ARTICLES

Development of a virtual learning environment on children's language for pediatricians

Desenvolvimento de um ambiente virtual de aprendizagem sobre linguagem infantil para pediatras

Desarrollo de un entorno virtual de aprendizaje del lenguaje infantil para pediatría

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Abstract

Objective: to develop and analyze a virtual learning environment (AVA) on the acquisition and development of children's language for the guidance of pediatric physicians. **Methods**: the content was delimited considering the doubts that pediatricians had about the acquisition and development of children's language and was constructed from a review of the scientific literature. The production of the material followed the developmental stages of instructional design encompassing analysis and planning, modeling, implementation and evaluation. Speech-language pathologists were invited to participate in the assessment of the quality of content and technological resources using the *Health-Related Web Site Evaluation Form Emory* questionnaire and the Content Questionnaire developed by the researcher. **Results**: the content included the stages of language development, main characteristics and development milestones in each phase. The material prepared is available at http://fonoaudiologiaparapediatras.wordpress.com. At the AVA evaluation stage, 63 speech-language pathologists who classified the *blog* as excellent for quality and

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Authors'contributions:
AM: study design, methodology structuring, data collection, writing and review of the article.
TCS and CCC: structuring of the methodology, writing and reviewing of the article.
LPM: study design, writing, reviewing of the article, in addition to guiding the study.

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content participated. **Conclusion**: an AVA, in a *blog* format, containing information about the acquisition and development of language was developed in order to guide physicians / pediatricians from typical phases to alterations, prevention, development phases and possible referrals.

Keywords: Language Development; Education, Distance; Telemedicine; Pediatrics; Speech, Language and Hearing Sciences.

Resumo

Objetivo: desenvolver e analisar um ambiente virtual de aprendizagem (AVA) sobre a aquisição e desenvolvimento da linguagem infantil voltado à orientação de médicos pediatras. **Métodos**: o conteúdo abordado foi delimitado considerando as dúvidas que os médicos pediatras possuíam sobre a aquisição e o desenvolvimento da linguagem infantil, e construído a partir de revisão da literatura científica. A produção do material seguiu as fases de desenvolvimento de design instrucional englobando análise e planejamento, modelagem, implementação e avaliação. Foram convidados fonoaudiólogos para participar da avaliação da qualidade do conteúdo e dos recursos tecnológicos utilizando o questionário *Health-Related Web Site Evaluation Form Emory* e o Questionário de Conteúdo desenvolvido pela pesquisadora. **Resultados**: o conteúdo contemplou as etapas de desenvolvimento da linguagem, principais características e os marcos do desenvolvimento em cada fase. O material confeccionado está disponível no endereço eletrônico http://fonoaudiologiaparapediatras.wordpress.com. Na etapa de avaliação do AVA, participaram 63 fonoaudiólogos que classificaram o *blog* como excelente para a qualidade e conteúdo. **Conclusão**: portanto, um AVA, em formato de *blog*, contendo informações sobre a aquisição e desenvolvimento da linguagem foi desenvolvido a fim de orientar médicos/pediatras desde fases típicas até alterações, prevenção, fases do desenvolvimento e possíveis encaminhamentos.

Palavras-chave: Desenvolvimento da linguagem; Educação a distância; Telemedicina; Pediatria; Fonoaudiologia.

Resumen

Objetivo: desarrollar y analizar un ambiente de aprendizaje virtual (AVA) sobre la adquisición y desarrollo del lenguaje infantil dirigido a la orientación de los médicos pediatras. **Metodos**: el contenido cubierto se delimitó de las dudas que tenían los médicos pediatras sobre la adquisición y desarrollo del lenguaje infantil, y se construyó a partir de una revisión de la literatura científica. La producción del material siguió las fases de desarrollo del diseño instruccional, incluido el análisis y la planificación, el modelado, la implementación y la evaluación. Se invitó a los logopedas a participar en la evaluación de la calidad del contenido y los recursos tecnológicos utilizando el cuestionario Emory del Formulario de evaluación del sitio web relacionado con la salud y el Cuestionario de contenido desarrollado por el investigador. **Resultados**: el contenido incluyó las etapas del desarrollo del lenguaje, las principales características e hitos del desarrollo en cada fase. El material elaborado está disponible en la dirección electrónica http://fonoaudiologiaparapediatras.wordpress.com. En la etapa de evaluación de la AVA participaron 63 logopedas, quienes calificaron el *blog* como excelente por su calidad y contenido. **Conclusión**: por lo tanto, se desarrolló un AVA, en formato de *blog*, que contiene información sobre la adquisición y el desarrollo del lenguaje con el fin de orientar a los médicos / pediatras, que van desde las fases típicas hasta los cambios, prevención, fases de desarrollo y posibles derivaciones.

Palabras clave: Desarrollo del Lenguaje; Educación a Distancia; Telemedicina; Pediatría; Fonoaudiología.

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Introduction

Language disorders are frequent problems during child development, affecting about 3 to 15% of children[1], being early diagnosis and intervention – before five years of age – decisive for the prognosis[2-3].

Parents' first contact with a health professional, during their child's development, is with a pediatrician. Therefore, studies have evidenced that pediatricians are interested in getting more information on child language disorders and their prevention, so that they have better results by referring children at proper ages, thus, contributing to better prognosis for their patients[3-5]. Regarding their referral routine, pediatricians reported that they referred their patients to speech-language pathological assessment at any ages. However, such referrals more frequently occur when the child has already featured communication disorders (51.90%). Consequently, that behavior may cause unfavorable prognosis to child development[5-6]. Pediatricians also report the scarcity of specific classes, courses or speeches on child language development during their graduation or medical residence. In addition, the amount of classes during medical graduation prevent them from taking extracurricular courses[4,5,7].

In the medical field, research was conducted, showing that most professionals have access to the internet, and they do it to seek information for their professional development and better care for their patients. The use of the internet for research has been increasing fast due to its rapid and easy access. Thus, in order to be effective, the access to online continuing medical education must be easy for use, immediate, with relevant, reliable themes, aiming at medical continuing education and, consequently, better patient care[8].

The popularity and increase of health information available on the internet, along with the facility and fast access, pose new challenges, such as, the reliability of the available information. Therefore, it is wise to evaluate the origin and quality of the information provided, mainly in the health field.

In that sense, evaluation instruments have been developed to guide users to reliable sources[9-11]. The use of standardized evaluations put forth benefits to users, such as better quality, use and effectiveness of contents, decrease of prospective deleterious effects, promotion of innovations and higher reliability. The evaluations can be conducted before the website development, during and after its release, ensuring updated contents and presentation refinement[11].

Breckons, Morris and Richardson[12] reviewed 12 websites from the health field by means of 12 evaluation instruments. They considered the criteria proposed by the HIICRW (*Health Improvement Institute and Consumer Reports WebWatch*), as follows: content relevance, content accessibility, content interchange, site reliability/transparency, links, quality assurance and safeguards. In Brazil, study carried out by Souza, Bastos and Ferrari[13] compared different site evaluation instruments in the health field, and three instruments were selected: the Emory (*Emory University Rollins School of Public Health*), the Michigan instrument and the *HONcode.* The Emory instrument was considered the most reliable in website rating and the easiest for question understanding.

Thus, the current study highlights the assumption that by elaborating and evaluating a VLE on child language, founded in scientific knowledge within proper technology, such knowledge could be spread among pediatricians, contributing to primary healthcare prevention and promotion.

Therefore, this study aimed to develop and analyze a VLE on child language acquisition and development in the speech-language pathology field to guide pediatricians.

Methods

The current study was approved by the Research Ethics Board under protocol number 092/2011. All the subjects involved signed the Free Informed Consent Form.

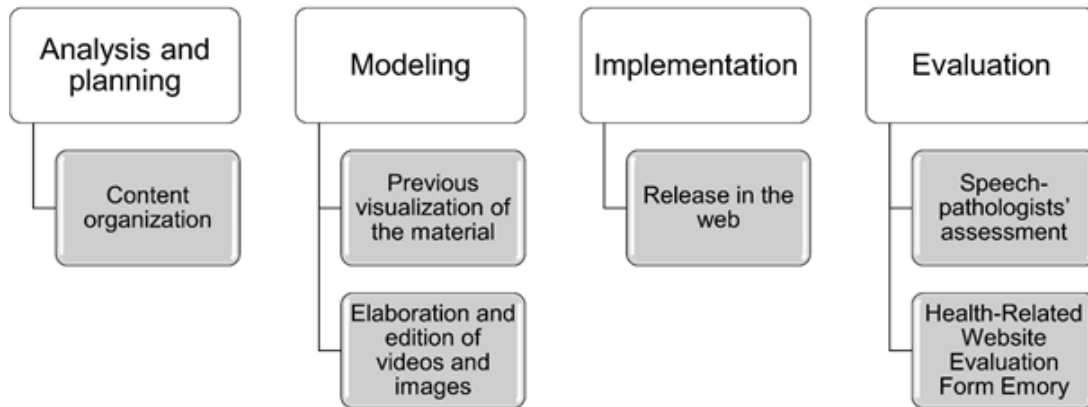The VLE elaboration followed the instructional design development model and procedures, as illustrated in Figure 1[14].

Figure 1. Organizational chart of the project steps.

First step: Analysis and Planning

From a previous study, which collected the most frequent questions asked by pediatricians on child language development[4], a theoretical script was outlined, using Lilacs, PubMed, Scielo Databases and books.

Second step: Modeling

In this step, the content was inserted in the PowerPoint 2010, before the actual construction and implementation of the VLE. The information was simplified and divided by chronological ages for an easy, stimulating reading. Images, videos, photos and animations of the Virtual Man, consistent with the theoretical content, were selected and produced, in order to make the VLE visually attractive, dynamic and interactive, thus, consolidating learning.

Third step: Implementation

The technological resources, which would meet the goal of the study, were analyzed, defining the elaboration of a web-based VLE, that is, a blog, for being an easily accessed and handled tool, not only to the designer, but also to the user. Therefore, with the choice of the blog, all information was organized in the WordPress platform, available for free on the internet (www.wordpress.com). An account was created with a user name, password and e-mail address; then, the pages were built with the content elaborated in the second step, following the website instructions.

Fourth step: Evaluation

The WordPress platform offers resources for statistical analysis. Therefore, an objective evaluation was conducted, computing the number of views on the blog between September 15, 2012 and December 31, 2012. The result yields information by month, as well as the total, besides the countries where the views occurred.

In order to assess the quality of the blog and its content, speech pathologists from all over Brazil were invited, by sending an invitation-letter by e-mail to all professionals registered in the system of the Speech-Language Pathology Department of the Institution. In addition, invitations were sent by the social networks. They were requested to access the blog available on http://fonoaudiologiaparapedia-tras.wordpress.com, and subsequently they should fill out the form available in the blog.

Specifically, for the quality analysis, the Emory, Health-Related Web Site Evaluation Form, 1998[15] questionnaire (adapted) was used. It comprises 36 questions, divided in eight scales, as follows: Q1 to Q6 evaluates content, Q7 to Q9, the precision, Q10 to Q12, the authorship, Q13 and Q14, the updates, Q15 to Q18, the public, Q19 to Q24, the navigation, Q25 to Q30, the external links, and Q31 to Q36 assess the structure. For each item, the answer options are: "agree" (2 points), "disagree" (1 point), and it was also possible to choose the option "not applicable" (0 points) for some items.

The final result for each scale of the **Quality Questionnaire**, in percentage, is obtained by means of the formula described in the Emory questionnaire, in which the Quality Scoring is represented

by the sum of the total amount of respondents who answered "agree" for each set of questions in the scale, multiplied by 2 (item scores), while the Maximum Quality Scoring represents the sum of the number of respondents who answered the questions, disregarding the selected item ("agree" and "disagree"), multiplied by 2 (maximum scoring for each item). In short, the final result is rated as excellent quality by scoring greater or equal to 90%; scoring between 75% and 89% is rated as adequate quality, and scoring lower than 75%, as poor quality.

For the analysis of the theoretical content on language development, the **Content Questionnaire** was applied, and the evaluators answered regarding each page of the VLE, rating it as "very poor" (1 point), "poor" (2 points), "fair" (3 points), "good" (4 points), and "very good" (5 points), with the option "not accessed" (0 points). The last item was not considered in order to calculate the maximum scoring for the content. The percentage formula was used to find the final result for each question, in which the Content Scoring is represented by the sum of the amount of respondents, disregarding the selected item ("very poor", "poor", "fair", "good", and "very good"), multiplied by 5 (maximum scoring for each item).

Results

The VLE was developed and released on the web by the link: http://fonoaudiologiaparapediatras.wordpress.com in blog format.

It is divided into 11 independent sessions (Beginning, Language, Language Development, Risk Factors, Guidance to Parents, Glossary, Talk to Us, Search, Evaluate this Site, Meet the authors, and Bibliographical References). Thus, users, who navigate in this environment, will have autonomy to do that, according to their needs and interests.

Concerning the number of views, there were 62 in September, 3,655 in October, 1,233 in November, and 96 in December, adding up to 5,046 views. According to statistics by Wordpress, several visits were performed in other countries, such as Portugal, Peru, USA, apart from Brazil.

The search terms, "Speech-Language Pathology for pediatricians", and "Speech-Language Pathology and Pediatrics", in the Google search engine, the blog link is made available in the first entry trials.

Research respondents entailed 63 speech pathologists from the Northern (1.5%), Midwestern (4.8%), Southern (12.9%), and Southeastern (80.8%) regions. Most respondents were females (96.8%). In some questions, the total number of respondents varies, as they were not supposed to answer the former question in order to advance to the following question.

As for the length of time working in the field, most speech pathologists reported 1 to 5 years (62.9%), followed by 5 to 10 years (14.5%), less than 1 year (11.3%), and over 10 years (11.3%). They reported using the internet to search information on language development, and the most searched themes were therapy (23%), development acquisition of the child language (21%), child-language disorders (20%), differential diagnosis (15%), written language (13%), and language disorders in adults (8%).

Evaluation of the VLE Quality by the Speech Pathologists

According to the scoring proposed by the Emory questionnaire, the blog was rated as adequate in the question 13 of the update scale, and in the question 21 of the navigation scale. In the other questions, the blog was rated as excellent, shown in Table 1.

Table 1. Percentage rating the quality for the items of the Emory questionnaire.

Emory Questions	%	Emory Questions	%
Q1 – Achieved the proposed goal	98.4%	Q19 – Internal blog links facilitate navigation;	100%
Q2 – Information provided does not look like an advertisement	100%	Q20 – Information can be retrieved at due time	98.3%
Q3 – No evidence of bias	100%	Q21 – Agree with the need of a search engine	74.1%
Q4 – The author(s) address the other facets of the issue.	98.2%	Q22 – Provide a search engine	93.4%
Q5 – Properly covers all the facets of the theme	95.1%	Q23 – Organized in a logical way, facilitating the location of the information;	100%
Q6 – Provides external links for thorough coverage of the theme	93.5%	Q24 – In case the installation of a program (software) is needed to view the page, the link for the program download is available	100%
Q7 – The information provided is correct	100%	Q25 – The external links provided are relevant and appropriate for this blog	98.3%
Q8 – Information sources are clearly documented	95.9%	Q26 – The external links provided are operable, that is, you can access them by clicking on them	98.3%
Q9 – States compliance with the HONcode principles	100%	Q27 – External links are properly updated	99.1%
Q10 – It is sponsored or associated to an institution or organization	94.4%	Q28 External links are adequate for the target-public	99.1%
Q11 – Blog author(s)' information and credentials are provided and mentioned	96.7%	Q29 – The external links hold reliable information from reliable sources	100%
Q12 – Author(s)' contact information is provided	93.5%	Q30 – The external links redirect to significant organizations/ institutions to the target public	99.1%
Q13 – The blog publication date is clearly provided	79.5%	Q31 – Blog graphs, figures and art aggregate value to it.	98.3%
Q14 – Date of the updates/alterations runs with the latest breakthroughs in the area	95.9%	Q32 – Graphs and figures do not hinder the blog download or upload significantly	96.7%
Q15 – The blog target public is clearly stated	98.3%	Q33 – There is an option for exclusive exhibition of the text	100%
Q16 – The level of the provided information details is appropriate for the target public;	97.5%	Q34 – The blog usefulness does not decrease when the "exclusively text" option is used	94%
Q17- The reading level is adequate for the target public.	99.1%	Q35 – There are options for disabled users	81.9%
Q18 – The technical terms used in the blog are appropriate for the target public.	99.2%	Q36 – Whenever it is not possible to access the blog audio/video, the provided information is still complete	90.8%

Legenda: Q=questão.

In Figure 2, the percentages by scale are shown, mostly rated "excellent" in quality (scoring greater or equal than 90%), except for the update scale, which was rated "adequate" (scoring between 75% and 89%).
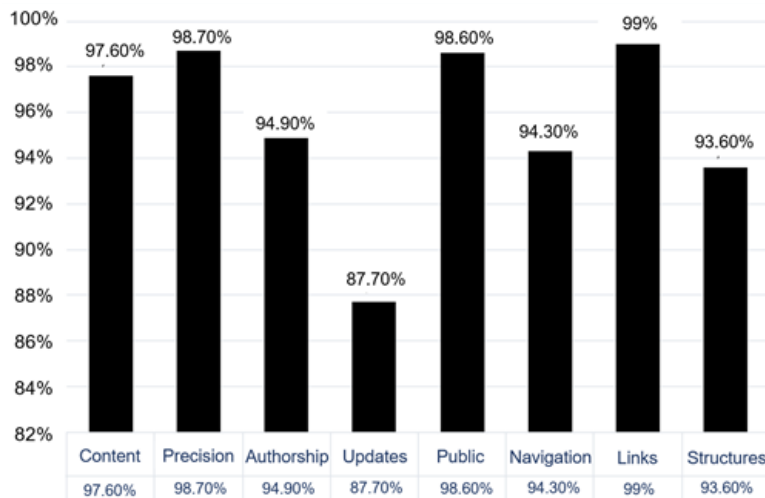
Figure 2. Scoring of the Emory questionnaire, distributed by the evaluation scales.

Similarly, the general scoring of the questionnaire was performed, adding up all scales, and according to the proposed analysis, the corresponding percentage was 95.8%, which rates the blog quality as "excellent" (this website is an excellent source of health information. Its users will be able to access and understand the information easily at this site. Don't hesitate to refer this site to your clients).

Content Evaluation of the VLE by speech pathologists

By performing the page analysis of the blog, according to the Content Questionnaire, it was observed that all contents were accessed, and in general, rated as "very good". Corroborating that evaluation, by means of the Emory questionnaire, the blog quality was also rated as excellent, once its score was greater or equal to 90% (Table 2).

Table 2. Content questionnaire ratings and blog quality indicator by the Emory questionnaire for each page.

VLE Pages	CONTENT QUESTIONNAIRE						Content Result
	Very poor	Poor	Fair	Good	Very good	Not accessed	
Q1 – Child Language Development - 0 to 6 months	-	-	-	19.0%	76.2%	4.8%	96.0%
Q2 - Child Language Development - 6 to 12 months	-	-	1.6%	17.5%	76.2%	4.8%	95.7%
Q3 - Child Language Development - 1 to 2 years	-	-	1.6%	14.3%	73.0%	11.1%	96.1%
Q4 - Child Language Development - 2 to 3 years	1.6%	-	-	17.5%	71.4%	9.5%	94.7%
Q5 - Child Language Development - 3 to 4 years	-	-	-	17.5%	73.0%	9.5%	96.1%
Q6 - Child Language Development - 4 to 5 years	-	-	1.6%	23.8%	65.1%	9.5%	94.0%
Q7 - Child Language Development - 5 to 6 years	-	-	-	20.6%	68.2%	11.1%	95.4%
Q8 - Child Language Development – over 6/7 years	-	-	1.6%	20.6%	66.7%	11.1%	94.6%
Q9 – Risk factors	-	-	6.3%	19.0%	68.2%	6.3%	93.2%
Q10 – Guidance to parents	-	-	4.8%	17.5%	71.4%	6.3%	94.2%

Legend: Q – question; VLE: virtual learning environment.

Discussion

The elaboration and creation of a VLE, which aggregates Information and Communication Technology (ICT), is a challenging task, once it must provide effective, pleasant and interactive learning to its target public. In this study, specifically, there were several challenges, from the technical language adequacy and image refinement, to the choice of the most appropriate medium for the information on child-language development to pediatricians.

A VLE blog features some facilities from its creation and edition to its publication. In addition to the advantages in breaking the time/space barrier, there is the possibility of interaction and steady information update, where all members may act, interact, exchange experiences on themes of common interest, thus, generating collaborative environments[16].

Therefore, a blog was elaborated for easy access, with accessible language and terminology to get information across on child-language development to pediatricians. However, being available on the internet, that access covered a larger population, comprising teachers, parents and students.

During 4 months of analysis, there was massive access of the blog, named "Speech-Language Pathology and Pediatrics", featuring 5,046 views, which reassured right option for the VLE. That also corroborates studies showing the frequent use of the internet to search for health information by teachers, students, patients and the population at large[16,17].

The large number of views points out the importance of that tool evaluation, by means of experts and comprehensive evaluation tools, which reassure its content safety and reliability to users[11,12]. That was the reason for using the Quality Questionnaire and the Content Questionnaire.

Concerning the Quality Questionnaire (Emory), the greatest score was observed in the item "agree", with 98.5%. Therefore, the result of the VLE final evaluation rated its quality as excellent, that is, according to the Emory (*Emory University Rollins School of Public Health*, 1998)[15] questionnaire, this blog is an excellent health information source. Users may easily access and understand the information in this site, and its use can be recommended.

The questions answered as "not applicable" were questions 9, 24, 33 and 34. Question 9 was about the principles of the *HONcode*, implying that most respondents did not know them. Question 24 was about the need of installing some software to view the blog. Thus, the item "not applicable" was selected by 88.5% of the evaluators, once there was no need of any specific program to visualize the blog. Finally, questions 33 and 34 address the possibility of displaying only the blog text, without videos or figures, which is not available in the free version of the Wordpress, used to elaborate this blog.

Most of the answers in the Content Questionnaire rated the blog "very good", that is, a result attesting its excellence.

Therefore, the step of planning and elaboration of the blog demanded longer time and dedication. The reason was that the researchers were concerned with the development of a material that contemplated the significant content, supposed to be addressed in a clear, objective way, fostering the reading and interactive navigation of the blog. Such concern in its development must occur, in order to present the information in an easy way, providing resources to help different users, such as videos and images[18].

As limitations in this study, it should be pointed out the difficulty in presenting specialized speech-pathology content in a technological environment without the support of a cross-disciplinary team. In addition, the assessment of this tool relied on non-specific protocols, adapted for this research, with results pointing to the VLE quality. However, the application of this VLE to the target public – pediatricians - will be necessary for its validation.

Telemedicine is important to spread knowledge produced in the large centers to professionals from the most remote areas, or with reduced time availability, aiming at their competent and efficient performance. Thus, the VLE is a powerful tool for health training, qualification and education. [19,20].

Therefore, the analysis of the VLE clarified that distance education programs must be developed, grounded in effective learning approaches, which foster adequate contents, research motivation, autonomy in the information search, collaborative sense and ethical behavior. Such resources promote change in behaviors, reflections, cooperative sense, and generation of overall health knowledge towards a transforming practice[17,21-23].

ARTICLES

Conclusion

The VLE on language development, focusing on the continuing education for pediatricians, was developed as a blog, once it is an easily built, accessed and navigated tool. The quality and content assessment was performed by speech-language pathologists, as they have previous knowledge on language development and its development milestones. The VLE was rated as excellent, and can be considered a reference for the access to health information regarding child language, in which users can easily obtain knowledge and understand it.

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