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Santa Fé: Building a Virtual City to Develop a Family Health Game

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Abstract

The current tendency of education in health is the use of new technologies like Virtual Reality. The course of UNASUS-UFCSPA specialization in family health was developed for health professionals that work in primary health care (PHC); in order to reach all Brazilian territory. Moodle is a platform where virtual activities are posted and evaluated. Santa Fé is a virtual city created in the Sketch up Pro, which aims to fit in specific clinical cases that involve matters of medicine, nursing and dentistry. The Software eAdventure was the tool used for the development of a game, offering interaction to the student with the Virtual City and the clinical cases, in the perspective of learning utilizing an entertainment method and evaluating individual performance of the students. The building of the city in the Sketch up Pro was successful and at low cost. The eAdventure was an efficient and intuitive tool, therefore, there was not necessarily a huge specific knowledge of technology or hardware with high speed processing and also speedy broad band internet for its use.

Keywords:
Virtual Reality, Games, Family Health Care, Medical Education, eAdventure.

Introduction

The Brazilian Primary Health Care (PHC) is currently covering 50% of the country population with 32 thousand Family Health Teams (FHT) and it is distributed in 4400 cities throughout the territory, which occupies half of the whole Latin America[1]. The FHT has a minimal composition of one generalist physician, one nurse, two nurses technician and 4-6 community-based health workers (CBHW)[1.2]. Most of the health professionals in this team are newly graduated and in need of specialized formation for working in this context.
Until August 2011, the FHT was present in 95% (5284) of the Brazilian cities, covering around 53% (101,5 million people) of the population[16]. (Figure 1)
This project is part of the Brazilian Ministry of Health effort, called Universidade Aberta do Sistema Único de Saúde (UNASUS), which will enlarge the specialized development in PHC on a large scale. This project concerns the use of courses in the modality distance learning in order to reach a larger number of people in space of an optimized time.
One of its objectives is the integration of universities' leaders in the medical education within a national network to qualify the professionals working in the National Health System into using new teaching technologies and distance learning.

The objective of the UFCSPA`s project is to specialize one thousand health professionals in Family Health as physicians, nurses and dentists.

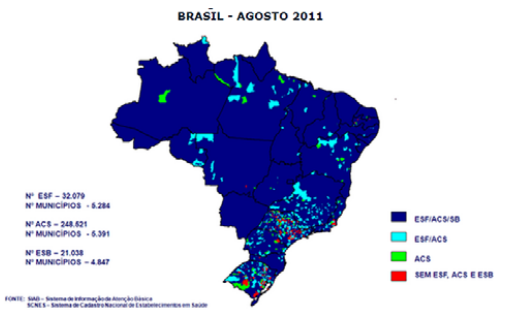

Figure 1 - Graphic of the Program of Family Health Strategy (Estratégia de Saúde da Família - ESF)

The length of the course is 18 months and the virtual platform used is the Moodle 1.8 platform. The UNASUS initiative already offered 17,000 vacancies for specialization, reaching all Brazilian states including the Amazon region.
To reach a large audience of health professionals, which is composed of new graduates and individuals with extensive experience in areas other than primary care, it is essential to use a variation of media and learning methodologies[3]. The new generation of students is already able to use new technology as educational tools and also reached higher scores in assessments than the ones that use more traditional methodologies[4]. The field of educational videogames is experiencing both increased acceptance and incorporation into current curricula as complementary content[5]. One of the explored possibilities is the use of virtual reality in order to simulate everyday situations, as well as the possibility of discovering a playful method of learning with the adults[3]. This also allows simulations of clinical situations associated with social and emotional factors without exposing patients.
Advanced 3D virtual environment technology, similar to those used by films and by the computer games industry can allow educational developers to quickly create realistic 3D and virtual environments. This technology has been used to generate a range of interactive learning environments across a broad spectrum of industries and educational application areas[6.7]. The use of such enabling visualization technology can affect the manner in which data is assimilated and correlated by the viewer; in many instances, it can potentially help make the information more relevant and easier to understand[6]. Ultimately, serious games are directed at reducing medical error and subsequent healthcare costs[8]. Technological innovations have improved the medical

performance in the choice of diagnoses. The virtual reality has been a systematic process of thought and can facilitate the development of transferable cognitive processes that are enriched by discipline-specific knowledge, evidence-based practice, experience, pattern-recognition and priority setting[7,9]. Games with interaction have the function of creating an invisible learning (stealth mode)[3,8] .

In order to mimic the work's routine of a health care system, the creation of a virtual city that could serve as a setting for the actions of the students was proposed. Many of the subjects related to the administration of the health area, as well as clinical situations. The creation of the fictitious city came from the formulation of clinical cases, where each character had two specific characteristics: work and home location, familiar context, historic character of disease, psychological and physical characteristics. In order to give realism to the cases, the creation of Santa Fé occurred in the perspective of freedom in the creation of such characters, with appropriate local to each individual.

Serious games are a term that has been used to describe video games that have been designed specifically for training and education[10]. The aim of this work was to create a representation of the fictitious city in virtual reality with the characteristics of the architecture of a countryside city of Rio Grande do Sul, Brazil and create an interactive game in Family Health.

Materials and Methods

Santa Fé is a virtual little countryside city of Rio Grande do Sul, Brazil. It has 36000 inhabitants, a higher human development index, with an area of 613 km², life expectancy around 74 years, and a per capita income around R$ 13.000,00 per year. All the important information was developed in order to make possible the characterization of a municipality, which could be used for the development of the course activities.

In the beginning, the city was created in second dimension. Professionals of the Literature and Health's areas made a low plant, delineating the geographical position of each area, distributing the PHC unit and other reference points of the city, for example: the main square, council, and hospital, according to the Figure 2.

For the manufacture of the city in third dimension, the following softwares of building in third dimension were used: Google Sketch up Pro 8.0[18], the software of edition of images in vectors Corel DRAWN X5[17]. The software XMind 2012 (v3.3.0)[19] was used for elaboration of complex flowchart and eAdventure for create a game.

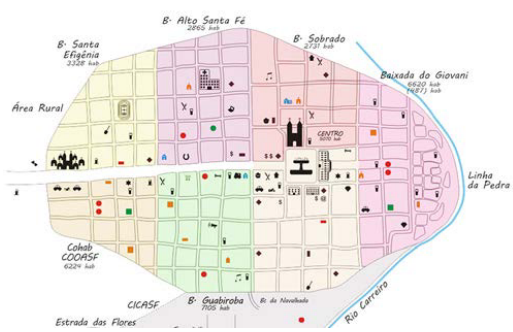

Figure 2 - Low Plant of the Santa Fé city in 2D how it was created.

The software Google Sketch up Pro 8.0 is a tool of projects' creation in third dimension. It was chosen for the ease of handling the elaboration of projects and for the experience of the professional with the software. The building of all residences and the establishments were handmade in order to make the progress of the project easier. The residences were also made in their internal parts. Cars, people and some smaller items were searched in the "warehouse" library and virtual library of the software.

The Corel DRAW is a program of bi-dimensional vector draw for graphic design, developed by the Canadian Corel Corporation. It is a software of a vector illustration and page layout that makes possible the creation and the manipulation of various products, for example: artistic design and manufacture of posters. The tool was used for the improvement of particular details of Santa Fé, such as: logos of all the establishments of the city, as well as street signs and the insides of the PHC unit.

The software XMind is a tool for explanation of complex flowchart, developed by the XMind Ltd., from Hong Kong. The program helps the users in the capture of ideas, organizing various graphics and sharing them easily. The program was also used for the development in tree of the logical reasoning of each stage of the game. Its use occurred with the image attachments, x-rays, banners and other contents that were, *a posteriori*, attached to the eAdventure software.

The eAdventure[20] platform is a research project aiming to facilitate the integration of educational games and game-like simulations in educational processes in general and Virtual Learning Environments (VLE) in particular. The e-UCM e-learning research group at Universidad Complutense, from Madrid is developing it.

The eAdventure was the chosen tool to give interaction to the virtual city of Santa Fé, creating a serious game. It's propose of an intuitive layout and with easy programming promotes an ease in the development of the game. Images of the virtual city of Santa Fé were used in order to show the way and the player inside the game. Characters for each cases were also created. The choice occurred mainly because of its interaction with the Moodle 1.9 platform that is already used in the course.

A notebook *HP* Pavilion dv6 was used, with a processor AMD Phenom(tm) II N850 Triple-Core 2,20 GHz, RAM memory of 4,00 GB, dedicated video cards of 1 GB and Windows 7 Home Premium operating system in the development of the virtual city and the game. For the compilation of the city for the video or image format, an Ultrabook Dell 14R was used, with an Intel Core i7 processor, 8 GB of SDRAM and Nvidia GeForce GT 630M, 128-bit, 1GB dedicated video card.

Results

The transformation of the fictitious city of Santa Fé for the virtual city was successful made. The time of length for the expansion of the project in the Sketch up Pro took months and a dental student with a research fellowship developed it. Geographical details and the arrangement of the houses and the buildings made Santa Fé closer to a countryside city of the southern of Brazil. Particularities like the church in front of the main square and nearby the council increased this similarity. The architecture from the Italian colonization became the environment similar to the historic concepts created for the city. Figure 3. Neighborhoods were created with the perspective of social discrepancy among them. Socioeconomic factors can be seen from one neighborhood to another.

Figure 3 - Image capture from the Sketch up, exemplifying part of the colonial architecture of Santa Fé.

The PHC unit had its internal structure developed in third dimension. Its appearance is similar to a Brazilian Family Health unit. Receptions, waiting room, medical office, nursing room, dental office, among other rooms were created to map the game out. Dental and medical equipments were also put in order to give reality to the local. Figure 4 and 5.

Figure 4 - Image captured from the Sketch up Pro: Reception of the Public Health Service

Figure 5 - Image captured from the Sketch up Pro: Medical office

In order to simulate stores and establishments, visual identities were created, for example: traffic signs, signs with name of streets and logo marks of stores, banks, supermarkets and posters of the internal parts of the Public Health Service. The CorelDraw X5 Software was efficient for the realization of layouts Figure 6.

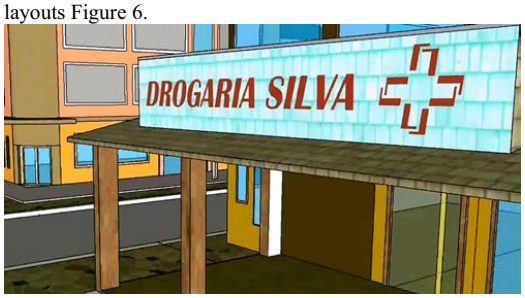

Figure 6 - Image captured from the Sketch up Pro: Virtual identities in the establishments

The XMind software was useful in the organization of the ideas for the development of clinical cases. The cases were organized in flowcharts in answers' tree Figure 7. Its use is intuitive and for easy handling. The inclusion of titles, subtitles, as well as attachments, brought enrichment and stimulus for creativity in order to solve the flows and also the cases in a same common denominator.

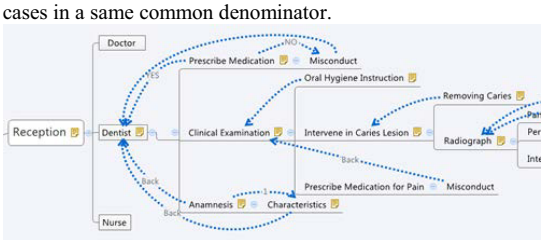

Figure 7 - Image of the XMind software for creation of the flowcharts in decision tree.

The developer tool of the game showed effectiveness in its performance, with low requirement of processing and without occurrence of bugs, the software can be defined as stable.

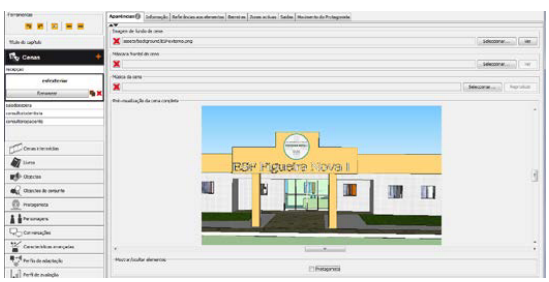

Figure 8 - Layout of the software of development of the game: eAdventure.

Discussion

A study in Zaragoza showed that 100% of the health professionals that had experience Second Life believe it facilitates learning and like the experience, although 58% did not consider it better than face-to-face and 90% had technical problems[11]. Nevertheless, in Brazil the internet access in many locations is of poor quality, so the use of the Second Life would not be possible. In the specialization, it is clearer the necessity for a lighter technology product due to a larger concentration of students in farther cities with the worst current service of internet. Therefore, the use of software that generates a simpler product to transmit was essential for the success of the initiative as most comprehensive and didactic resources for these students. It`s also important to generate versions of the game that can be stored on DVDs to be played off line.

The developer software of the game has a small, intuitive and organized learning curve, making easier the identification of the required resources. It has support for the main operating systems (MAC OS, Windows e Linux); the debugger, although contains certain graphic bugs, is extremely useful in this context. However, the simplicity of the tool restricts the activity, because it does not have programming, thereby decreasing the freedom of the creator.

The Sketch up Pro showed stability during the elaboration of the city. Even with the details in the external surface of the buildings and the houses, the size of the file and the request of the processor had low level, considering the size of the project.

However, when we use materials of the library of the software, the size of the file and the levels of processing exceeded the capacity of the hardware, making necessary the acquisition of a computer with a better performance.

The use of games became the tool innovation for teaching to health professionals, in solving potential psychological and behavioral problems that influenced the health of individuals and the possibility to develop new skills[12].

The evaluation of knowledge, skills and attitudes in the health area always is a challenge. In the new processes of evaluation and training, the inclusion of serious games as a tool have been considered, once it was used in other areas with success such as aviation[13]. Although the games and the softwares are developed with the objective of teaching health students, it is still difficult to evaluate its effectiveness, because of the complexity of defining parameters[8].

Conclusion

The development of an education project in health created in a third dimension showed an innovative character(8), considering that it is adapted for the local-regional conditions and use of free technology. The creation of a city in virtual reality and implementation of an interactive game abandons the static form of distance learning platforms are commonly used in Brazil. The games allow you to focus on the learning performance of students who may be influenced by knowledge acquired in the course combined their knowledge previos, changing the traditional pattern of education focused on what the teacher will teach. It eliminates the need for travel and improves access to educational activities for primary healthcare professionals in different geographical locations[11]. Games can have a good balance between teaching and the challenge[9]. This context turns around to the student that test his/her knowledge and, progressively, increases the degree of difficulty and go deeper into this knowledge or, considering the challenge, he/she searches new contents that, in other situations of teaching, he/she would leave in a second plan. The feedbacks of the game can be considered new learning material for the students.

This is an area that still needs researches, one of the areas that need to be explored further is the validation of the games as a learning tool for different audiences (age range, digital inclusion, level of training such as undergraduate and postgraduate, etc.) and in larger samples. The interaction between the games and the students is very promising and deserves an expansion in all educational institutions in a feasible and cost-effective manner[10].

References

[1] Bursztyn I. Notas para el estudio de la Atención Primaria en contextos de sistemas de salud segmentados. Revista de Salud Pública. 2010;12:77–88.

[2] Castro R. Quality assessment of primary care by health professionals: a comparison of different types of services. Caderno de Saúde Pública. 2012;28(9):1772–84.

[3] Le Beux P. Virtual biomedical universities and e-learning. Int J Med Inform. 2007;76:331–5.

[4] Golchai B. Computer-based E-teaching(virtual Medical Teaching) or traditional teaching: A comparison between Medical and Dentistry students. Procedia - Social and Behavioral Sciences. 2012;47:2080 – 2083.

[5] Marchiori EJ. A visual language for the creation of narrative educational games. Journal of Visual Languages and Computing. 2011;22:443–52.

[6] Schofield D. Experiences with Virtual Learning. SBC Journal on 3D Interactive Systems. 2012;3(1):18 – 26.

[7] Le Beux P. Developing the Serious Games potential in nursing education. Int J Med Inform. 2007;76:331 – 335.

[8] Graafland M. Systematic review of serious games for medical education and surgical skills training. Br J Surg. 2012; 99(10):1322–30.

[9] Schreuder HW. Implementation of simulation in surgical practice: Minimally invasive surgery has taken the lead: The Dutch experience. Med Teach 2011: 33(2):105-15.

[10] Annetta L. The "I's" Have It: A Framework for Serious Educational Game Design. Review of General Psychology. 2010;14:105–12.

[11] Palazón E. Experience with using second life for medical education in a family and community medicine education unit. BMC Medical Education. 2012;12(30):1–9.

[12] Kato P. Video Games in Health Care: Closing the Gap. American Psychological Association. 2010;14(2):113–21.

[13] Moreno-Gera, P. Application of a low-cost web-based simulation to improve students' practical skills in medical education. International journal of medical informatics. 2010;7 9:459–67.

[14] Zhang J. Virtual City Ground Object Modeling and Visualization Based on OpenGL. Materials Science and Engineering. 2012;263 - 266:1910–5.

[15] Lahti M. Impact of e-learning on nurses' and student nurses knowledge, skills, and satisfaction: A systematic review and meta-analysis. International Journal of Nursing Studies. 2012;4.

[16] Brasil - Ministério da Saúde: Departamento de Atenção Básica a Saúde da Família [Internet]. [cited 2012 dez 08] Avaliable from http://dab.saude.gov.br/abnumeros.php#mapas

[17] CorelDRAW [Internet]. Softonic. [cited 2013 Mar 31]. Available from: http://coreldraw.softonic.com.br/

[18] Sketchp Pro[Internet]. Trimble. [cited 2013 Mar 31]. Available from: http://sketchup.com/intl/pt-BR/download/

[19] Xmind 2012 [Internet]. Xmind [cited 2013 Mar 31]. Available from: http://xmind.net/download/win/

[20] eAdventure [Internet]. e-UCM [cited 2013 Mar 31]. Available from: http://e-adventure.e-ucm.es/

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