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The role of animated pedagogical agents in scenario-based language e-learning: a case-study

Eliseo Reategui¹, Eunice Polonia², Letícia Roland³

UCS; NUED – UFRGS; LearningBrazilian.com

Key words: *CALL, e-learning, pedagogical agents, scenario-based learning*

Abstract:

Scenario-based language e-learning (SBEL) is focused on contextual learning, since it uses authentic activities that can improve communication skills. This paper reports a case-study that proposes the use of animated pedagogical agents (APAs) in a Brazilian Portuguese web-based course built under a mix of task- and scenario-based approaches. Its main purpose is to discuss how APAs can be used to improve students' communicative skills, cultural awareness and level of interaction with course's content.

1 Introduction

According to LinguaNet, Portuguese is among one of the less commonly taught languages in Europe [1], what makes Brazilian Portuguese (br-pt) learning materials pretty difficult to be found outside Brazil. Online searches in famous search-engines such as Google and Yahoo reveal that it can be difficult to find high-quality learning materials of br-pt when compared to other languages. However, the Internet can bring an opportunity to get in contact to updated authentic materials, showing itself as a proper place to look for educational resources. *LearningBrazilian.com* is an online language school being developed to decrease the lack of resources about br-pt and one of its purposes is to provide free resources for teachers and students, in order to develop a world-wide learning community for this language, where students and teachers can look for information, get in contact to high-quality digital educational resources and share experiences on the target language learning/teaching. Among the free resources offered in the homepage, an introductory course of br-pt is being developed.

Considering that learning a language requires very complex cognitive process, a mix of task- and scenario-based learning seemed to be the most appropriate. In this way, the approach adopted by the course is focused on contextual learning and stimulates the use of authentic tasks that can improve communicative skills and cultural knowledge.

All students enrolled in the course are engaged in an online role-playing in which they are exchange students living with a Brazilian family in Rio city. The role-playing story is performed by animated pedagogical agents (APAs) and learners should use Portuguese to accomplish simple but authentic everyday tasks and reach common goals.

In a nutshell, this paper will report a project for using animated pedagogical agents in a Brazilian Portuguese web-based course built under a blended approach that mixes task- and scenario-based learning methodologies. Its main purpose is to discuss how animated pedagogical agents can help to improve students' communicative skills, cultural awareness and level of interaction with the course's content.

2 Scenario-based learning

2.1 Definition

Paulus, Horvitz and Shi believe learning must be provided in a context in which a story offers useful advice or modelling that helps students to achieve their goals of solving tasks [2]. Scenario-based e-learning (SBeL) environments can fit this model since they usually present a story (video, animation or audio-based) to be followed by students, in order to perceive real-life actions and attitudes, which will serve the basis in tasks accomplishment and further discussions. In this way SBeL can also offer an interactive environment with authentic and meaningful tasks distributed in a non-linear way, where students can focus on contextualized activities.

Simulation-based learning environments offer the most realistic activities in training and instruction but they can be very expensive and difficult to be implemented. They usually offer many different behavioural paths that can be successful [3], as it happens in reality. It is why technical simulations are easier to be implemented than realistic social contexts, despite SBeL can offer a good degree of reality, even for social contexts (See Table 1).

Table 1 – Comparison among different approaches

	Asynchronous e-Learning	Scenario-Based e-Learning (SBeL)	Simulation-Based e-Learning (SimBeL)
What	Information	Behaviour	Performance
How	Information display and assessment	Situation response	Near or pseudo reality
Learning Domain	Recall	Reasoning	Intuitive/Emotional
Time Constraints	Less	Medium	More
Product Complexity	Lower	Medium	Higher

Source: Adapted from [3] Kindley, 2002, pp.2.

Kindley [3] highlights that, by way of comparison, SBeL is more about “particular discrete behaviours” where “the learner is presented with a specifically defined situation” (pp.2). Simulation-based e-learning, on the other hand,

“makes possible ‘learning by doing’ because it focuses on the learner’s performance outcomes in a context that mirrors the real work environment, demands more intuitive responses (judgment), is usually constrained by time, and takes into account the complexity of possible interactions across key variables” (pp.3).

For Kindley, it is important to understand that SBeL learning theories are based on the idea that learning is a “natural byproduct of authentic activities that are common to the community of practice in which the learner is involved” [4]. In SBeL,

“you first immerse learners in a realistic scenario, provide them with a list of potential decisions, give them a description of the outcome of their choices, and then branch them into additional decisions and outcomes until they reach the end of the problem”[5].

Kindley [3, 4] and Bender [6] emphasize the idea that scenario-based environments have to offer both success and fail paths. Activities that finish when user chooses the wrong path are attached to a more behaviouristic way of teaching than to active learning. Furthermore, in order to be more realistic, SBeL is supposed to show the learner what happens when he takes the wrong way.

There are some softwares focused on development of scenario-based multimedia available in the market, such as Adobe Captivate© (<http://www.adobe.com/products/captivate/>) and Qarbon Viewlet Builder© (<http://www.qarbon.com/presentation-software/viewletbuilder5/>), authorwares that enable rapid development of SBeL materials without sound programming and multimedia skills. With this type of software it is possible to control the success and fail paths and build interactions with the content.

Another advantage of SBeL is the ability to foster intercultural communication [7], since some students who participate in SBeL maintain a “*reflective orientation that helps them to reinterpret prior experiences through new lenses and “potentially formulate new frames of reference”*” (Ziegahn, 2001, pp. 146).

3 Animated Pedagogical Agents (APAs)

3.1 Definition

Animated pedagogical agents (APAs) are human-like characters that are included in educational and instructional materials in order to somehow stimulate learning. According to Jacques [8] animated pedagogical agents should use multimedia resources in a human-like way, exploring facial expressions and human-like gestures, to improve the communication capacity of educational systems. Kim and Baylor [9] understand that

“a learner can learn content through interacting with one or more pedagogical agents, who may provide information or encouragement, share mental tasks, or collaborate with the learner” (Kim and Baylor, 2006, pp. 224).

For Reategui and Moraes, [10] an interface that uses interactions such as the ones used by people is more attractive and user-friendly. In this way, in an environment that offers interaction with APAs, students become more engaged in learning tasks through social interaction with the agents.

In a study conducted by Kim and Baylor [9], it was found that students who worked with high-competency APAs – in both proactive and responsive conditions – achieved higher scores in applying what they had learned and showed more positive attitudes toward the APA. In another study, Moreno et al. [11] concluded that students who used pedagogical agents environments showed deeper learning and higher motivation than students who didn't have contact to APAs.

Kindley [3] analysed a course where the mentor was an animated pedagogical agent who acted as student guider, connecting students to the content and ensuring they understand the scenario as it was supposed to. After observing the standard behaviour, students were supposed to accomplish the tasks.

According to Atkinson [12] voice APAs environments have better results in measures of learning than text-only or audio-only environments. Considering the use of SBeL in language e-learning, Morton and Jack [13] describe a Computer-Aided Language Learning (CALL) approach that integrates speech recognition with virtual agents and virtual worlds to create an immersive environment of SBeL, in which learners can use the target language.

When choosing or designing an APA, three aspects must be considered: (i) identity; (ii) character's life story; and (iii) appearance [10]. Some other important features are highlighted by Reategui e Moraes [10]:

- **Conversation.** APAs should engage in conversation with learners or with other APAs. It is important that the character's speech is understandable, not just related to the vocabulary itself, but also concerning to idiomatic expressions, slangs, etc. Intonation, time, velocity, frequency, ways of talking and gesticulating, and words choice also help to build the character's persona.
- **Empaty.** APAs must feel, perceive and react to people, events, situations, etc. Emotions and attitudes that compose character's behaviour must be coherent and stick to their emotional model.
- **Sociability.** APAs have to follow social and cultural rules, such as gestures and turn-taking code, being able to integrate social relationships.
- **Intelligence.** APAs must show knowledge and expertise consistent to the character's role in the role-playing story.
- **Variability.** APAs should avoid repetition and have a variety of speeches and gestures for every possible situation.
- **Coherency.** APAs must be singular creatures with identity and global coherency. Gestures should be connected to speech and facial expressions.

There are many available softwares for design and development of virtual characters, such as Media Semantics Character Building© (<http://www.mediasemantics.com/Product.htm>), an authorware for easily creating animated characters with the possibility of integration to artificial intelligence features, such as text-to-speech engine and AIML (Artificial Intelligence Markup Language). There are also some companies that provide ready-to-use characters to be integrated in e-learning projects, such as Cantoche (<http://www.cantoche.com>) and OddCast (<http://www.oddcast.com/home/>).

4 Case-study

LearningBrazilian.com is implementing an introductory web-based language course for beginners in Brazilian Portuguese. All students enrolled in the course are engaged in an online role-playing in which they act as participants in an exchange program, living with a Brazilian family in Rio de Janeiro City.

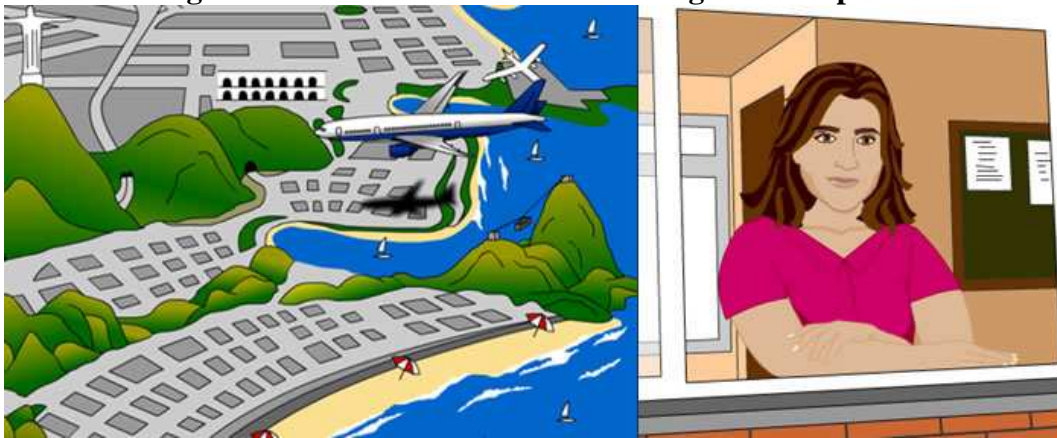
Every member of the family has his/her own personality, range of vocabulary, gestures and facial expressions, in order to offer learners the possibility to meet many different types of "Brazilian people", with different gender, age, cultural and social backgrounds. In order to increase the reality and coherence of APAs, the voices of each character are recorded by people who have the same character's gender, age and body type.

In each lesson, learners can watch short animations that show everyday situations such as arriving at the airport (Figure 1), going shopping, going to the beach, among many others, according to the topic of the lesson. After watching the scenes and perceiving the way characters act and talk, learners can verify their abilities to deal with real-life situations in scenario-based materials, where pedagogical agents help them to solve problems, accomplish the tasks and reach their goals.

The educational approach adopted mixes task- and scenario-based learning. When talking about task-based approach, Skehan [14] understands that learners should "*engage in communication, but may prioritise getting the communicative activity done, through the use of strategies of comprehension and production*". In this way, the activities proposed create

situations in which learners engaged themselves in meaningful interactions with APAs, when meaning can be negotiated and the learners can develop their communicative skills.

Figure 1 – Scenes from lesson “Arriving at the airport”



Kim and Baylor [9] recommend proactive behaviour of APAs in learning guidance, since studies show that built-in helpers are rarely used. According to these authors, APAs should

“be designed as highly competent for learning contexts in which instructional goals focus on knowledge and skill acquisition. On the other hand, in contexts where learners’ self-efficacy beliefs in the task are a major concern, less competent pedagogical agents could be more effective” (Kim and Baylor, 2006, pp. 238).

The animated pedagogical agents were developed with Adobe Macromedia Flash© software and interact with students with text and audio messages in a proactive way. Besides the characters integrated in the main role-playing story, a virtual tutor guides them within the courses’ content along the scenario (Figure 2).

Figure 2 – Virtual tutor guides students in specific moments



5 Conclusion

The introductory course of Brazilian Portuguese at www.learningbrazilian.com is being developed according the theories about using scenario-based e-learning and animated pedagogical agents in web-based environments.

Related to SBeL, the learning materials are being designed to provide real-life contextual learning tasks [1] and they will offer different successful paths, as suggested by Kindley [3, 4]

and both success and fail paths. Intercultural communication and cultural awareness will be fostered by further discussions, as it was suggested by Ziegahn [7].

Related to the use of APAs, the characters are being developed under a global coherency model, involving features such as conversation, empathy, sociability, intelligence and variability, as it was highlighted by Reategui and Moraes [10]. All characters will have voice output [12, 13].

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Author(s):

Eliseo Reategui, Ph.D.
 Universidade de Caxias do Sul
 Departamento de Informática
 Rua Francisco Getúlio Vargas 1130 – Bloco G, s.201
 Petrópolis – CEP 95070-560
 Caxias do Sul, RS – Brasil
ereategui@ucs.br

Eunice Polonia, Ph.D
 Universidade Federal do Rio Grande do Sul
 Núcleo de Educação a Distância do Instituto de Letras
 Av. Bento Gonçalves 9500 – CEP 91540-000

Bairro Agronomia – Porto Alegre, RS – Brasil
epolonia@orion.ufrgs.br

Leticia Roland, Coordinator
LearningBrazilian.com
Rua Augusto Pestana 128 – 01
CEP 90040-200 – Porto Alegre, RS – Brasil
leticia@learningbrazilian.com