Training Job Interview Online Simulator for Hearing-Impaired People

Nelba Quintana[1], Alcira Vallejo[2], Alejandro Héctor González[3(✉)], and José María Pereyra[3]

[1] Facultad de Humanidades y Cs. de la Educación de la Universidad Nacional de la Plata, La Plata, Argentina
[2] Comisión de Investigaciones Científicas, Pcia. Buenos Aires, Argentina
[3] Instituto de Investigación en Informática III-LIDI, Facultad de Informática de la Universidad Nacional de la Plata, La Plata, Argentina
agonzalez@lidi.info.unlp.edu.ar

Abstract. This article describes an online training course for adult hearing-impaired individuals who use hearing aids or cochlear implants. This training course developed in HTML5 and JavaScript consists of a set of training activities to be solved online. The originality of this development is the recreation of a virtual scenario where a hearing-impaired person faces a job interview situation. This simulation strategy with multimedia features is based on a series of videos that recreate an office scenario where an interviewer asks questions that the interviewee must answer by choosing one of the options presented after every interviewer's question. The simulator prototype and the other activities make up a website developed in HTML5 and the PHP programming language. The user requires identification to have access to the site which has the ability to store in a MySQL relational base, the data of each registered person including the educational activities that he is carrying out each time he enters the training. The design of the proposal includes a pilot experience for the evaluation of the tool by a group of users by means of online surveys and personal interviews. According to the results, the optimization of the tool is foreseen for its subsequent implementation.

Keywords: Hearing impaired · Educational simulators · Technology applied in education

1 Introduction

1.1 Hearing-Impaired People and Their Limitations

One of the ways in which the existence of limitations for the full development of disabled people can be addressed is the approach to learning and participation barriers, based on the social model of disability, which states that the limitations or restrictions disabled people face are mainly social [1].

In the case of people with hearing impairment, communication and discrimination were identified as the two major obstacles for their development, their independent

P. Pesado and M. Arroyo (Eds.): CACIC 2019, CCIS 1184, pp. 84–95, 2020.
https://doi.org/10.1007/978-3-030-48325-8_6

evolution and their active participation in the construction of their rights and satisfaction of their needs.

A person with severe hearing loss faces significant consequences on his general development and thus his educational and work alternatives can be limited.

Current technology can provide a variety of appropriate tools to diminish the social environment and communication limitations people with hearing disabilities usually face. These information and communication technologies (ICT) already have been used as tools for educational purposes in general, whereas multimedia has been used for dynamic interaction, simulation and communication processes for special educational needs [2].

1.2 New and Advanced Hearing Aid Technology

Hearing aid technology has improved considerably in the past decades providing efficient therapeutic benefits to people with severe or profound hearing impairment (deafness). Technological development thus contributed to the creation of various devices, systems and resources to help communicative interaction in difficult listening situations.

In the case of hearing-impaired individuals, there are already technological instruments that are being constantly developed to optimize the quality of life of people with hearing loss, providing them better accessibility and, therefore, enhancing their personal autonomy. This is the case of hearing aids and cochlear implants (CI). These devices allow people with hearing impairment to understand the oral information they receive from their environment more accurately.

On the one hand, modern hearing aids based on digital technology can be adapted to individuals quite precisely and effectively. These devices have a processor which allows speech therapists to program their sound software very precisely and adjust it to the characteristics of the individual's hearing loss. This fact makes the performance of modern hearing aids significantly superior to the previous analog headphones.

During the past 30 years, the cochlear implant has become the routine treatment for severe to profound hearing loss. The cochlear implant consists of a prosthesis that transforms acoustic signals into electrical ones. A cochlear implant consists of an external part, generally worn behind the ear, and an internal one. The latter is introduced into the cochlea by surgical intervention. In this way the acoustic sound waves captured by the external part of the device reach the internal part through the receiver. These acoustic sound waves are then transformed into electrical signals which are passed on to the brain through the auditory nerve [3].

Another instrument that begins to be used is the Modulated Frequency system, which consists of an accessory used by people either with hearing aids or cochlear implants to improve their oral understanding of speech-in-noise (SIN) such as in classes, meetings or conferences. This device consists of a microphone that is located close to the sound source and that transmits the signal to a receiver that is placed in the hearing aid or implant, thus making oral messages sound and clear.

1.3 Technology as Basis of the Educational Project

The project presented in this work was developed with a multidisciplinary approach, with the intervention of specialists in virtual education, a computer programmer, a graphic designer, and the central idea and fundamental participation of a teacher with a typology of postlocutive hearing loss.

The high visual character of the project, accompanied by written text, confirms that computer technology is capable of providing highly effective tools for the design of educational strategies for hearing impaired people.

The use of technology to increase, maintain or improve the functional capacities of these individuals has become an essential resource, which includes training and training actions, such as those described in this paper.

This research and development project were proposed as the basis for a Master's Thesis in Applied Information Technology in Education of the Faculty of Informatics of the National University of La Plata. The proposal is intended for the training of hearing-impaired adults who use hearing aids, assuming that the majority of educational proposals are intended for children, so that hearing-impaired adults are a rarely considered age group in learning situations.

The training is aimed at supporting the insertion of these individuals in working life, for which an admission interview situation is reproduced, using a simulator based on video sequences articulated with JavaScript, included in a website specifically developed in HTML5, which also provides content with text and multimedia format, as well as the proposal of interactive activities prior to the use of the simulator itself.

This article enlarges with greater precision the description previously made in the work presented in October, 2019 at the XXV Argentine Congress of Computer Science (CACIC 2019) [4]. The conceptual framework of multimedia learning, the detail of the simulator structure and the planning of the training evaluation stage as a whole are depicted here.

Although these instruments reduce the communication barriers suffered by the hearing impaired people, the limiting factor is their availability, due to their high costs and the small number of countries in which they are manufactured.

2 Conceptual Approaches

2.1 The Emotional Influence on the Learning of Hearing-Impaired Individuals

Unlike other types of disabilities, such as visual or motor impairment, hearing loss is not noticed at first sight by a normal hearing person. A priori ignorance of the situation of the hearing impaired obliges him to permanently report his hearing loss situation. This reiteration of their limiting condition negatively affects their emotional state and their self-esteem, so it eventually causes their social isolation. It is important, then, to use different means to facilitate their incorporation into their socio-cultural environment, in which orality predominates. In this sense, we understand that education and training are fundamental factors to achieve this goal. The educational proposal that we develop through a simulation strategy seeks to provide the apprentice with a previous

experience, which by its own emulation characteristic of a real situation trains the individual not only to choose suitable answers, but also confronts them with a situation which involves the management of emotional skills, in order to facilitate their subsequent performance and improve their autonomy in a situation of an admission job interview in real life.

2.2 Design as a Contribution to Communication

Communication design acquires a fundamental cognitive role in learning and knowledge; which is increasing along with nowadays technological development. The presentation of knowledge and communication fundamentally need the intervention of the design to be mediated by an interface that can be perceived and assimilated [5]. For an effective communication, the design must consider elements of different hierarchy based on a defined structure, taking into account the sensory management, that is, the appropriate choice of stimuli which will guide users keeping their attention, thus reducing the complexity of knowledge and contributing to clarity and understanding.

The way in which information is structured in digital media determines the user interaction. This can take for example a non-linear form, such as hypertext or have an interlaced structure where the user can choose how to move within a network of semantic nodes [6].

Current multichannel media require high competence to successfully manage the most appropriate way to present information to the user: sound, music, voice, typography, images, movies, movement. The cognitive load, defined as the demand for information processing that each task implies, varies according to the contents or activities of a multimedia educational material. As the information processing capacity of individuals is limited, the challenge to design these materials is to avoid the demand on information processing or cognitive load. According to Mayer [7], to achieve this we can:

- Reduce the superficial processing of information caused by design errors which does not contribute to the appropriation of information.
- Optimize the essential processing of information, required to organize and represent it in working memory.
- Promote the generative processing of information, aimed at understanding information and relating it to previous knowledge.

According to Mayer, cognitive theories argue that the process of acquiring knowledge taught through intentional instruction begins in sensory memory. There, the stimuli of the environment are perceived, and the learning process begins. In a second moment, working memory, through the attention process, selects some stimuli and processes them to construct cognitive schemes, which vary in degree of complexity, based on their integration with knowledge recovered from long-term memory and returns to be stored in this latter memory.

Sensory memory uses an independent channel to capture the stimuli that each sense perceives, that is, the sounds perceived by the ear are received in the auditory or echoic channel, while the graphics and texts that visualize the view, in the visual channel. Like

sensory memory, working memory also includes two channels: one for processing visual information and one for auditory.

Due to the complexity of the steps in the processing of a multimedia message, an adequate analysis is necessary to design effective messages. This complexity, which is present in normal hearing individuals, is accentuated in hearing impaired individuals, who may have deficiencies in auditory sensory memory and working memory, attention and processing speed [8].

From a more general point of view, it is essential to consider the most frequent possible accessibility barriers in the design. The development phase involves the written text, the video material, the web pages and multimedia resources. It also includes the student's activities and the evaluation instance. Due to the diversity of tasks, this phase is more likely to unintentionally introduce accessibility obstacles, mainly in web development [9].

To avoid these barriers, at least the following recommendations should be considered for all content and activities: 1. Transcription of texts for audios or podcasts. 2. Subtitling of videos with sound content. 3. The use of written language appropriate to the competencies of the recipients. These recommendations are limited to materials intended for individuals with postlocutive hearing loss, who can interpret written language. In materials intended for hearing impaired people who do not access this language, translation into sign language should be considered, although this option exceeds the scope of this work.

2.3 Simulators as a Pedagogical Strategy

The use of simulation for training purposes began in the field of military training several decades ago. It was then disseminated to other disciplines, mainly in the economic sciences and is currently a fundamental strategy in the teaching of medicine, engineering and other areas of knowledge. At present, modern and sophisticated simulators, many of them based on artificial intelligence, which can reproduce real scenarios, have been developed [10].

In the present article we will refer to the process in which a model is created to replace real situations with artificially created ones, but where the model reproduces the appearance, structure and dynamics of the system [11]. The simulation consists of a simplified and artificial experimental environment, but with enough plausibility to provoke authentic reactions on the participants, since the aim is to instruct them about some real-world situations. The basic idea is to create experiential situations which participants can then transfer to real life.

One of the classic educational theories that sustains the use of simulators is the concept "learning by doing" developed by Dewey [12], which is now widely naturalized in the educational fields. By generating a direct link between theory and practice, new knowledge can be applied and obtained from discovery, as well as the validity of theoretical concepts. For this purpose, the student must have a direct experience generated by an authentic problem that motivates their interest, thus being able to build the necessary knowledge to solve it [13]. The problem to be solved should resemble "real" problems, regardless of the "academic" type of problems, without

direct connection with real life. This approach to learning by doing leads students to be personally involved with a problem that is significant to them.

Within this framework, current simulators developed based on technology are fundamental in the construction of meaningful knowledge; that is, they can be the solution to the decontextualization of learning.

From the emergence of the concept of situated learning, Brown, J. and his collaborators suggest that educational activities and the acquisition of concepts must take place in the environments in which learning takes place. The construction of knowledge is generated dynamically, through interaction with the situation. The authors declare that "knowledge is located, being partly a product of the activity, context and culture in which it is developed and used" [14].

Simulators can represent an alternative that resembles the context of reality, promoting situated learning, if they present to the learner an environment credible enough to resemble a real system.

Another theoretical support for the use of simulators in learning is the constructivist learning environment model stated by Jonassen [15], which emphasizes the involvement and commitment of the learner in the construction of his own knowledge. When considering a problem through a simulation, there are three components of Jonassen's model that are present: the context of the problem, the simulation itself and a manipulation space that allows the learner to appropriate the problem and interact with it. This interaction allows the learner to influence and modify the environment, thus achieving significant learning [16].

In the educational proposal, the simulator, the teaching materials and the proposed activities must be designed in such a way that they allow the apprentice experience a learning process through the anchoring of new knowledge in those already available: that is, he can use his preexisting knowledge as an ideational and organizational matrix that will facilitate the incorporation, understanding, retention and organization of new ideas.

3 Educational Proposal

3.1 Recipients

This proposal under development is primarily intended for people with different degrees of hearing loss who use hearing devices (hearing aids or cochlear implants), who have secondary or tertiary level of education and aspire to obtain a job.

3.2 Aims

It was determined as a general aim to guide and prepare the target individuals of the proposal to successfully resolve the instances of a possible job interview. Specific objectives are to familiarize the student with the use of a simulator as a learning resource, develop experience in decision-making that promotes successful responses in a job interview and train him to acquire effective communication techniques.

3.3 Design and Characteristics of Materials and Activities

The training proposal consists of several instances, which are presented to the apprentice through the website developed for this purpose. The first action required is enrollment, where the apprentice must complete minimum personal data that allows identification, which will be necessary in individual activities and assessments. The teaching materials are presented in text, images and video format, as learning instances of different aspects related to the skills necessary to face the interview situation, represented in the last instance by means of the multimedia simulator.

The resources in text format were included because they are considered essential to train people with hearing loss [17]. Since people with hearing loss develop predominantly visual memory [18], materials based on images, infographics, presentations and subtitled videos were included.

Formative evaluations were prepared on the different contents. These evaluations are presented in a multiple-choice question type with automatic and immediate qualification, including a specific feedback on each item. The training includes collaborative activities in the form of group tasks, to promote interaction and communication between participants.

The simulator prototype has included the recreation of scenarios and the interaction with them, considering different behavior patterns, also stimulating the development of competences linked to the teaching and learning process [19, 20].

The cognitive functions that this simulator aims to stimulate are:

Attention and concentration, which facilitates the understanding of oral language.
Memory, to remember appropriate attitudes and language for an interview
Executive, to plan activities
Language, for more effective communication.
Perception and recognition or emotional intelligence, understood as the cognitive ability of a person to understand the emotional universe of another. The orientation in this sense is considered necessary due to the fact that the emotional experience of hearing impaired people can affect or distort the identification of emotions that are perceived in others.

3.4 Technical Development

The educational resource is presented as a website developed in HTML5 and the PHP programming language.

For the design, the Materialize framework, based on Material Design was used on the client side. Materialize has a grid system that generates a responsive design, adaptable to different formats and devices.

During development, we chose to follow the MVC architecture pattern (Model-View-Controller) together with the Twig template engine to improve the maintenance and scalability of the software.

Among its features, Twig allows to define the framework of a site, making all pages fit to it. With this engine the content of the structure has become independent, as well as able to eliminate repetitive code.

The site works with a MySQL relational database, managed through the PhpMyAdmin tool to store the required information to each user in the access instance, as well as the educational activities that it is carrying out.

The interactions with the user are managed by JavaScript using JQuery as a framework to facilitate this work. This allows communication to be more enjoyable, responding to the actions taken by the user through the graphical interface. AJAX was also used for asynchronous communication, obtaining results without the need to reload or switch to other page of the website.

The mail system, used to validate user registration and recovery, was implemented under an SMTP server configured with the PHPMailer library.

The simulator prototype was initially developed using the online tool called "Decision Scenario", which is part of the 40 free educational instruments based on multimedia technology offered on the H5P portal (http://h5p.org). This tool was selected for its user-friendliness, thanks to its intuitive interface, which does not require knowledge of programming languages to design the decision tree architecture. It is a new tool of the H5P set, developed in HTML5 and JavaScript. The H5P portal, it should be noted that it is completely free and open source, community development [21], designed under license from the MIT (Massachusetts Institute of Technology).

For the selection of this open source tool, its ease of use and its wide potential were considered.

Several stages were followed in the construction of the simulation system [13]:

- *The definition of the problem* to be solved and the delimitation of the limits of the system that was to be simulated. In this case, the training of hearing-impaired individuals was raised in a job admission interview situation. As mentioned, the system was delimited for cases of postlocutive hearing loss compensated with technological devices, such as headphones, hearing aids or cochlear transplantation. This delimitation of the recipient implies certain characteristics of the simulator, such as the absence of a sign language translation, since the recipients, in principle, understand written language.
- *The design of the model*, starting from flow charts or blocks to the preliminary experimental design. The prototype flowchart was made directly with the H5P tool itself, which offers the possibility of generating the diagram, relating the flows and editing the steps for the necessary changes or corrections (see Fig. 1). This tool supports text, images and video in its content, and offers two interchangeable interface types, which facilitate the design of the material: a preview interface that shows the author the results of its production, and a specific interface that allows the construction of the Navigation scheme in the form of a diagram.
- *The translation of the model into computational language*. Although in a first approach the prototype was developed with H5P, it was decided in a second stage the direct inclusion in the website by programming it, so that all user interactions can be stored to evaluate the correct and incorrect paths followed by each one.
- *The verification of the operation and verification of the validity of the model*. The development of the prototype made in H5P is currently under verification.
- *Experimentation and implementation*. The simulator will soon be implemented with a group of volunteers.

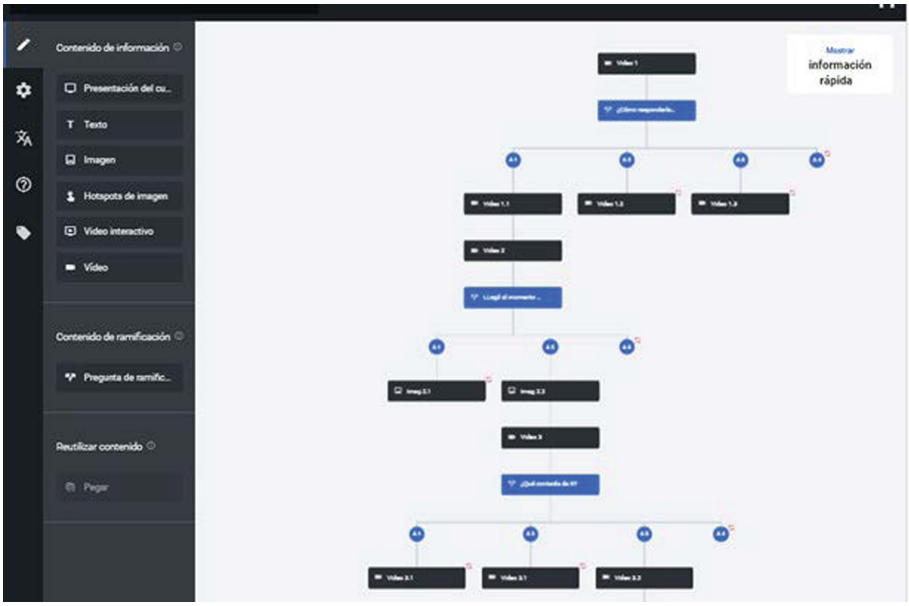

Fig. 1. Partial view of the flow chart built in H5P (https://h5p.org/node/723193)

This type of simulator does not require artificial intelligence. It is based on branched options, so it has low processing requirements. The user has three or more choice options in a sequence of events that represent the different steps of the interview.

The decision scenario consists of a branched series of job interview situations represented by videos filmed with real actors, where the interviewer character asks questions that will require the interviewed user to make decisions regarding the different response alternatives, obtaining a score that will be added in accordance with the assessment previously assigned to each response. If the user chooses an inappropriate response, he must go back to reflect on the choice made and try again for a better option based on the knowledge acquired during the previous training. The participant moves forward in the simulator path only if he takes the most appropriate option as seen in the study material.

During the simulation, participants must go through the 8 (eight) steps that make up the proposal, making decisions about 23 (twenty-three) options.

In this way, it seeks to train the hearing impaired people to face a job interview successfully related to aspects such as communication skills, control of emotional aspects and appropriate information they must provide to the interviewer regarding their disability.

4 Planning a Future Evaluation of the Project

4.1 Methodology

The didactic usefulness of the simulator will be evaluated through an opinion survey conducted on the participants in order to collect information about the learning process results on certain aspects such as: the application of theoretical concepts, attention, memory, communication strategy and emotional intelligence are improved at the time of the job application interview. The aspects to be evaluated are: the potential of the tool to decide on the most appropriate communication strategies, the participant's attention to his body language and the interviewer's one, the application of what has been learned, self-control under stressing situations.

4.2 Sample

The sample will consist of an initial group of recipients with the characteristics already explained, who wish to apply for a job. His previous experience in the use of digital technology in general and simulators in particular will be considered, which will be obtained through an online questionnaire made at the time of registration.

4.3 Information Collecting Tools

Online Survey. The instrument will be a survey with an online form format based on a Likert-type scale, which will gather the opinion and perception of the participants regarding the following aspects:

a) advantages related to the use of the simulator
b) functions enhanced with the interaction promoted by the simulator
c) skills they consider having developed
d) acquired communication skills

On the other hand, the collected pieces of information will be about how the training has contributed to the assimilation and retention of information, the application of searching strategies and the treatment of information, organizational skills, interest in applying for a job, motivation to adopt or maintain a competitive job position, development of emotional intelligence, decision-making skills under pressure levels, problem-solving skills and abilities to move in the normal world.

Personal Interviews. Personal interviews will be conducted to a group of participants to enlarge the answers obtained from the simulator data analysis and the survey responses.

5 Conclusions

The work has presented the foundation, design and functionalities of a simulator aimed at job interviews with hearing impaired people, although it is adaptable to other educational functionalities for people with hearing disabilities.

The design has placed emphasis on communication, interactivity, simplicity for the user and collaborative activities.

An evaluation of the tool by a group of users that will constitute a pilot experience is in the elaboration stage. The evaluation will be carried out through online surveys and personal interviews. According to the results, the optimization of the tool is foreseen for its subsequent implementation.

6 Future Work

Once the simulator currently under development on a conventional PC platform has been tested and validated, work will be done to optimize a multiplatform version with the purpose to offer the possibility of its use on mobile devices. The project will be open to modifications according to the results of the online survey and personal interviews obtained through the pilot experience. The improvements can be implemented both pedagogically and technologically with the participation of the multidisciplinary team of specialists.

For the next stage, the diversification of the educational aim delimited to the use of simulation for a job interview is presented with the purpose of offering new possibilities with the same basic platform and other content oriented to the specific problem of hearing loss.

References

1. Palacios, A.: El modelo social de discapacidad: orígenes, caracterización y plasmación en la Convención Internacional sobre los Derechos de las Personas con Discapacidad. CERMI, Madrid (2008)
2. Roig Vila, R.: Las tecnologías de la información y la comunicación (TIC) como recurso en la atención a las necesidades educativas especiales. En A. Lledó Carreres, La discapacidad auditiva, pp. 183–189. Barcelona, Edebé (2008)
3. Bell Rodríguez, R.: Algunos puntos para una reflexión integral en torno a la discapacidad auditiva, el uso de audífonos y los implantes cocleares. Revista de Investigación, Formación y Desarrollo **5**(2), 11–20 (2017)
4. Quintana, N., Vallejo A., Pereyra, J.M., González, A.H.: Simulador en línea para capacitación de individuos hipoacúsicos adultos. Congreso Argentino de Ciencias de la Computación, CACIC 2019, Universidad Nacional de Río Cuarto, Córdoba. http://entornosvirtuales.unlp.edu.ar/assets/files/cacic2019.pdf. Accessed 21 Feb 2020
5. Bonsiepe, G.: Una Tecnología Cognoscitiva. 2000–2008 (2009). http://guibonsiepe.com.ar/guiblog/text/. Accessed 21 Feb 2020
6. Sangrà, A., Wheeler, S.: Nuevas formas informales de aprendizaje: ¿O estamos formalizando lo informal? RUSC. Universities and Knowledge Society Journal **10**(1), 107–115 (2013)

7. Mayer, R.E.: Cognitive theory of multimedia learning. In: Mayer, R.E. (ed.) The Cambridge Handbook of Multimedia Learning. Cambridge University Press, New York (2015)
8. Calderón-Leyva, I., Díaz-Leines, S., Arch-Tirado, E., Lino-González, A.L.: Análisis de la relación entre las habilidades cognitivas y la pérdida auditiva sensorial unilateral. Neurología **33**(5), 283–289 (2018)
9. Ferreiro-Lago, E.: Accesibilidad para personas sordas y con discapacidad auditiva en el diseño instruccional e-learning basado en ADDIE. https://www.researchgate.net/publication/322276350_Accesibilidad_para_personas_sordas_y_con_discapacidad_auditiva_en_el_diseno_instruccional_e-learning_basado_en_ADDIE. Accessed 29 Jan 2020
10. García-Carbonelli, A., Watts, F.: Perspectiva histórica de simulación y juego como estrategia docente: de la guerra al aula de lenguas para fines específicos. Ibérica, 13, pp. 65–84 (2007)
11. Amaya Franky, G.: La simulación computarizada como instrumento del método en el proceso de enseñanza y aprendizaje de la física, desde la cognición situada: ley de Ohm. Revista Electrónica "Actualidades Investigativas en Educación", vol. 8, no. 1 (2008)
12. Cabero-Almenara, J., Costas, J.: La utilización de simuladores para la formación de los alumnos. Prisma Social, núm. **17**, 343–372 (2016)
13. Cataldi, Z.; Lage, F., Dominighini, C.: Fundamentos para el uso de simulaciones en la enseñanza, Revista de Informática Educativa y Medios Audiovisuales **10**(17), 8–16 (2013)
14. Brown, J., Collins, A., Duguid, P.: Situated Cognition and the culture of learning. Educ. Res. **18**(1), 33–42 (1989)
15. Jonassen, D.H.: El diseño de entornos constructivistas de aprendizaje. In: Reigeluth, Ch., Diseño de la instrucción. Teoría y modelos. Madrid, Aula XXI Santillana, pp. 225–249. (2000)
16. Casanovas, I.: La utilización de indicadores didácticos en el diseño de simuladores para la formación universitaria en la toma de decisiones, TE&ET, Revista Iberoamericana de Tecnología en Educación y Educación en Tecnología, No. 2 (2007)
17. ONU: "Convención sobre los Derechos de las Personas con Discapacidad y Protocolo facultativo"; Fundación AEquitas y Colegio de Escribanos de la Provincia de Buenos Aires; FEN Editora Notarial (2008)
18. Sacco, A.: Estrategias para la utilización de tecnología en educación especial. Análisis de la implementación de las TICs en la atención a la diversidad. Propuestas para su eficaz aprovechamiento (2009). http://sedici.unlp.edu.ar/handle/10915/4165
19. Fernández, C.A.: Diseño pedagógico del simulador SIPAD Trabajo fin de grado. Facultad de ciencias de la educación. Curso 2013/2014 (2013) http://www.terras.edu.ar/biblioteca/31/31DE-LA-TORRE-saturnino-Cap3-Parte1-exito-error.pdf
20. Ainciburu, M.C.: Simulación en la Web2 y los lenguajes específicos, la comunicación profesional a través de la red Universidad de Siena (2009). Recuperado de: http://cvc.cervantes.es/ensenanza/biblioteca_ele/asele/pdf/20/20_0103.pdf
21. Buhu, A., Buhu, L.: Developing interactive elearning courses based on HTML5 for students in textile engineering. In: 9th International Conference on Education and New Learning Technologies, Barcelona (2017)