THE DESIGN AND PROGRAM EVALUATION OF A DISTRIBUTED PBL CURRICULUM FOR TRAINING FAMILY DOCTORS IN BRAZIL

José B. C. Tomaz, MD, MHPE, [batistatomaz@gmail.com], Center for Educational Development in Health, School of Public Health of Ceará, Av. Beira-Mar, 4344, 1102, Fortaleza, Ceará, CEP 60.165-121, Brazil [http://www.esp.ce.gov.br]
Henk T. van der Molen, PhD [vandermolen@fsw.eur.nl], Institute of Psychology, Erasmus University Rotterdam, Burgemeester Oudlaan 50, Postbox 1738 3000 DR Rotterdam, The Netherlands [http://www.eur.nl/fsw/english/psychology/]
Sílvia Mamede, MD, PhD [mamede@fsw.eur.nl], Institute of Psychology, Erasmus University Rotterdam, Burgemeester Oudlaan 50, T13-33, 3062PA, Rotterdam, The Netherlands [http://www.eur.nl/fsw/english/psychology/]

Abstract

Over the past decade Problem-based Learning (PBL) and distance education have been combined as educational approaches in higher education. This combination has been called distributed PBL (dPBL). However, 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 approaches for elderly people with dementia" offered by the School of Public Health of Ceará, Brazil. The course is 120 hours long and is available through the Learning Management System 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, 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 the course was highly rated by respondents.

Keywords: Problem Based Learning (PBL), distributed Problem Based Learning (dPBL); competence-based curriculum, distance education, web-based education, online courses.

Introduction

The purpose of this paper is to describe the programme and the results of the 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.

PBL: an alternative approach to conventional education

The conceptual foundation for dPBL is the PBL theoretical background, processes, methods, and outcomes (Scripture, 2008). PBL has been a well established constructivist educational approach in higher education. In the medical education field, PBL has been presented as a useful

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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.

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.

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. This procedure consists of seven steps (Figure 1).

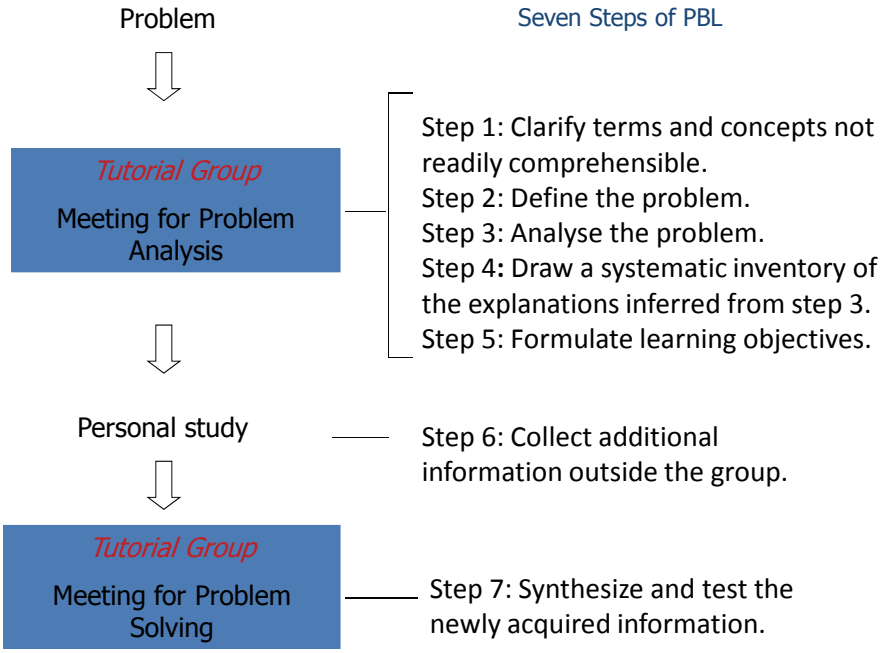

Figure 1. The PBL process

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

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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 authentic PBL method used in the curriculum (Cameron, Barrows & Crooks, 1999). The authors used traditional face-to-face tutor group sessions associated with dPBL in which the group participated from distributed sites. Another interesting use of dPBL in the health area was developed by Valaitis, Sword, Jones & Hodges (2005). 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.

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), 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.

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).

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). 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. 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. 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 dPBL 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 tutor's experiences with computer-

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mediated dPBL. Few studies have focused on the dPBL design and implementation from the planner'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 – 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).

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 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.

A competence-based dPBL curriculum design and implementation

The design of dPBL programmes is still a challenge for curriculum planners and it is an undeveloped area that needs to be more explored (Savin-Baden, 2003). The findings of the studies on dPBL design, although scarce, 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 present study we used that approach for designing the course "*Clinical approaches for elderly people with dementia"* that is described below.

The course "Clinical approaches for elderly people with dementia"

The course *"Clinical approaches for elderly people with dementia" (CAED)* 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.

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). 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.

ISSN 1027-5207

- 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 was based on the *authentic PBL* approach described by Barrows (2002), and on the seven steps model presented by Schmidt (1983) adapted to distributed, web-based context. 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. Synchronous communication tools (chats) were also used when needed for complementing the discussion or concluding the problem solving. 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). 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. 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.

In the present course 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.

In the following section we present a brief description of research and evaluation literature on dPBL.

The present study

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.

The main research question of the present study was: how does authentic dPBL work from the participants' perspective? For answering this main question a set of specifics 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.

ISSN 1027-5207

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 in 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 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, Derry, Hmelo-Silver, & Delmarcelle, 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?

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 – Brazil 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.

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.

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 Likert scale was used (1 – totally disagree and 5 – totally agree) (Crowl, 1996).

ISSN 1027-5207

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.

Results

The results of group 1 and 2 are presented together. We ran an independent samples t-test between the mean scores of the two groups and found no statistically significant difference between them, 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) and their evaluation (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

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 centers. The majority of the respondents asserted that they were able to use 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.

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 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 would prefer to have the course in a more traditional way. 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).

Table 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) and gave the opportunity to study the content in depth (*M* = 4.52).

ISSN 1027-5207

Table 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

Table 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).

Table 2: Means and standard deviations of respondents' answers related to the virtual group dynamics and application of the seven steps of 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 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. Only 23.8 % (N = 10) of the respondents agreed or fully agreed that the tasks of skills training were difficult for them.

Tutors performance

Table 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.

Table 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

Distance Education tools

Browsing the course website was friendly for 95.2 % (N = 40) of the respondents. Only 19.1 % (N = 8) had previously accessed the LMS (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.

According to 83.3 % (N = 35) of 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 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 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.

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

General aspects of the course

Table 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).

ISSN 1027-5207

Table 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 achieved	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 centre 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 indicate that the competence-based approach for curriculum design was very adequate for our proposal and the course was highly rated by respondents. These results show 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.

Regarding the course 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: the high dropout rate in DE programmes in our context, (around 30 %) (MEC-BRASIL, 2009; Almeida, 2010), our experience in face-to-face PBL and economics reasons.

ISSN 1027-5207

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).

The easy access to computer and to Internet and the ability of using 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 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. 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). As described previously, in the Course *"Clinical approaches for elderly people with dementia",* in the first face-to-face meeting participants were trained in using DE tools and in how dPBL works. In our study we chose common tools used in DE, such as a free LMS (MOODLE®), virtual forum, chat and email for interaction.

The results regarding the methodological approach are discussed here. 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 the majority of the participants. This result may indicate the feasibility of using such a combination for training family doctors in Brazil. In fact, 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).

According to the students' perception the three face-to-face meetings were essential for their understanding about the course. 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 et al., 1999; Taradi, Taradi, Radic, & Pokrajac, 2005).

The problems used in the course were highly rated by the respondents. These results are important, since in authentic 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; Barrows, 2002).

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. 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, Beaumont, Poh, & Westhead, 2004). Brodie (2009) identified several barriers, categorized in three main areas – time, technology and learning – to

ISSN 1027-5207

student participation and hence student learning in a PBL course which utilizes virtual teams. In the present study we suppose that all three categories had, to a certain extent, influenced that negative results.

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 fact that tutors have previous experience in PBL and could have good performance in guiding students to follow the steps.

Regarding skills training at distance, Degiorgio (2009), who was examining counselling skill acquisition for Rehabilitation Counselling 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 counselling 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.

We also examined the participants' perception about the tutor performance. Overall, tutors were well rated by respondents. Murphy, Shelley, White, & Baumann (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, Perry, & Janzen (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.

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-centred method (Schmidt, 1993; Barrows, 2002) and DE learners need to be stimulated to take responsibility for their own learning (Scripture, 2008). 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). 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).

In general, the DE technology and tools used during the course were well rated by participants, including the website, the asynchronous (virtual forum and email) and synchronous (chat) interaction tools. Tapscott and William (2008) 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 this requires a significant amount of effort, time and resources, and tends to be viewed by the learner as artificial games (Lehtinen, 2002). For these reasons, in our study, we chose common and simple technology.

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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 and the findings will soon be published.

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