

In Search of the Lost Donor: An educational game as a tool for education and awareness of blood donation

Paulo A. I. Pontes Rafael O. Chaves
Emanuel M. C. Tavares* Elói L. Favero

Federal University of Pará, Post-Graduate in Electrical Engineering Program
Applied Computing. Belém, PA.

*Mackenzie Presbyterian University, Post-Graduate in Electrical Engineering Program
Applied Computing. São Paulo, SP.



Figure 1: Main character. Screen of the game.

Abstract

Faced with difficulties in raising blood bag donations, blood centers always try to sensitize donors in order to keep its banks stocked. This paper presents a partial simulation of this reality through an electronic educational game that focus to inform and raise awareness of the benefits of blood donation by answering frequently asked questions and demystifying widespread beliefs. By trying to educate and not only entertain, this game presents a common theme in a creative, motivational way with social change potential. The game contextualizes the difficulties of finding suitable blood donors and teaches about basic issues of the donation process. Through the results of an experiment with suitable blood donors, the game proposal was validated as a way to raise awareness about the social and health importance of the donation process.

Keywords: games, information, donation.

Authors' contact:

{paulo9pontes,rafael.ufpa,
emanuelmaues, eloi.favero}@gmail.com

1. Introduction

Although video games are widely used for entertainment purposes, they may also play a role in promoting attitude changes in players [DEMPSEY et al. 1996]. These changes can occur through careful observation that encourages a new consciousness.

Games that simulate and demonstrate social facts and rules allow the player to acknowledge that are not part of its immediate context, but which are relevant to his community. As an example, “Environmental Education” is a topic broad enough to be published with different approaches: Rose [2009] presents educational games on sustainability in environmental education; Jansen et al [2007] addresses it as a response to environmental issues and Silva [2007] presents modeling of an educational application focused on the topic. However, issues of equal importance to society, such as blood donation, lack research into the development of related games.

During research, it was not found any other game suited to teach the player the benefits of donating, even less teaching about donation myths or offering additional details about the process. This highlights the importance and motivation to produce such game.

Donating has crucial importance because there is no substitute for human blood. This habit saves lives during surgeries, accidents, natural disasters, helps cancer treatment and chronic kidney disease. Currently, the maintenance of an adequate blood supply is a challenge because the only way to meet regular demand is through volunteering donations who meet the criteria established by the Brazilian Ministry of Health (MS).

According to Franco [2005], Brazil needs 5,500 units of blood on a daily basis. However, only 1.7% of the population is a donor. World Health Organization (WHO) recommends 3-5%. It is believed that this index is a consequence of myths and taboo that are perpetuated in society and the ignorance of how important blood donation is.

The possibility to use games as a potential tool to assist in the transformation of this reality led to the creation of a game able to simulate some of the main challenges and difficulties to obtain new donors. This approach is based on awareness reflection and subsequent change in players' attitude when they realize the difficulties and problems related to donation. Currently, this work-in-progress project is named "In Search of the Lost Donor" (ISLD).

This educational game is classified as a social simulation (*The Sims*¹ is an example). Its interaction is characterized by a character who tries to find and convince ordinary people to become donors while facing the following difficulties: myths about donation, rare blood types and the basic requirements for the act. These challenges set the context of the game and were chosen because they represent the most common obstacles that are directly related to the donor candidates.

An experiment was conducted to evaluate the objective of raising awareness about blood donation. The sample was a group of students from the Federal Institute of Pará (IFPA). After a play session, it was observed that almost all the 23 students which at the beginning of the experiment were not donors changed their minds about it. This result is quite positive because the game was developed with simple computational resources (e.g. graphics and sounds). Therefore, the social appeal of the game was more taken in consideration.

2. Related Work

The use of digital game as a tool to assist in the teaching-learning of various subjects is increasingly common. Besides the natural attraction of people for games, this tool makes learning more attractive.

In Rosa [2009], it is shown the percentage of educational games published according to areas of knowledge and makes clear the importance of working in the play areas linked to public health.

Silva *et al* [2011] proposes a dynamic educational game as a tool against dengue, whose main focus is to show the symptoms caused in people who contract the disease and the fight against the mosquito *aedes aegypti*. During the game, the character should see a doctor to obtain a diagnostic, manage disease outbreaks quickly and bring medication to the infected. To destroy mosquitoes, the player must have certain tools while avoiding being bitten by them. Each bite will decrease the player's health bar. It is a game that seeks to inform important aspects related to dengue, which is a subject worth of special care, because even with numerous awareness campaigns, there are still people who do not give attention to this issue. The same problem occurs with blood donation.

The interface of the game Ginger Dawn [2011] was seen as a reference: the player controls a red-haired

character searching to interact with red-haired women in order to prevent the extinction of redheads. Difficulties will be encountered as not all women approached are willing to engage with the main character or do want to have children. In a similar way, ISLD has a character that needs to interact with other people to convince them to become blood donors; however it is impossible to enlist everyone given MS criteria or unwillingness.

2.1 Educational Games

In Tavares (quoted in Rosa [2009]), the most common educational games are boring and tend to become an obligation for children and adolescents. It does not help if in-game characters and stories do not engage them. Although Tavares also warns that there are two key points in the development of electronic educational games: interface and didactic. The man-machine communication has to be friendly, intuitive and precise. For this, the designer needs to find solutions that facilitate user action: games that require reading large manuals certainly have design problems. When it comes to teaching, Tavares says that educational goals cannot be explicit, otherwise the player loses interest. Ideally, students must have a desire for playing without even realizing it. An example is the game "*Where in the World is Carmen Sandiego?*"² where the player learns about geography and the culture of various European countries as he seeks the thief Carmen Sandiego. Besides school, many corporations are using games to train their employees by helping them to understand company business assignments [Flausino 2006].

According to Alves (quoted by Martins [2009]), games promote the construction or reorganization of cognitive functions such as memory, attention, creativity and imagination. The main problems educational games face, according to young users, are: lack of interesting challenges, low level of immersion, poor graphics and low level of interaction.

Games produced for educational purposes compete with commercial games that have millionaire budgets for the production of their titles, while many of the educational games are produced within universities with low budgets and inexperienced staff.

3. The Game

3.1 Motivation

Electronic game simulation aims to emulate the real-world through virtual reality. By interacting with this kind of game, the player will be able to experience old or new situations. [KRÜGER and CRUZ] point some characteristics of gaming simulation with emphasis on the possibility of interaction that these games have and the degree of realism, which is essential. Another very important feature in this kind of game is the fact that scenery and action creation are made to solve problems found in real life (cited in Fonseca 1992).

¹ thesims.com

² www.carmensandiego.com

In this context, “In Search of the Lost Donor” aims to promote learning and human development based on its main objective to inform blood donation criteria and myth clarification, allowing the user to visualize the difficulty to find new donors.

3.2 Citations and References

It is believed that web games have a great potential for marketing. Unlike other media, they are within easy reach worldwide and favor a more effective experience on social issues in order to transform reality.

The game proposal combines learning with awareness and makes constant use of communication, since dialogue is one of the main actions. Dialogue is established between the player and people around. The first needs to convince the latter to donate. Every person has different characteristics, which became evident while talking with them. Conversations portrait situations inherent to blood donation, such as: basic requirements for the act and myths.

Since the game has an educational purpose, its data and content were rigorously selected and prepared to avoid spreading more misinformation and biased assumptions when it comes to donations. However, these are much more complex than the game portrays; they merely show how difficult it is to find donors when most present lack of interest, myths or doubts about the act.

These objectives can be achieved at a low cost, since this game was developed as part of MSc. thesis from the Graduate Program in Electrical Engineering from Federal University of Pará (PPGEE/UFGPA). Technical supported was provided by the Blood Center of the State of Amapá (HEMOAP).

“In Search of the Lost Donor” is a 2D game set in an urban environment where the player must talk to people about their interest in donating blood. This talk serves to decide if the person will donate or not, whether as a result of myths or because MS criteria were not met. The player must be quick to find suitable donors so there’s always enough blood of each type (A +, A-, B +, B-, AB +, AB-, O +, O-).

3.3 Characters

Besides the playable character (Figure 2) there are another characters (some example in Figure 3). Each has randomized characteristics not noticeable in appearance, they can only be found through talk. They can be divided between those who will donate and those who do will not (Table 1).



Figure 2: Main character.



Figure 3: A few non-player controlled characters.

Table 1. Randomized characteristics among characters

Will not donate	Will donate
Strong myth believer: the person strongly believes in myths. Even after clarification, fear remains;	Weak myth believer: They believed in lies but after enlightenment, they finally agree to donate.
Unconditional: the person is simply not interested;	Does meet MS criteria: the person is willing to donate and his blood is apt for donation.
Does not meet MS criteria: intention alone is not enough. If the criteria are not met, donation cannot happen.	

3.4 System Features

This game is developed using Construct 2³ which is an HTML5⁴ game engine.

3.4.1 Environments

When the game starts, the player will have access to the main menu (Figure 4) where six options are found: blood donation, requirements, instructions, credits, game start and exit game.



Figure 4. Main screen.

3.4.2 Blood Stocks

Duration of the game is based on blood stocks. The player must be aware of the quantity of each blood type, which are presented in the game Heads Up Display (Figure 5). When any of them reaches zero, it is game over.

³ www.scirra.com

⁴ pt.wikipedia.org/wiki/HTML5



Figure 5. Blood stocks for each type.

3.4.3 Searching for donors

The player must control the main character to walk by the scene to search for people to convince them to donate (Figure 6). When you are successful, the stock is increased given the donor's blood type.



Figure 6. Player talking with another character.

3.4.4 Myths

Myths are misassumptions about consequences of donating. They are originated by misinformation and ignorance. They are an obstacle for people to agree to donate, being the reason why it is one of the central concerns of the game. Some common examples are:

- Donating turns the blood thicker or thinner.
- The donor fattens or loses weight.
- The donor becomes addicted to donate.
- Doubt as to the actual use of the blood.

3.4.5 MS basic requirements for donation

Standard MS requirements for blood donation are used as reference in the game (Figure 7). They are:

- Good health conditions;
- Have an age between 18 and 65;
- 50 kg minimal weight;
- No signs of flu or fever;
- No ingestion of alcohol six hours before.
- No tattoos, piercings, acupuncture treatments in the last twelve months;
- Man can donate four times per year. There's an interval of 60 days per donation;
- Woman can donate three times per year. There's an interval of 90 days per donation.

It's important to notice that there's a bigger and more complex list of requirements. Screening for eligible donors is a task that must be performed by qualified professionals.

Condições básicas para doar sangue:

- Sentir-se bem, com saúde.
- Apresentar um documento com foto, emitido por órgão oficial e válido em todo o território nacional.
- Ter entre 18 e 65 anos de idade.
- Ter mais de 50 kg.

Honestidade também salva vidas.

Embora sejam realizados exames no sangue coletado: tipagem sanguínea, hepatite B e C, sífilis, doença de Chagas, HIV, HTLV I e II, há um período chamado de janela imunológica, que é o espaço de tempo entre a contaminação e a positividade do teste. Isso significa que a pessoa pode ter sido contaminada por um agente infeccioso (vírus) e este não ser detectado por meio dos exames realizados. Então, é fundamental que você seja sincero na entrevista. Diante de um teste positivo ou inconclusivo, o doador será convocado por carta para a realização de testes confirmatórios.

Recomendações para o dia da doação:

- Nunca doe sangue em jejum.
- Faça um repouso mínimo de seis horas na noite anterior à doação.
- Não ingerir bebidas alcoólicas nas 12 horas anteriores.
- Evite fumar por pelo menos duas horas antes da doação.
- Evite alimentos gordurosos.

Quem não pode doar?

- Quem teve diagnóstico de hepatite após os 10 anos de idade.
- Mulheres grávidas ou que estejam amamentando.
- Pessoas que estão expostas a doenças transmissíveis pelo sangue, como aids, hepatite, sífilis e doença de Chagas.
- Usuário de drogas.
- Quem teve contato sexual com múltiplos parceiros nos últimos 12 meses.

O que acontece com o sangue doado?

Todo sangue doado é separado em diferentes componentes (hemácias, plaquetas, plasma e outros) e, assim, poderá beneficiar mais de um paciente com apenas uma unidade coletada. Os componentes são distribuídos para os hospitais da cidade para atender casos de emergência, pacientes internados e pessoas com doenças hematológicas.

AJUDAR TÁ NO SANGUE

Figure 7. MS promotional material to encourage blood donation.

3.5 People's profiles

During execution, donor candidates are automatically generated through random function of Construct 2: every individual has its unique profile. This contains the following attributes: blood type (B.T.), sex, age, weight, impediments, donor and myths. Each attribute has a randomly generated value. Table 2 shows a set of lines representing the characteristics of individual characters.

Table 2. Individual Characters Profile

B.T	Sex	Age	Weight	Impediments	Donors	Myths
A-	M	60	89	0	0	0
O+	M	45	86	0	0	MITO 2
O+	M	64	110	1	1	0
A+	F	52	65	0	0	0
B+	F	46	69	2	0	MITO 1
B+	M	58	54	3	1	MITO 3
O+	F	62	115	6	1	0
O+	F	48	86	0	1	0
O+	F	67	94	5	0	0
A+	F	43	86	0	0	MITO 5
A+	F	41	99	2	1	0
B+	F	58	84	4	0	MITO 2

3.5.1 Blood type

Blood type percentages used in the game reflect Brazilian's population reality when it comes to donation demand (Table 3). These normalized numbers are from Pro-Blood Foundation from Sao Paulo.

Table 3. Blood percentages

A	+	34%
	-	8%
B	+	8%
	-	2%
AB	+	2,5%
	-	0,5%
O	+	36%
	-	9%

Blood groups percentage in Brazilian population is approximately equal to world's population. However, certain ethnic groups (with little or no mixing), such as indians, have a O+ majority.

3.5.2 Sex

The characters' gender is defined by a 50% probability.

3.5.3 Age

The characters' age is defined by an interval where the probability to be between 18 and 65 is a lot higher, to allow not only a greater realism but to simulate situations where the character does not have enough age to donate.

3.5.4 Weight

A 50 kg weight is the minimum allowed to blood donation. To randomly generate the characters' weight, there's a small possibility to generate one smaller than the allowed, ranging from 45 to 49 kg. The remaining possibility ranges from 50 to 120 kg.

3.5.5 Impediments

A character can have an impediment to donate. This attribute was randomly generated based on basic requirements to donate blood. There is a probability for each requirement, each one presented in Table 4. The remaining probability corresponds to a character which has no impediments to donate.

Table 4. Probability for each basic requirement to donate blood.

Description	Probability
Flu or fever	10%
Drank alcohol in the last 12 hours	10%
Anemia	5%
Tattoo done in the last few months	5%

A man who exceed its limit of donations.	5%
A woman who exceed its limit of donations.	5%
No impediments	60%

3.5.6 Myth beliefs

A character can have myth beliefs. The probability for a character to have a particular myth is presented in Table 5.

Table 5: Myths and their probabilities to occur.

Description	Probability
Thicken or thin	10%
It really is used?	10%
Addicts?	10%
Fattens or loses weight	10%
No myth	60%

3.5.7 Donor

Donor candidate attributes were generated after they were split between donors and non-donors. There's a 60% and a 40% probability for a candidate to be one, respectively.

4. Results

4.1 The experiment

Game evaluation occurred with 26 people, aged 18-38 years, students from Buildings and Computing of the Federal Institute of Pará – Campus Marabá.

The experiment was split in three moments: 1) at first, there's a form to answer questions about blood donation, myths, doubts and if the person identifies himself as a donor or not; 2) a game session, with six minutes for each student; 3) filling of a new form with questions about the game, its level of awareness and how much it stimulates blood donation.

4.2 Detailed results

While the experiment was performed, the following observations and suggestions were obtained, as shown in Figure 8.

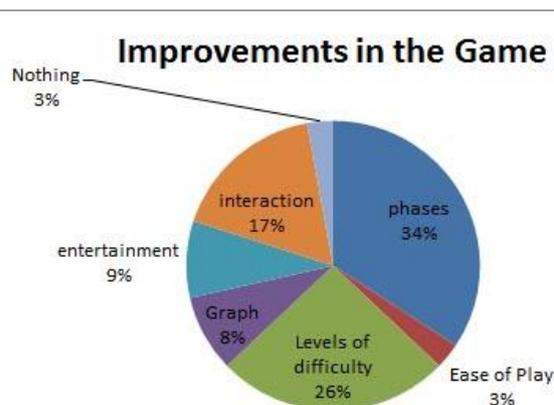


Figure 8: Suggested game improvements

- 3% found the game too hard to be played;
- 26% suggested the game needs difficult levels: easy, medium and hard;
- 8% criticized the graphics. They suggested the possibility to create new characters and complained about the environment's design;
- 9% complained that the game should be more fun. They proposed more dynamic in-game situations that could occur, beyond looking for donors. It was also suggested to show above each character their blood type, so the player can prioritize which person he will try to convince;
- 17% suggested a better game interaction, allowing parallel strategies to be done;
- 34% suggested new and diverse levels to be created;
- 3% would not change anything in the game.

Observed behavior in players:

- At the beginning of the experiment, some participants had questions about the game controls because most players skipped instructions that were presented in the menu. However, the dialogue with the donor candidates was carefully read, except when the users tried to skip them so they could talk to more candidates;
- A discussion about the main aspects and various issues of blood donation was done after the game session;

According to the answers filled in the forms, the 26 people sample was divided in two groups: donors (3 people) and non-donors (23 people) as shown in Figure 9. Figure 10 shows that almost all test subjects (specifically all donors and 21 non-donors) agreed that the game stimulates blood donation. These results corroborate the premise that the game is a useful tool to raise awareness and encourage this act. A result of greater importance is positive impact the game had in the non-donors.

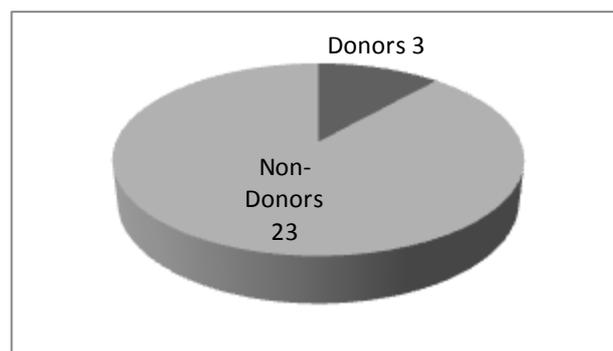


Figure 9: Profile of Interviewed.

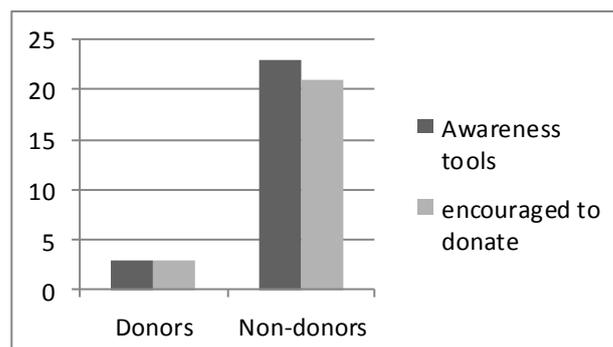


Figure 10: Usefulness to raise awareness and encouragement to donate

5. Results

The results obtained made possible to perceive the importance this game can achieve through its information strategy. It was shown (Figure 10) that 100% (all 23) of the non-donors stated the game served as an awareness tool and 21 (nearly 92%) of them stated the game encouraged blood donation, therefore the project's objective was successfully achieved.

As proposed future experiments, it is highlighted the need to expand the target audience. While the experiment focused on potential donor candidates, with ages varying between 18~65 years, it would be interesting to approach people under 18 and observe their reactions to the game, since the game could not only help actual candidates but also shape the mind of future ones.

Other rules and facts about blood donation will be added to the game to increase realism: an example is people that do not tell the true about themselves in screening interview: this irresponsible behavior can bring serious prejudice to people that need the transfusion. Thus, it will be used to aware players about how important it is to answer truthfully during screenings.

Given the suggestions of the students along the experiment, the game will undergone graphical improvements, more levels will be created and difficulty modes will be added, so the project appeals to an even wider audience.

Acknowledgements

The authors would like to thank Ivan Daniel Amanajás, Director of the Blood Center of Amapá - HEMOAP for his technical support and enthusiasm for this work.

We are grateful to IFPA - Federal Institute of Pará that offered the computer labs for this work be possible.

References

- DARWICHE, Mohamad, FEUILLOY, Mathieu, BOUSALEH, Ghazi and SCHANG, Daniel, 2010. *Prediction of blood transfusion donation* – IEEE.
- DAWN, Ginger, 2011. Site Uol. Disponível em http://jogosonline.uol.com.br/ginger-dawn_867.html#rml [Acessado em agosto de 2011]
- DEMPSEY, J.V, LUCASSEN, B, and RASMUSSEN, K., 1996. *The Instructional Gaming Literature: Implications and 99 Sources, tech. report 96-1*. College of Education, Univ. of South Alabama, 1996.
- FLAUSINO, Rodrigo, 2006. Os Jogos Eletrônicos e seus Impactos na Sociedade - Faculdade Cenecista de Varginha. Varginha, 2006. Disponível em <http://www.rodrigoflausino.com.br/os-jogos-eletronicos-e-seus-impactos-na-sociedade/>. [Acessado em maio de 2012]
- FRANCO, Patrícia, 2005. *A importância da doação de sangue e formação de novos doadores em palmitos*. SC - CEO/UDESC.
- FONSECA, Lázaro Emanuel Souza. *Os Jogos Eletrônicos de Simulação: Aprendendo com o The Sims*. In: Revista da FAEEBA / Universidade do Estado da Bahia, Departamento de Educação I – v. 1, n. 1, p.113-121, (jan./jun., 1992) - Salvador: UNEB, 1992.
- JANSEN, Giane Roberta, VIEIRA, Rafaela and KRAISCH, Raquel, 2007. *A educação ambiental como resposta à problemática ambiental*. Universidade Federal do Rio Grande 2007.
- KRÜGER, Fernando. Luiz. and CRUZ, Dulce. Márcia, 2002. *Jogos (virtuais) de simulação da vida (real): o The Sims e geração Y*. Universidade Federal de Santa Catarina. Disponível em: <http://www.uff.br/ciberlegenda/fernandokrugerdulcecruz.pdf>. [Acesso em 24/06/2012]
- MARINS, Jodeilson Mafra, 2009. *Jogos Eletrônicos e as Políticas Públicas de Inclusão Interativa* - Faculdade de Comunicação. V Estudos de Estudos Multidisciplinares em Cultura. Salvador-Ba, 2009. Disponível em: www.cult.ufba.br/enecult2009/19519.pdf. [acessado em maio de 2012]
- ROSA, Antonio Vitor, 2009. *Jogos Educativos sobre sustentabilidade na educação ambiental crítica*. Universidade Federal de São Carlos – SP
- SILVA, Alessandro Antunes, 2007. *A Fazenda Software Educativo para a Educação Ambiental*. UFRGS, 2007.
- SILVA, Flávio Soares Corrêa da, 2005. *Agentes Inteligentes em Jogos de Computador*. Tópicos em Ciência da Computação. Faculdade de informática. USP.
- SILVA, Walter da, ALMEIDA, Ailson de ALVES, Douglas da Silva, ANDRADE, Mariel and ARAUJO, Alberto, 2011. *Exterminadores de Dengue: Um jogo educativo dinâmico como ferramenta de educação contra a dengue*. Universidade Federal Rural de Pernambuco, Unidade Acadêmica de Garanhuns 2011. Disponível em: http://www.sbgames.org/sbgames2011/proceedings/sbgames/papers/cult/short/92252_1.pdf. [acessado em fevereiro de 2012]
- WHO, 2000. *Strategies for Blood Donor Recruitment, Report of an Intercountry Workshop 24-28 September 2000*. Disponível em: http://whqlibdoc.who.int/searo/2001/SEA_HLM_333.pdf