly with Dementia and measure the degree of achievement of the cognitive learning objectives proposed by the course. This evaluation has no involvement with the certification of the course. We appreciate your participation!

1. Mr. John is 89 years old and has four brothers, all octogenarians. Based on Mr. John's family and life expectancy at birth of Brazilians, we can state that:

- A) This is a relatively common situation as life expectancy at birth of Brazilians is gradually decreased, which points to the aging of the population.
- B) It is an unusual situation, because life expectancy at birth of Brazilians has been gradually increasing, pointing to the rejuvenation of the population.
- C) It is a relatively common situation, as life expectancy at birth of Brazilians has remained stable over the past decades, which points to the gradual aging of the population.
- D) It is a relatively common situation as life expectancy at birth of Brazilians has been gradually increasing, pointing to the aging of the population.

2. Mrs. Maria and her sister died at 70 and 73 years old, respectively. Based on the current life expectancy at birth (IBGE 2010) in Brazil, we can state that:

- A) Both are within the current parameters of the current expectation at birth in Brazil that is between 69.9 and 72.8 years.
- B) Maria is within the current parameters of the current expectancy at birth in Brazil that is 69.8 years.
- C) The sister of Dona Maria is within the current parameters of the current expectancy at birth in Brazil, which is 73.2 years.
- D) Both are not within the current parameters of the current expectation at birth in Brazil, which is 75.7 years.

3. Mrs. Antonia and Mr. Francis is an elderly couple residing in a metropolitan area of a state capital in the Northeast of Brazil. He has diabetes. She has Hypertension. This situation:

- A) It is unusual, since only 30% of the elderly in the Northeast of Brazil are suffering from chronic diseases.
- B) It is common, because in Brazil, on average, about 75% of elderly people are suffering from chronic diseases.
- C) It is common, especially among the poor elderly, as in the North and Northeast regions of Brazil.
- D) It is not so common, why in the Northeast, among the elderly, there is prevalence of infectious diseases.

4. Mrs. Rita is 78 years old, widow, retired and lives with a daughter. Mr. Antonio is 80 years old, widower and lives with a son who uses his father's retirement income to help with household expenses. Taking into account the socio-demographic profile of Brazilians elderly is CORRECT to say:

- A) Mr. Antonio is within the socio-demographic profile of Brazilians elderly, therefore, prevail among aged widowers men and most live with at least one child, being the person who gives them more attention.
- B) Both are not within the socio-demographic profile of Brazilians elderly, since, on average, five persons resides in households in which they live instead of 4 people in homes where there are no elderly.
- C) Mrs. Rita is within the socio-demographic profile of Brazilians elderly, as, among the elderly, widows prevail, most live with a son or daughter, who gets more attention.
- D) Both are within the socio-demographic profile of Brazilians elderly, although a small part of the older population itself is a source of income - especially retirement income - and contributes to household expenses.

5. Mr. Victor is 66 years old, Mrs. Marta, 56 years old. Both developed dementia.

Considering the prevalence of dementia is CORRECT to say:

A) Victor is within the parameters of prevalence of dementia, as in cases of late onset (> 65 years) is higher in men than in women.

B) Victor is within the parameters of prevalence of dementia since it doubles every five years after 60 years old, resulting in an exponential increase with age.

C) Mrs. Marta is within the parameters of prevalence of dementia, because in recent Brazilian study population on elderly people living in the community, the prevalence of dementia ranged from 10% among individuals aged 55-69 years old, 50% among those aged over 84 years old.

D) Mrs. Marta is within the parameters of prevalence of dementia, as in cases of early onset (<65 years), women are at greater risk of developing the disease.

6. Patient 76 years old, with a good level of education, complaining of forgetfulness for one year, the score on the Mini-Mental State Examination was 18, and with difficulty with some daily activities. Regarding the probable diagnosis of this condition, check the CORRECT item:

A) This is probable dementia.

B) The patient presents with cognitive impairment, but does not meet criteria for dementia.

C) It is probable Mild Cognitive Impairment.

D) It is likely a benign senescent forgetfulness.

7. Patient 79, diagnosed with Mild Cognitive Impairment. Mark the CORRECT item:

A) It is characterized by a condition that in most cases it progresses to Alzheimer's disease.

B) It is expected that the patient no longer is able to do some activities of daily living.

C) There are still no laboratory tests for diagnosis of this condition in clinical practice.

D) There are effective treatments that prevent their progression to Alzheimer's disease.

8. Patient with Alzheimer's disease, behavioral changes, incontinence, difficulty walking, apathetic, with little interaction with the family, completely dependent for activities of daily living. If you were to make a pharmacological option for treating this condition, the most appropriate would be:

A) Rivastigmine

B) Memantine

C) Donepezil

D) Galanthamine

9. Patient with Alzheimer's disease, there are two days in use of rivastigmine and presenting nausea and vomiting. Mark the CORRECT item:
- A) These are likely hydrocephalus symptoms causing intracranial hypertension.
 - B) Nausea and vomiting are common alterations in patients with Alzheimer's disease and are due to deregulation of the hypothalamic-pituitary axis.
 - C) These are likely adverse effects of the anticholinesterase.
 - D) Nausea and vomiting are probably not even related to the underlying disease, or with the drug in use.
10. Patient with personality change and aggressive, having sought doctor, who noted that he was also quite forgotten.
- A) The diagnosis of dementia is very unlikely, since the personality change was initially perceived by the family, which usually does not occur in dementia.
 - B) Memory loss not perceived initially by the family is unusual in non-Alzheimer dementias.
 - C) The patient above is undoubtedly in a very advanced stage of disease, as behavioral change does not occur in other stages.
 - D) In the investigation of some cases of dementia, imaging exams may show specific changes.
11. Patient presenting with dementia, characterized by fluctuating cognitive symptom, episodes of hallucinations and rigidity in the limbs. Mark the CORRECT item:
- A) It is probably dementia with Lewi Bodies.
 - B) It is probably Alzheimer's disease with adverse effects of medications.
 - C) The anticholinesterase drugs would be contraindicated in this case.
 - D) It is probably a very rare dementia.
12. In a patient with Alzheimer's disease, diagnosed six months ago, with Mini-Mental 24, is expected to occur:
- A) Commitment calls Instrumental Activities of Daily Living.
 - B) Commitment of so-called Basic Activities of Daily Living.
 - C) Commitment of Basic and Instrumental Activities of Daily Living.
 - D) Lack of commitment of Basic and Instrumental Activities of Daily Living.

13. Patient of 78 years old, hypertension, began to show an abrupt memory, attention and language deficits, and difficulty in performing their daily tasks. The most likely diagnosis:

- A) Alzheimer's disease.
- B) Vascular Dementia.
- C) Lewy Body Dementia.
- D) Fronto-Temporal Dementia.

14. Patients with suspected vascular dementia or mixed need to take brain imaging, the most suitable:

- A) Skull-Brain CT without contrast.
- B) Brain Mapping.
- C) Skull Brain CT with contrast.
- D) Head and Brain Magnetic Resonance.

15. Patients with Alzheimer's disease usually have behavioral changes, such as delusions and hallucinations. Mark, among the drugs below, the most appropriate:

- A) Lorazepam.
- B) Quetiapine.
- C) Rivastigmine.
- D) Sertraline.

16. Patient presenting with changes in behavior and personality change at the beginning of the clinical and CT of Skull with frontal atrophy. The most likely diagnosis is:

- A) Alzheimer's Disease
- B) Lewy Body Dementia
- C) Fronto-Temporal Dementia
- D) Vascular Dementia.

17. About the care of patients with dementia, particularly Alzheimer's disease, check the CORRECT item:

- A) It is desirable to have only a caregiver and continuously monitor the patient for 24 hours.
- B) It is important that the patient's caregiver record and clarify any misconceptions related to memory that will commit the day-to-day activities.
- C) It is important to change periodically the patient room to avoid the monotony of care.
- D) It is necessary to have special attention to the caregiver, since he/she may present a high risk of emotional disorders.

18. Still on the care of patients with dementia, particularly Alzheimer's disease, check the CORRECT item:

- A) Physical activity is not recommended since it can excite more the patient.
- B) The patient should avoid staying at home.
- C) Some patients require careful with the doors as they can go aimlessly and get lost in the street.
- D) Cognitive stimulation by experienced personnel is not recognized as an activity with significant effect.

19. Patients with Alzheimer's disease usually have moderate to advanced oropharyngeal dysphagia. In this case, check the CORRECT item:

- A) Dysphagia may improve with diet and should always be offered with the patient supine.
- B) The diet should be modified and should be offered preferably liquid.
- C) Exercises with speech therapist have little benefit.
- D) The paste food should be preferred to liquid and solid.

20. About aspects of professional communication with family and patients with Alzheimer's disease, check the CORRECT item:

- A) It should be explained to the family that Alzheimer's disease is progressive and irreversible.
- B) You must inform the family that this is a case where there may be complete recovery of memory and other cognitive functions.
- C) The family should not be informed of this diagnosis.
- D) Speaking loudly near the ear is a proven effective strategy to improve communication.

21. Maria comes for a routine visit at the health center. She has hypertension, diabetes and Alzheimer's disease with moderate deficit of recent memories and moments later and temporal and spatial disorientation. His daughter, Regina, appears to be quite stressed during the consultation stating that, at times, his mother becomes agitated and aggressive with all the family. How to approach this case in this context?

- A) The approach of the family is not a priority for the prevention of behavioral disorders, since this action has little evidence in the treatment of this condition.
- B) The use of drugs such as Gingko biloba has scientific evidence for the prevention of Alzheimer's disease as in this patient.
- C) An approach to preventing falls must be investigated, although Alzheimer's is not a direct risk factor for such events.
- D) Physical exercises are recommended here.

22. About abuse in the elderly, select the CORRECT alternative in relation to the case below:

"Mr. Antonio is an elderly bedridden with advanced dementia. He receives routinely home visits by the Family Health Team. Over the past three months, he has lost weight and is showing signs of anti-psychotic impregnation (stiffness "cog", tremors, drooling, sleepy). He is malnourished. When questioned about who was the caregiver of the elderly, the team knew that his son give him the medication daily to stay calm in the morning and night. Because his son has to work, Mr. Antonio is left home alone and locked and the neighbour comes to give him lunch and dinner.

- A) Malnutrition and weight loss can lead to suspicion of abuse and / or neglect.
- B) In this case, we should not interfere as health professionals, because it involves family related problems and we can end the doctor-patient relationship.
- C) In the context of the Family Health Strategy, there are no ways for reporting the fact in question, and the case notification is the responsibility of the Social Assistance through the notification form.
- D) The fact related above does not reflect a situation of abuse, because it is justifiable that the son has to work in order to pay for household and expenses.

23. Ms. Raimundinha has 76 years old and is worried with her memory. She stated that her husband and her father died with Alzheimer's disease and wants to prevent against this disease. Thinking about the aspects of prevention and health promotion, how is the best approach for this case? Mark the CORRECT item:

A) The performance of crosswords is routinely disseminated widely by the population as a protective factor for Alzheimer's disease, but science sees this fact as a myth and there is no scientific evidence of this relationship.

B) Leisure activities have a protective effect against Alzheimer's disease.

C) Low-calorie diet and supplements of vitamin E in high doses, according to recent studies, prevent Alzheimer's disease.

D) Poorly controlled hypertension and diabetes mellitus are not risk factors for Alzheimer's disease itself, but for vascular dementia.

24. According to the previous case, we emphasize the importance of screening tests for evaluating Ms. Raimundinha. About these methods, check the CORRECT alternative:

A) The mini mental state examination can differentiate Alzheimer's from other types of dementia.

B) The clock-drawing test is ideal to be realized in the elderly with no schooling.

C) The mini mental state examination score below average means necessary a dementia syndrome.

D) It is recommend screening for depression in suspected dementia.

25. The Ms. Ana's daughter, Mariana, went to the health center to inquire about his mother who recently was diagnosed with Alzheimer's dementia. Mariana had the experience of living next to an elderly woman who had this problem and observed the evolution of the disease, mainly the changes in behavior such as aggression and agitation with episodes of escape. About the prevention and treatment of behavioral symptoms in elderly patients with dementia, select the CORRECT item:

A) Neuroleptics should be used as a preventive action for Ms. Ana.

B) We should avoid changes in the patient's home environment, except for her safety.

C) Confront the patient (Ms. Ana) with threats can be an effective action to prevent such symptoms, but should not be done in order to avoid change in mood.

D) The physical restraint has proven to be effective in preventing accidents and reducing costs of elderly patients with behavioral symptoms.

The National Primary Care Policy defines the elderly care as a strategic area and states that primary care resources should be devoted primarily to care for the elderly within municipal health plans (Ordinance of the Ministry of Health No 648 - March 2006).

Considering the clinical case described below answer the questions 26 to 30 about the organization of comprehensive health care for the elderly with dementia.

Ms. Francisca, 88 years old, suffering from Alzheimer's disease in the moderate stage, has difficulty walking for 11 months, with frequent falls (3 episodes in the last month) and urinary incontinence. The family deny the occurrence of head trauma. Nine months ago, the caregiver perceives that the patient changed his behavior presenting visual hallucinations, persecutory delusions and inversion of the sleep-wake cycle. Her relatives seek medical evaluation.

26. Mark the CORRECT alternative strategy on the initial approach to the problem.

- A) The best approach is to take Ms. Francisca to the hospital, considering that she has probably delirium (acute confusional state).
- B) The physician should refer the patient immediately to a tertiary center to perform a CT of Skull because of falls.
- C) The doctor should order general lab exams including blood count, biochemistry and urinalysis as initial investigation, keeping the patient in her home.
- D) Due to the visual hallucinations associated with frequent falls, it's probably Dementia with Lewy bodies rather than Alzheimer's disease and it is recommended refer the patient for neurological evaluation.

27. When the doctor is asked by the family about what is the best conduct to face the difficulty walking, which is the best intervention?

- A) Prohibit walking due to the high risk of falling.
- B) To propose a strategy for motor rehabilitation through physiotherapy at home and guide environmental changes to reduce the risk of falls.
- C) Give a wheelchair for mobilization of the patient.
- D) Change the walker for a cane would be the most important and priority conduct.

28. What is the CORRECT item about the management of the behavioral disturbance of the patient?

- A) The physician should start with sedative medication such as benzodiazepine preferably with the patient in a tertiary hospital.
- B) The best alternative for this case is to suggest the hospitalization of the patient in a Long Term Institution - LTI (Asylum).
- C) Advise the family to comply with the new sleep schedules of the patient and to talk to him to soothe him when he is aggressive, keeping him at home. If this strategy would not be effective, give sedative medication when necessary.
- D) The use of neuroleptic (antipsychotic) is useful in this situation especially when combined with non-pharmacological resources and occupational therapy at home to help restore the sleep-wake cycle.

29. Regarding home care of elderly patients as a form of health care, check the CORRECT alternative:

- A) Strategy of health care which consists mainly in providing a standard medical home care.
- B) It is a form of care that emphasizes the patient autonomy and strives to enhance their functional abilities within their own environment.
- C) Patients with the possibility of movement should not be treated at home.
- D) There should be an attribute of the health team to suggest environmental changes during home care, the autonomy of patients and their families should always prevail.

30. Valdomiro, 78 years old, has Alzheimer's disease in the beginning of the moderate phase, is independent to the Basic Activities of Daily Living (BADL), remains continent for feces and urine, eats without gagging and walks with the aid of orthosis (cane). Among the items below what would be the best form of care for this patient?

- A) Day Centre
- B) Institution of long-stay
- C) Hostel for elderly
- D) Asylum.

THANK YOU AND GOOD LUCK!

Appendix 6

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COURSE CLINICAL APPROACH FOR ELDERLY WITH DEMENTIA

THE USE OF MINI MENTAL STATE EXAM - MMSE

Guidelines for Simulated Patient

Clinical case

Mrs. Maria dos Prazeres da Silva (MPS), 74, retired, former seamstress with 08 years of schooling (high school), has been regularly monitored for four years in the Family Health Unit. Her daughter brought her for consultation because, in the last twenty days, has noticed that she suddenly began to have difficulty remembering the names of the children and performing household chores, such as cooking for the family on weekends. Twice, she put sugar in the flesh. Mrs. MPS has always been very active and her family had not noticed before any difficulty remembering things. Since last week, she has been crying easily, especially when she cannot remember the names of family members.

She has diabetes mellitus (she takes Glibenclamide 5mg/day and Metformin 500mg twice daily) and hypertension (she takes Eenalapril Maleate 20mg twice daily and metformin and amlodipine 10mg/day).

The doctor who attended applied the Mini-Mental State Exam, whose score was 16.

Appendix 7

School of Public Health of Ceará
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COURSE CLINICAL APPROACH FOR ELDERLY WITH DEMENTIA

THE USE OF MINI MENTAL STATE EXAM – MMSE

Performance Assessment Checklist - PAC

Name: _____ Code _____

Look at the performance of the participant and check the score on each item, according to the following scale: 1 = Disagree completely; 2 = Disagree; 3 = Neither disagree nor agree; 4 = Agree e 5 = Agree completely.

		1	2	3	4	5
I.	PREPARATION					
1	Explained to the patient and the caregiver the the objective and meaning of the test					
2	Explained to the patient and the caregiver how the test will be applied					
3	Made the patient comfortable					
4	Established a good relationship with the patient					
II.	APPLICATION	1	2	3	4	5
A)	Orientation					
5	Asked the patient to say the day of the week, the date, month, year and approximate time of this day					
6	Asked the patient to tell the specific location (room or sector), the institution, the address, the city and the state we are					
7	Did not give tips to the patient					
8	Assigned scores correctly					
B)	Immediate memory					
9	Asked the patient whether he could test his memory					
10	Mentioned three unrelated words slowly and clearly					
11	Asked the patient to repeat them, making sure that he learned					
12	Did not give tips to the patient					
13	Assigned scores correctly					
C)	Attention and calculation					
14	Asked the patient to, starting with 100, subtract 7 (eg. $100 - 7 = 93$; $93 - 7 = 86$, and so on)					

15	Interrupted after five subtractions					
16	Did not give tips to the patient					
17	Assigned scores correctly					
D)	Recall					
18	Asked the patient if he remembered the three words you previously asked					
19	Did not give tips to the patient					
20	Assigned scores correctly					
E)	Language					
21	Applied the items related to language correctly, as directed in the exam itself					
22	Did not give tips to the patient					
23	Assigned scores correctly					
III.	INTERPRETATION OF RESULTS AND CLOSING SESSION	1	2	3	4	5
24	Asked the questions in the proposed order					
25	Assigned the final score correctly					
26	Interpreted correctly the results					
27	Considered the education level of the patient					
28	Established the probable diagnosis correctly					
29	Explained to the patient and the caregiver the results of the exam					
30	Negotiated with the patient and the caregiver the approach to be adopted					

Comments

Evaluator

Date: / /

Appendix 8

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COURSE CLINICAL APPROACH FOR ELDERLY WITH DEMENTIA

MINI MENTAL STATE EXAM – MMSE

PATIENT NAME: _____ DoB: _____

DATE: / /

Right / Wrong? - 30 questions for 30 points

ORIENTATION – 10 points

Ask the following questions:

1. What is today's date?
2. What is the month?
3. What is the year?
4. What day of the week is it today?
5. What season is it?
6. What is the name of this clinic (place)?
7. What floor are we on?
8. What city are we in?
9. What county are we in?
10. What country are we in?

Orientation subtotal = /10

IMMEDIATE RECALL – 3 points

Ask the subject if you may test his/her memory. Then say "ball", "flag", "tree" clearly and slowly, about 1 second for each. After you have said all 3 words, ask him/her to repeat them - the first repetition determines the score (0-3):

11. BALL
12. FLAG
13. TREE

Recall subtotal = /3

ATTENTION – 5 points

NB PERFORM SERIAL 7S **OR** 'WORLD' BACKWARDS **BUT NOT BOTH!**

A) Ask the subject to begin with 100 and count backwards by 7. Stop after 5 subtractions. Score the correct subtractions.

- 14. "93"
- 15. "86"
- 16. "79"
- 17. "72"
- 18. "65"

B) Ask the subject to spell the word "WORLD" backwards. The score is the number of letters in correct position. For example, "DLROW" is 5, "DLORW" is 3, "LROWD" is 0.

- "D"
- "L"
- "R"
- "O"
- "W"

"DLROW" or Serial 7s subtotal = /5

DELAYED VERBAL RECALL – 3 points

Ask the subject to recall the 3 words you previously asked him/her to remember.

- 19. BALL?
- 20. FLAG?
- 21. TREE?

Delayed verbal recall subtotal = /3

NAMING –2 points

Show the subject a wrist watch and ask him/her what it is. Repeat for pencil.

- 22. WATCH
- 23. PENCIL

REPETITION – 1 point

Ask the subject to repeat the following: "No ifs, ands, or buts"

- 25. REPETITION

3-STAGE COMMAND - 3 points

Give the subject a plain piece of paper and say, "Take the paper in your hand, fold it in half, and put it on the floor."

- 25. TAKES
- 26. FOLDS
- 27. PUTS

READING – 1 point

Hold up the card reading, "Close your eyes", so the subject can see it clearly. Ask him/her to read it and do what it says. Score correctly only if the subject actually closes his/her eyes.

28. CLOSES EYES

WRITING 1 point

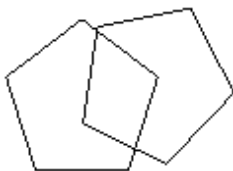
Give subject a piece of paper and ask him/her to write a sentence. It is to be written spontaneously. It must contain a subject and verb and be sensible. Correct grammar and punctuation are not necessary.

29. SENTENCE

Language subtotal = /8

COPYING – 1 point

Give subject a piece of paper and ask him/he to copy a design of two intersecting shapes. One point is awarded for correctly copying it. All angles on both figures must be present, and the figures must have one overlapping angle.



Example:

30. PENTAGONS

Pentagon subtotal = /1

TOTAL MMSE = /30

(MMSE maximum score = 30)

The examination has been validated in a number of populations. Scores of 25-30 out of 30 are considered normal, 18-24 indicate mild to moderate impairment, and scores of 17 or less indicate severe impairment.

Appendix 9

School of Public Health of Ceará
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COURSE CLINICAL APPROACH FOR ELDERLY WITH DEMENTIA

Assessment of Differential Diagnosis Skills

Name: _____ Cod. _____

Look carefully at the five mini-cases below, observe the imaging presented in each case and answer the questions presented regarding the differential diagnosis of dementia.

Mini-Case 1

Mr. MFC, 74, retired, former coach of electricity, with 08 years of schooling, has been regularly followed for 4 years in the Family Health Unit. His daughter brought him for consultation because, in the last twenty days, he suddenly began to have difficulty remembering the names of the children and performing household chores, such as cooking for the family on weekends. Twice, he put sugar in the meat. Mr. MFC has always been very active and his family had not noticed before any difficulty remembering things. Since last week, he has been crying easily, especially when he cannot remember the names of family members.

He has diabetes mellitus (taking 5mg/day of Glibenclamide and Metformin 500mg twice daily) and hypertension (taking Enalapril Maleate 20mg twice daily and Amlodipine 10mg/day).

The doctor who attended applied the Mini-Mental State Examination, whose score was 16. Based on the patient's performance on the MMSE, the doctor ordered a brain MRI. The result is the following:

SEE SLIDES 1, 2, 3 and 4

Obs. All the slides is included in the CD-ROM attached to this the thesis

Question:

Based on the clinical history and imaging tests, answer:

- a) Do you consider this a case of dementia? () Yes () No
b) If yes, what is the most likely cause?

Mini-Case 2

Mrs. FCD, 81, retired, elementary school teacher, is forgetting recent events for 2 years. On a certain day, in the evening, she had not remembered that her daughter had visited her in the morning. Her husband has observed she was more uninterested in things, for example, no longer care for the plants, an activity that she did with great satisfaction. Mrs. FCD think is actually more forgotten, but not as much as her husband and daughter are reporting. She says she has been doing everything as before, understands the difficulties that are normal with advancing age.

Mrs. FCD actually does not engage in any activity more, says that this is occurring because she has two home secretaries who do everything with no need for their participation. Her husband has always made purchases and payment of accounts.

She has no significant morbidity. She checks up regularly.

The doctor who attended applied the Mini-Mental State Examination, the result was the following:

SEE SLIDE 5

The results of imaging studies were:

SEE SLIDES 6 AND 7

Question:

Based on the clinical history and imaging tests, answer:

- a) Do you consider this a case of dementia? () Yes () No
b) If yes, what is the most likely cause?
-

Mini-Case 3

Mrs. TSC, 77 years old, was brought for consultation by her daughter because she has presented an episode of hallucination. She said she was seeing a child sitting on the couch in his home, a view that, of course, not corresponded with reality and who left the family very perplexed by what happened. For some time, her husband has observed that she is a bit forgotten, but said that it is not a very important thing, perhaps something of her own age. Recently, Mrs. TSC fell. She has osteoarthritis, osteoporosis and dyslipidaemia.

The doctor noticed that Mrs. TSC had a fine tremor in her hands.

The result of imaging was as follows:

SEE SLIDE 8

Question:

Based on the clinical history and imaging tests, answer:

- a) Do you consider this a case of dementia? () Yes () No
b) If yes, what is the most likely cause?
-

Mini-Case 4

Mrs. CSF, 80 years old, in the last six months has shown progressive forgetfulness. During the consultation, she was not able to remember how many children she has and the name of the street where she lives. Her daughter reports that Mrs. CSF has also presented a progressive difficulty in walking. She is walking only with the help of others. He suffered two

episodes of falling in the last fifteen days. She's wearing diapers, because she was not able to control urine.

The result of imaging was as follows:

SEE SLIDE 9

Question:

Based on the clinical history and imaging tests, answer:

- a) Do you consider this a case of dementia? () Yes () No
 - b) If yes, what is the most likely cause?
-

Mini-Case 5

Mr. JMC, 60, a lawyer, since a year ago, he has been more extroverted (before he was very stern and moralist, according to his wife). He has often made offensive comments to people. The day before the appointment, he was found with obscene gestures and even get naked on the gate of his house, which motivated the consultation. Family members do not notice he is forgotten.

He is still acting as lawyer, but he has often received complaints about his attitudes from his co-workers.

MRI of the skull was as follows:

SEE SLIDE 10

Question:

Based on the clinical history and imaging tests, answer:

- a) Do you consider this a case of dementia? () Yes () No
 - b) If yes, what is the most likely cause?
-

Sumário

Esta tese explorou o uso da Aprendizagem Baseada em Problemas (*Problem-based Learning – PBL*) à distância na área da educação dos profissionais de saúde em um contexto de baixos recursos. Nosso principal objetivo é contribuir para responder à pergunta: Será que o PBL à distância funciona em um ambiente com recursos limitados? Este sumário tem a finalidade de apresentar um resumo dos principais resultados dos estudos e discutir algumas implicações destes resultados para a concepção e execução de programas de educação baseados no PBL à distância em nosso contexto. Além disso, são apresentadas sugestões para futuras pesquisas sobre o tema.

O Capítulo 1 fornece ao leitor uma visão geral do conteúdo e da estrutura desta dissertação. Ele apresenta a justificativa, as bases teóricas e a relevância educacional e científica dos estudos realizados. Neste primeiro capítulo, também introduzimos o tema da tese - o desenho e a avaliação do programa e da eficácia de um currículo baseado em PBL à distância no campo da saúde - e apresentamos as três questões centrais estudadas, a saber:

1. A educação à distância (EAD) é uma estratégia educacional aceitável para a educação permanente dos profissionais de saúde da família no Estado do Ceará, sob o ponto de vista deles?
2. Como os médicos de família avaliam um curso baseado em PBL à distância desenvolvido para eles?
3. Qual é a eficácia deste currículo para alcançar seus objetivos em termos de aprimoramento do conhecimento médico e de habilidades de diagnóstico?

No Capítulo 2, analisamos a urgente necessidade de formação de médicos de família no Brasil e descrevemos o cenário em que os estudos foram desenvolvidos. Neste capítulo, apresentamos o currículo baseado em PBL à

distância do Curso "*Abordagem Clínica do Idoso com Demência*", oferecido pela Escola de Saúde Pública do Estado do Ceará, Brasil.

O Capítulo 3 apresenta as bases teóricas desta dissertação. É voltado principalmente para as duas abordagens educacionais exploradas pelos estudos desenvolvidos nesta tese: a combinação da EAD baseada na Web e o PBL, o que é conhecido na literatura internacional como *distributed PBL (dPBL)*.

Os capítulos seguintes relatam os três estudos realizados nesta tese. O Capítulo 4 descreve o estudo desenvolvido com os profissionais de saúde da família com o objetivo de investigar a primeira pergunta central, relacionada à aceitabilidade da EAD por parte dos potenciais alunos. Outro estudo abordou a segunda questão - a avaliação do programa - e é apresentado no Capítulo 5. No Capítulo 6, nós apresentamos um estudo experimental realizado com médicos de família, cujo objetivo foi explorar a terceira pergunta: Qual é a eficácia do currículo baseado em dPBL para alcançar seus objetivos em termos de aprimoramento do conhecimento médico e das habilidades de diagnóstico?

Resumo dos resultados

O resumo dos resultados é descrito de acordo com as três questões centrais desta tese.

1. A educação à distância (EAD) é uma estratégia educacional aceitável para a educação permanente dos profissionais de saúde da família no Estado do Ceará, sob o ponto de vista deles?

O Capítulo 2 fornece ao leitor uma visão geral da justificativa para o desenvolvimento de um programa baseado na EAD para a educação permanente de profissionais de saúde no Brasil. Desde 1994, um modelo de saúde da família tem sido implementado no Brasil através do chamado Programa Saúde da Família (PSF), que visa a prestação de cuidados primários de saúde a toda a população. É dada prioridade a pessoas em risco de adoecer ou de morrer. Uma restrição importante para a sua implementação tem sido a falta de profissionais qualificados. Além disso, tem havido dificuldades importantes para capacitar os

profissionais de saúde da família, visto que a maioria trabalha em áreas rurais distantes. Neste contexto, a EAD pode ser uma estratégia educacional adequada, pois seus objetivos incluem a abertura de oportunidades de aprendizagem para uma gama maior de pessoas e a redução de barreiras ao acesso aos programas educacionais.

No entanto, em geral, programas baseados em EAD não são tão fáceis de implementar e os custos iniciais são elevados (Rumble, 1997). Infelizmente, às vezes, programas são implementados, grandes mudanças de estratégias educativas são feitas sem uma avaliação adequada de sua viabilidade e uma grande quantidade de dinheiro e esforço são desperdiçados. Por isso, três perguntas devem ser respondidas antes da implementação de um programa baseado na EAD (Engel, Browne, Nyarango, Akor, Khwaja, Karim & Towle, 1992). Primeiro, essa abordagem (EAD) é aceitável para os potenciais alunos? Em segundo lugar, essa abordagem é eficaz em ajudar os alunos a alcançar os objetivos educacionais? Em terceiro lugar, mesmo que o programa seja aceitável e eficaz, ele é eficiente? Ou seja, vale à pena o dispêndio de tempo e energia por parte do usuário e do provedor do programa? Esta tese abordou a primeira e a segunda questões.

Para responder a primeira questão, realizamos um estudo com 209 profissionais de saúde da família (81 médicos de família e 128 enfermeiros de família) no Estado do Ceará, Brasil, relatado no Capítulo 4. O objetivo deste primeiro estudo foi investigar a aceitabilidade de um hipotético curso baseado em EAD por parte dos potenciais alunos (médicos e enfermeiros de família). Estávamos interessados em descrever as características dos profissionais de saúde da família, suas percepções, opiniões e atitudes em relação à utilização da EAD.

Um estudo transversal, utilizando questionários autoadministrados, foi realizado em 28 municípios do Estado do Ceará, Brasil. O estudo foi parcialmente adaptado

a partir do trabalho realizado por Evans (1994) na Faculdade de Educação da Universidade Deakin, na Austrália. Seu trabalho foi baseado em histórias de vários estudantes recolhidas ao longo dos anos em que ele esteve envolvido em projetos de pesquisa e avaliação do ensino aberto e à distância. Em seu trabalho, ele permitiu que os alunos contassem suas experiências com suas próprias palavras, cobrindo em detalhes uma variedade de temas, incluindo os relacionados às questões de fundo social e educacional. Os temas incluíam aspectos familiares, escolaridade, experiências dos alunos como professores e outros aspectos importantes da vida dos alunos e as inter-relações com outros contextos mais amplos, como questões financeiras, sexo, poder, idade, trabalho e lazer.

Este primeiro estudo começou com a investigação das diversidades que o educador à distância pode esperar na formação educacional dos alunos. Em seguida, foram abordados vários aspectos da vida, das necessidades e do contexto dos alunos. Investigamos também aspectos relacionados com a concepção do curso e, por fim, examinamos alguns aspectos gerais relacionados com a motivação e interesse.

No total, 255 questionários foram enviados para os potenciais alunos e foi obtida uma taxa de resposta de 81,9%. Em termos de perfil e características dos participantes, os resultados mostraram que a grande maioria - 90,7% - não tinha nenhuma experiência anterior em educação à distância. Isso indica a necessidade de treinar os participantes na utilização de ferramentas de EAD. Além disso, a fim de serem bem sucedidos, os alunos que frequentam um curso à distância pela primeira vez devem ser orientados para manter certa disciplina em termos de tempo, lugar e reconciliação entre família, trabalho e lazer.

Os resultados relacionados às questões de fundo social e educacional dos potenciais alunos mostraram que a grande maioria dos participantes, em geral, teve uma experiência anterior positiva como estudante. Esse fato é positivo, principalmente para a educação à distância, pois os estudantes tendem a ser

mais bem sucedidos em outros cursos (Evans, 1994). Por outro lado, a maioria dos participantes não teve experiência de formação independente. Este achado foi considerado não tão positivo para a educação à distância, uma vez que a aprendizagem independente é frequentemente uma característica dessa abordagem. A conclusão foi que esses futuros alunos provavelmente teriam que se adaptar ou ser estimulados a usar a aprendizagem independente no caso de participar de um curso a distância.

Uma das principais conclusões deste estudo está relacionada com o desenho do curso, em particular quanto ao desejo de participar do curso a distância e as razões para isso. Na verdade, esses resultados são importantes e indicam que EAD é uma abordagem aceitável para ser usada na educação permanente dos profissionais de saúde da família.

As duas melhores opções selecionadas sobre as razões pelas quais eles gostariam de participar de um curso baseado na EAD - "para o meu autoaperfeiçoamento intelectual" e "para meu próprio prazer", indicam que os participantes do estudo têm uma motivação acadêmica / intrínseca e pessoal / motivação intrínseca, respectivamente, para participar de tal curso. Alguns autores (por exemplo, Sagar e Strang, 1985; Strang, 1987, citado em Rowntree, 1992) sugerem que os alunos com interesses intrínsecos tendem a obter notas mais altas do que aqueles com interesses extrínsecos. Os mesmos autores também descobriram que os alunos que têm várias razões para estudar têm um desempenho melhor do que aqueles que têm uma só. Estes estudos também afirmam que a motivação intrínseca estimula os alunos a obter o hábito de aprendizagem ao longo da vida, que deve ser o objetivo de qualquer sistema educacional.

Em relação às mídias a serem utilizadas no curso, as quatro mais selecionadas pelos nossos futuros alunos em ordem decrescente - material impresso, vídeo, computador e TV - em termos de suas preferências, deram pistas importantes para os planejadores do curso.

Em suma, os resultados mostraram que os participantes do estudo tinham percepções e atitudes positivas em relação à EAD e estavam motivados a participar de um curso em saúde da família usando uma abordagem baseada na EAD.

Finalmente, uma lista de recomendações foi obtida a partir dos resultados para ajudar os planejadores de curso à distância, em especial os planejadores do nosso programa baseado na EAD. Um resumo dessas recomendações é apresentado mais adiante neste capítulo, na seção *Implicações dos resultados*.

2. Como os médicos de saúde da família avaliam um curso baseado em dPBL que foi desenvolvido para eles?

No primeiro estudo, os resultados indicaram que os profissionais de saúde da família tinham percepções e atitudes positivas em relação à EAD. Esses resultados deram suporte à decisão de desenvolver um currículo baseado na EAD para capacitá-los. Três questões principais sobre o desenho curricular surgiram: (1) Qual seria o tema do curso? (2) Quais mídias e outras ferramentas e tecnologias de informação e comunicação (TIC) deviam ser escolhidas, e (3) Qual seria a melhor abordagem educacional à distância a ser utilizada?

Levamos em conta as conclusões e recomendações do nosso primeiro estudo para decidir sobre a primeira e segunda questões, isto é, o tema do curso e as ferramentas de TIC. Antes do início do processo de elaboração do currículo, mantivemos contato com um grupo de médicos de saúde da família e com a Associação de Profissionais de Saúde da Família e escolhemos juntos "a abordagem clínica das pessoas idosas com demência", como o tema do curso. Os dados epidemiológicos e as políticas nacionais e estaduais de saúde para as pessoas idosas também influenciaram nossa escolha. Com base no perfil, nas preferências e no acesso dos profissionais de saúde da família, escolhemos o computador como a principal mídia a ser utilizada no curso. Vimos anteriormente que o computador está entre as quatro mídias mais selecionadas pelos nossos

futuros alunos. Ademais, o computador é uma das mídias mais utilizadas em todo o mundo em cursos baseados na EAD.

Em relação à terceira questão, decidimos usar dPBL como a principal abordagem educacional. Uma abrangente revisão da literatura, descrita no Capítulo 3, apoiou esta decisão (ex, Baturay & Bay, 2010; Bowdish, Chauvin, Kreisman e Britt, 2003; Cameron, Barrows & Crooks, 1999; Chagas Faria, Mourato, Pereira & Santos, 2012; Valaitis, Espada, Jones & Hodges, 2005; Wheeler, 2006). A nossa própria experiência na utilização de PBL presencial em programas de educação permanente de profissionais de saúde também influenciou nossa escolha.

Desse modo, desenvolvemos um currículo baseado em competências, em problemas e na Web para o curso de pós-graduação - "*Abordagem Clínica do Idoso com Demência*". O curso tem 120 horas de duração (100 horas à distância e 20 horas presenciais) e foi disponibilizado por meio do Sistema de Gestão de Aprendizagem MOODLE®. O curso é dividido em cinco unidades e aborda vários temas, como o envelhecimento e demência, procedimentos de diagnóstico para avaliar o declínio cognitivo em idosos, o tratamento da demência (tratamento farmacológico e não farmacológico), ações coletivas para a promoção da saúde e modelos de atenção à saúde dos idosos com demência. Grupos de doze a quinze participantes foram apoiados por um tutor e estimulados para realizar as atividades do curso a uma taxa média de 10 horas por semana, com uma duração total de 12 semanas (3 meses).

Para responder a segunda questão desta tese foi realizado um abrangente estudo de avaliação do programa, com 42 médicos de família, que participaram de duas turmas do curso. Este estudo foi descrito no Capítulo 5. O objetivo deste estudo foi descrever o processo de elaboração do currículo e os resultados da avaliação do curso "*Abordagem Clínica do Idoso com Demência*" a partir da perspectiva dos participantes. Nossa intenção foi explorar o uso da combinação da Aprendizagem Baseada em Problemas (PBL) com a Educação a Distância (EAD) no contexto da educação para as profissões de saúde em um ambiente com baixos recursos.

Os participantes das duas turmas responderam um questionário autoadministrado com perguntas fechadas e abertas. As perguntas incluíram vários aspectos, como a qualidade dos materiais de ensino, a adequação da abordagem educacional escolhida, as ferramentas de tecnologia da informação e comunicação (TIC) utilizadas, o desempenho dos tutores e a satisfação dos participantes.

Em geral, os resultados indicaram que a abordagem baseada em competências para a elaboração curricular foi adequada para a nossa proposta, e que o curso foi muito bem avaliado pelos participantes. Uma pequena maioria dos profissionais de saúde da família que participaram do estudo era do sexo masculino (52,4%) e casados (64,3%). A média de idade foi de 42,6 anos, entre 27 a 66 anos. Eles tinham uma carga horária média de trabalho por semana de 45,6 horas, e uma média de 17,6 anos de prática clínica. Uma percentagem significativa dos participantes (85,7%) tinha acesso fácil a um computador, e a maioria (78,6%) tinha acesso fácil a Internet. Além disso, uma proporção significativa dos entrevistados respondeu que tinha pouca ou nenhuma experiência prévia com EAD (57,1%), e com o PBL (66,7%).

O uso do dPBL no curso foi interessante e motivador para a maioria dos entrevistados - 76,1% (N = 32). Os problemas foram bem avaliados. Os participantes consideraram que os problemas foram bem formulados e deram-lhes a oportunidade de estudar o conteúdo em profundidade. A aplicação dos sete passos foi clara para os participantes e o ambiente no grupo foi considerado agradável. Os objetivos de aprendizagem do treinamento de habilidades foram facilmente compreendidos e considerados relevantes para a prática deles, de acordo com 95,2% dos entrevistados. Os tutores demonstraram bom conhecimento dos temas abordados no curso, estimulou o grupo para o estudo e incentivou a discussão em grupo. A navegação no site do curso foi amigável para 95,2% dos participantes. De acordo com 83,3% deles, o fórum virtual é uma ferramenta adequada para a discussão em grupos tutoriais virtuais (GTV).

Os resultados sobre os aspectos gerais do curso mostraram que, de acordo com os participantes, o curso foi bom e o conteúdo foi considerado interessante, pertinente e adequado ao conhecimento prévio deles. Também acharam que o curso foi bem organizado, e, até certo ponto, os objetivos de aprendizagem propostos pelo curso foram alcançados.

Um achado importante deste estudo foi que, apesar do fato de que um terço dos participantes prefeririam fazer o curso de uma forma mais tradicional, a proposta de utilizar dPBL foi interessante e motivadora para a maioria deles. Este resultado indicou a viabilidade do uso de tal abordagem educacional para a educação permanente de médicos de família no Brasil. Este resultado está em coerência com um estudo transversal realizado no Estado do Ceará - Brasil, com o objetivo de avaliar a aceitabilidade de um curso baseado na EAD entre os médicos e enfermeiros do Programa de Saúde da Família (PSF), relatado no Capítulo 4. Os resultados mostraram que, em geral, os médicos de família e enfermeiros do PSF têm percepções e atitudes positivas em relação à EAD e estão motivados para participar de um curso baseado em EAD (Tomaz & Van der Molen, 2011).

No entanto, os resultados também mostraram que vários aspectos do dPBL não foram bem avaliados pelos entrevistados, destacando-se que eles acharam que nem todos os membros do grupo contribuíram ativamente nas discussões e que os colegas apresentaram suas opiniões de uma forma não muito clara. Além disso, apenas 52,4% dos entrevistados disseram que eles foram capazes de usar o programa de bate-papo (chat) e só metade deles consideraram que esta ferramenta contribuiu para a interação entre os participantes do grupo.

No geral, os resultados deste estudo foram coerentes com outros estudos de avaliação de dPBL, embora que alguns autores achem que é necessária mais investigação nesta área (Barrows, 2002; Valaitis et al, 2005). Valaitis et al. (2005), por exemplo, investigou as percepções dos estudantes de ciências da saúde sobre suas experiências no uso de PBL online, utilizando um modelo de seis passos durante o ciclo do PBL (Rideout & Carpio, 2001). Os autores se

concentraram no processo de aprendizagem e de grupo no ambiente online, e concluíram que o uso de PBL online é viável. Outros autores não apoiam a utilização desta abordagem na aprendizagem online e têm opiniões divergentes sobre a sua viabilidade (Taplin, 2000). A falta de proximidade física e os desafios no apoio ao estudante são exemplos das razões para esta divergência.

Por fim, concluiu-se que a abordagem baseada em competência para elaboração de currículos foi adequada para a nossa proposta e que os alunos perceberam a experiência de usar dPBL como interessante e motivadora. Assim, os resultados do nosso estudo podem indicar a viabilidade da utilização de tal combinação - PBL e EAD - para a formação de médicos de família no Brasil e talvez em contextos semelhantes.

3. Qual é a eficácia deste currículo para alcançar seus objetivos em termos do aprimoramento do conhecimento médico e das habilidades de diagnóstico?

Os dois primeiros estudos desta tese mostraram que, em geral, a abordagem EAD é aceitável para os profissionais de saúde da família e que os médicos de família avaliaram muito bem um curso baseado em dPBL. A fim de abordar a terceira questão central desta tese, foi realizado um estudo *quasi-experimental* com o objetivo de avaliar a eficácia de um curso baseado em dPBL para melhorar o conhecimento e as habilidades de diagnóstico de demência dos médicos de família. O Capítulo 6 relata seus resultados. O estudo centrou-se na avaliação da eficácia do curso "*Abordagem Clínica do Idoso com Demência*", um curso de pós-graduação oferecido pela Escola de Saúde Pública do Ceará, descrito em detalhes no Capítulo 2.

Foi utilizado no estudo o desenho baseado em pré-teste, pós-teste e grupo controle. Trinta médicos de família foram designados para o grupo experimental e o mesmo número para o grupo controle. Foram utilizados três instrumentos de coleta de dados: um teste de conhecimentos baseado em questões de múltipla escolha, um exame clínico objetivo estruturado (*Objective Structural Clinical Examination - OSCE*) para avaliar a habilidade do uso do Mini Exame do Estado

Mental (MEEM) e um teste baseado em casos clínicos para avaliar a habilidade para realizar o diagnóstico diferencial de demência.

Os resultados mostraram efeitos significativos do curso sobre o conhecimento dos participantes e as habilidades de diagnóstico. Os achados indicaram que os participantes do grupo experimental mostraram mais progresso em todas as três variáveis dependentes: o conhecimento, o uso do MEEM (OSCE) e a capacidade de dar um diagnóstico diferencial (DD) correto em comparação com os participantes do grupo controle.

A análise multivariada da variância (*Multivariate Analysis of Variance - MANOVA*) mostrou que a diferença entre os dois grupos foi significativa ($F = 10,38$, $p < 0,001$). Além disso, os testes univariados apresentaram diferenças significativas no teste de conhecimento ($F = 17,98$, $p < 0,001$), MMSE ($F = 63,47$, $p < 0,001$) e DD ($F = 43,98$, $p < 0,001$). O tamanho do efeito medido pelo d de Cohen é moderado para o conhecimento, muito grande para o uso do MMSE (OSCE) e grande para a capacidade de dar um diagnóstico diferencial (DD) correto.

Estes resultados, em parte, estão de acordo com os achados de outros estudos sobre a eficácia do dPBL. Por exemplo, os resultados do estudo realizado por Atan, Sulaiman & Idrus (2005) mostraram que os alunos do grupo experimental que participaram de um curso que utilizou dPBL apresentaram melhor desempenho acadêmico em comparação com os alunos do grupo controle que participaram do curso cuja abordagem foi baseada em conteúdo. Baturay & Bay (2010) avaliaram a eficácia de um currículo dPBL baseado na web em Ciências da Computação, e também encontraram resultados positivos em termos da obtenção de escores mais altos em um pós-teste de conhecimento por parte dos alunos do grupo experimental, em comparação com os alunos do grupo controle. Porém, Sendag & Odabas (2009) não encontraram efeito significativo em relação à aquisição de conhecimento em um curso baseado em dPBL. O curso foi sobre o uso de computadores na educação e foi oferecido aos professores estagiários do Departamento de Ensino de Matemática em Escola Primária da Faculdade de

Educação, na Turquia. Foi verificado, no entanto, que dPBL teve um efeito significativo sobre as habilidades de pensamento crítico.

Na área da saúde, Bowdish, Chauvin, Kreisman e Britt (2003), num estudo *quasi-experimental* baseado somente em pós-teste, comparou a utilização de um exercício baseado na aprendizagem baseada em problemas virtual (VPBL) realizado via Internet com uma versão baseada em texto do mesmo exercício. Os autores compararam o nível de aprendizagem dos estudantes de medicina do primeiro ano e suas percepções sobre o ambiente de aprendizagem. Os autores concluíram que o VPBL é tão eficaz quanto à versão baseada em texto na melhora da aprendizagem dos alunos e do seu ambiente de aprendizagem. Raupach, Muenscher, Anders, Steinbach, Pukrop, Hege e Túlio (2009), por meio de um estudo controlado randomizado investigaram o efeito de um módulo colaborativo virtual online sobre desenvolvimento de raciocínio clínico em comparação com um grupo tutorial do PBL tradicional. Os resultados sugeriram que o aprendizado virtual colaborativo foi tão eficaz quanto o PBL convencional na aquisição de habilidades de raciocínio clínico, embora tenha sido menos aceito pelos participantes (estudantes de medicina do quarto ano) do que as sessões de PBL tradicionais.

Uma limitação importante do nosso estudo foi que, por questões operacionais, um teste de *follow-up* não foi incluído. Por isso, não podemos tirar conclusões sobre os efeitos do curso em longo prazo. Contudo, apesar desta limitação, os resultados do presente estudo indicam que métodos pedagógicos inovadores, tais como PBL, podem ser eficazes em ambientes online com as vantagens e benefícios da abordagem da EAD. Isso tem grande relevância para a educação permanente dos profissionais de saúde, já que programas baseados em EAD podem alcançar um número considerável de pessoas (centenas e até milhares de pessoas) que vivem em diferentes lugares, alguns deles distando centenas de quilômetros de instituições de ensino, em um curto período de tempo. Em países com extensa área territorial, como o Brasil, o uso da abordagem EAD é ainda mais relevante. Em nosso contexto, temos de capacitar uma quantidade

significativa de profissionais de saúde, incluindo médicos de família, e demonstramos por meio do presente estudo que um programa bem concebido baseado em EAD pode ser uma estratégia efetiva.

Implicações dos resultados

Os resultados dos nossos estudos têm implicações científicas e educacionais, de acordo com os propósitos da presente tese apresentados no Capítulo 1. Em EAD, e certamente em outras áreas, há uma necessidade imediata e vital para desenvolver-se programas de pesquisa mais integrados, com base em um referencial teórico bem estabelecido (Moore & Kearsley, 1996). Conforme descrito no Capítulo 3, o desenho de nossos estudos é baseado em pelo menos três modelos teóricos: construtivismo, aprendizagem baseada em problemas e Educação a Distância. Acreditamos que nossos resultados contribuem para a produção de conhecimento sobre a relação entre estes três relevantes campos. De acordo com nosso conhecimento, este é um dos primeiros estudos de avaliação abrangente do programa e da eficácia em dPBL, no campo da educação dos profissionais da saúde, em um contexto de baixos recursos. Nós provamos cientificamente que dPBL é aceitável e eficaz para aprimorar o conhecimento teórico e as habilidades de diagnóstico em um ambiente com poucos recursos.

Os resultados dos nossos estudos também podem ter implicações educacionais gerais e específicas. Em termos gerais, os nossos achados podem fornecer uma estrutura que pode ser usada para a elaboração e estabelecimento de políticas efetivas de educação permanente para os profissionais de saúde da família em contextos com poucos recursos, como o Estado do Ceará, Brasil. Os achados desta tese podem também ter implicações econômicas e servir os interesses individuais e coletivos dos profissionais de saúde da família, dos gestores da área da saúde e da educação e da própria comunidade. Uma vez que as conclusões de nossos estudos mostraram que dPBL é aceitável e eficaz, os gestores educacionais e da área da saúde, apoiados nessas evidências, podem tomar decisões sobre a implementação de programas de educação permanente para as

equipes de saúde da família. Levando-se em conta a economia de escala e os benefícios da abordagem EAD, os programas de educação permanente podem ser oferecidos a um número maior de profissionais, ao mesmo tempo, e com custos mais baixos. Além disso, os profissionais de saúde da família podem ser mais motivados em participar de um programa baseado em EAD mais interativo e desafiador, com base em uma pedagogia inovadora, sem perder tempo e dinheiro em viagens e deslocamentos. Certamente, os gestores de saúde ficariam mais satisfeitos em ter os profissionais mais tempo no trabalho e a comunidade iria beneficiar-se com profissionais de saúde da família mais presentes e qualificados.

Em relação às implicações educacionais mais específicas, uma série de recomendações para a concepção e implementação de currículos baseados em dPBL em nosso contexto foi obtida a partir dos resultados dos nossos estudos. Um resumo destas recomendações é descrito a seguir.

Ao planejar um curso à distância para profissionais de saúde da família, os planejadores devem levar em conta o perfil predominante e as necessidades dos futuros alunos. Eles precisam ter em mente as diversas características dos alunos e precisam ser capazes de contemplá-las. Por exemplo, ao selecionar os meios de comunicação para o curso baseado em EAD, os planejadores devem levar em conta as preferências dos profissionais de saúde da família e o acesso a esses meios. Por exemplo, no nosso caso, material impresso, vídeo, computador e / ou TV foram considerados as melhores escolhas. Recomenda-se ainda que o que precisa ser ensinado / aprendido, durante em que período e em que contextos e como a aprendizagem vai ser avaliada devem ser decididos de acordo com as necessidades dos alunos. É sugerido também que durante o processo de desenho do currículo, seja mantido contato com um grupo de futuros alunos e / ou organizações dos alunos (por exemplo, no nosso caso a Associação de Profissionais de Saúde da Família) para avaliar melhor as suas necessidades.

Outra recomendação é sobre a experiência anterior dos alunos em EAD. De acordo com nossos resultados, a maioria dos potenciais alunos (profissionais de

saúde da família) não teve experiência prévia com EAD. Por isso, recomenda-se que no início do curso, ou mesmo durante o curso, algumas orientações sejam dadas aos estudantes sobre como ser um bom aluno em EAD (Evans, 1994). Naturalmente, cada um dos alunos tem seu próprio estilo de aprendizagem, mas eles precisam refletir sobre isso. O coordenador do curso e os tutores precisam orientá-los para que eles mantenham certa disciplina em termos de tempo, lugar e reconciliação com a família, trabalho e lazer, a fim de ser bem sucedidos em seu curso a distância e no seu processo de aprendizagem.

Recomenda-se também que o contato entre pares, colegas e professores (por telefone, internet, ou até mesmo pessoalmente) seja estimulado durante o curso à distância. Troca de experiências e feedback imediato são fundamentais para o processo de aprendizagem.

Outra recomendação importante é quanto à escolha dos meios e tecnologias de comunicação para a realização do curso. Isso é crucial em EAD. Nossos resultados mostraram que uma parte significativa dos profissionais de saúde da família disseram que tinham dificuldades de acesso a computador e à Internet, principalmente em áreas rurais. O computador é, sem dúvida, um importante meio de educação à distância nos dias de hoje. Desse modo, recomenda-se que os gestores de saúde e planejadores reivindiquem programas governamentais para estimular e subsidiar a aquisição de computadores e acesso à Internet para os profissionais de saúde da família como parte de um projeto de educação permanente. Livre acesso às bibliotecas virtuais e centros de estudo, poderia ser também uma valiosa estratégia para ser incluída no projeto.

A conciliação entre trabalho e estudo é outro aspecto relevante que necessita ser levado em conta pelos planejadores de programas em EAD. Embora nossos potenciais alunos tenham dito que eles são capazes de conciliar o trabalho com pelo menos 20 horas de estudo por semana, é sabido que, de fato, eles têm muitas atividades para realizar como profissionais de saúde da família. Assim, recomenda-se não sobrecarregá-los com muitas tarefas ao longo do curso, em

particular os médicos, já que os resultados dos estudos mostraram que eles têm uma carga horária semanal excessiva.

Em relação à estrutura do curso, a possibilidade de dar alguma flexibilidade da data de envio das atividades, o uso de sessões presenciais, como grupos de estudo e tutoriais, e planejar o treinamento de habilidades, preferencialmente, como sessões presenciais deve ser estimulada. Recomenda-se a inclusão de algumas atividades práticas presenciais durante o curso, como visitas a um centro de atendimento ambulatorial para os idosos com demência. Quando isso não for possível, sugere-se a utilização de estratégias mais autênticas de aprendizagem e tecnologias de presença virtual, como videoconferências. Isso poderia contribuir para aproximar o curso ao contexto real e para melhorar a aprendizagem dos participantes. Alguns participantes do curso sentiu falta desse tipo de atividade.

Uma implicação importante em relação especificamente à dinâmica de grupo do dPBL é a possibilidade de aplicação dos sete passos (Schmidt, 1983, 1993). Os resultados mostraram que a aplicação dos passos foi clara para a maioria dos participantes. Assim, o método PBL que já foi bem testado no formato presencial, pode também ser utilizado no formato de dPBL.

Finalmente, a principal implicação de nossos resultados é que é possível elaborar um currículo dPBL eficaz para a formação de médicos de família no Brasil, e este método pode ser auspicioso para a formação de outros grupos em similares contextos de baixos recursos.

Sugestões para futuras pesquisas

Destacam-se, nesta seção, sugestões de caráter geral e específico com base nos resultados dos nossos estudos. Começando por sugestões gerais, como indicado no Capítulo 1, em geral, os programas de EAD não são tão fáceis de implementar e, geralmente, os custos iniciais são altos (Rumble, 1997). Três perguntas devem ser respondidas antes da implementação de um programa baseado em EAD (Engel et al., 1992). As duas primeiras perguntas sobre a aceitabilidade e eficácia do programa baseado em EAD foram exploradas por esta tese. No entanto, uma

terceira questão ainda precisa ser abordada: seria o programa eficiente? Ou seja, valeria à pena o gasto de tempo e energia por parte do usuário e do provedor do programa? Portanto, outras pesquisas devem explorar esta questão.

Além disso, os estudos realizados nesta tese estão focados em um curso específico sobre as estratégias para abordar idosos com demência para os médicos de família. Os outros profissionais da equipe de saúde da família (enfermeiro, dentista, auxiliar de enfermagem, agente comunitário de saúde e outros) precisam ser incluídos em pesquisas futuras.

Neste e nos próximos parágrafos, vamos comentar e apontar sugestões mais específicas. Um primeiro aspecto é em relação à qualidade dos estudos em dPBL. Achamos que estes estudos ainda precisam ser melhorados. Barrows (2002) referiu que a maioria dos estudos nesta área tem sido baseada num pequeno número de participantes e apenas durante poucas interações ao longo do curso, e que existe uma falta de clareza na descrição do método de aprendizagem utilizado. Suas preocupações incluem questões como, por exemplo, se os problemas foram baseados em situações reais, como a interação do grupo e as tomadas de decisão foram estruturadas, qual era o papel dos facilitadores e como eles foram preparados, e quão centrado no aluno o método era. Na opinião do autor, o termo PBL tem sido ligado a uma miríade de diferentes métodos e uma classificação taxonômica para PBL ajudaria muito na realização de pesquisas em dPBL. Concordando com a relevância dessas preocupações, no presente estudo, foi utilizado um modelo PBL já bem testado, baseado em sete passos (Schmidt, 1983; 1993) e o método de aprendizagem foi descrito em detalhe. Recomenda-se, então, que mais pesquisas neste campo sejam concebidas tendo em conta estas preocupações.

Além disso, são necessários mais estudos com outros grupos de amostras e controlando outras variáveis, tais como os papéis do tutor, as características individuais dos alunos e estilos de comunicação, ou aspectos relacionados com a concepção e implementação do curso. Assim, para a generalização dos

resultados dos estudos, todos esses aspectos devem ser levados em conta. Na realidade, a comparação entre os estudos de eficácia de programas baseados em dPBL dependem das características dos alunos, do perfil e funções do professor/facilitador, do método educacional aplicado, do conteúdo do curso e do design instrucional. Embora os estudos desta tese tenham revelado resultados interessantes sobre o efeito do dPBL na aquisição de conhecimentos e habilidades de diagnóstico, uma melhor e mais definitiva compreensão dos fatores que influenciam a eficácia de currículos dPBL ainda é necessária. Como Dolmans (2003) afirmou: "Nós não devemos apenas focar nossa investigação sobre a eficácia de intervenções educativas, mas também na determinação sobre por que uma intervenção é eficaz ou não, e em que condições." (p. 1129).

Quanto aos aspectos relacionados com a realização de um currículo dPBL na prática, os resultados mostraram que várias questões não foram bem avaliadas pelos entrevistados, como o fato de que, na opinião deles, todos os membros do grupo não contribuíram ativamente nas discussões e que as questões não foram apresentadas pelos colegas de uma forma clara. Em nossa opinião, estratégias para estimular todos os membros do grupo para participação ativa em discussões de grupo virtuais, e como ajudá-los para apresentar suas opiniões de forma mais inteligível no ambiente virtual são aspectos relevantes da dinâmica de grupo em dPBL que ainda precisam ser explorados.

Além disso, tal como discutido no Capítulo 6, percebeu-se que um problema relevante de "cronologia" ocorreu na aplicação dos sete passos, principalmente durante o passo 3 - A análise de problemas. No PBL, os alunos analisam e levantam hipóteses sobre as causas e abordagem de problemas, utilizando seu conhecimento prévio (Schmidt, 1993; Barrows, 2002). O principal objetivo educacional desta etapa é exatamente ativar o conhecimento prévio dos alunos. Assim, no presente estudo, durante a análise do problema, usando comunicação assíncrona (fórum virtual), os estudantes tiveram tempo para procurar e ler a literatura previamente. Isso pode ter distorcido o funcionamento do PBL. O uso de comunicação síncrona (por exemplo chat) para iniciar a análise do problema

poderia ser uma possível solução desta dificuldade de 'cronologia'. O fornecimento gradual de literatura na biblioteca virtual também poderia minimizar esse problema. Porém, a eficácia dessas estratégias tem de ser abordada em pesquisas futuras.

Finalmente, não podemos tirar conclusões sobre os efeitos do curso em longo prazo, porque um teste de *follow-up* não foi incluído no projeto. Portanto, um estudo de *follow-up* seria recomendado.

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whole content of the course. He was also one of the course tutors and participated in data collection as one of the observers in a behavioral test used in a research component of the thesis. Another geriatrician from Federal University of Ceará, Jarbas Roriz, was also one of the course tutors and an observer in a behavioral test used in one of the pieces of research carried out for this thesis. Therefore, the participation and support of both geriatricians were fundamental for the development of this thesis and for this I am very grateful.

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Curriculum vitae (summary)

José Batista CisneTomaz was born in Sobral, Brazil. In 1984, he graduated in medicine at the Federal University of Ceará, Brazil. He is specialist in internal medicine; title obtained from the Brazilian Society of Internal Medicine in 1993. He was awarded a Master's degree in Management of Primary Health Care from the Instituto Superiore di Sanità - Rome, Italy, in 1995. In 2004, he attained a Master's degree in Health Professions Education from Maastricht University, in the Netherlands. He obtained the title of Specialist in Clinical Management of Health Care Networks from the Syrian-Lebanese Institute of Education and Research, São Paulo, Brazil in 2010. From 1984 to 1997 he held several roles as a general practitioner and as a manager of health services in the Brazilian National Health System. Since 1997 he has taken on various academic and management functions in the School of Public Health of Ceará, Brazil. He is currently Chair of the Center for Educational Development in Health (CEDES) and Center for Distance Education (NEAD) at the School of Public Health of Ceará, Brazil. Since 1997 he has also worked as a consultant in the field of Health Professions Education in various curriculum designs and continuing education projects of the Brazilian Ministry of Health and several public and private universities. His areas of interest in the field of health professions education include competence-based curriculum design, continuing education, Problem-based Learning and web-based distance education.

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