

Web Scripts and Mediation Dialogs as a Quality Factor in the Interaction of the Deaf

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Abstract

The difficulty in reading and interpreting textual information interferes in the quality of the interaction of pre-linguistic deaf in the web. This article aims at determining whether the use of new communication strategies improves interaction of the deaf. The stage of data collection and observation involved the participation of eight volunteers. Two sessions of observation of interactions were held, one with the system original interface, and another with the use of new communication strategies, using the communicability evaluation method (CEM) of Semiotic Engineering. The survey results identified that the development of communication strategies meeting the specific language of pre-linguistic of the deaf improves the quality of metacommunication, thus encouraging accessibility during interaction with the system.

Keywords: Accessibility; Semiotic Engineering; Communicability; Deafness.

1. Introduction

For being a vehicle of communication with the Internet, through which a variety of information is transmitted to people spread across various regions of the world [1], the interfaces of web pages should allow access to anyone, regardless of their physical abilities perceptual and motor, social and cultural. In other words, they must be designed in accordance with accessibility guidelines and focusing on usability [25-19].

However, to obtain interfaces that meet many users is not trivial, given the diversity of people with different needs [10-20]. For developing good interfaces should consider the concepts of usability, accessibility and communicability

The usability, important feature of information systems does not guarantee full access to all users [14, 15]. It is also necessary that the systems are oriented accessibility [16]. To obtain a site accessible is essential to follow the recommendations and accessibility guidelines, and to observe and analyze the various ways in which users, with or without limitation, interact with systems, identifying difficulties and skills [19]. The communicability is defined as the ability of the designer to achieve the metacommunication with the user, achieving this notice the original message sent by the first [5, 6].

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For certain user profiles, as pre-linguistic deaf bilingual, communicability is presented as a key factor for a friendly and accessible interface, facilitating the metacommunication. Pre-lingual deaf bilinguals are individuals who were born deaf or lost their hearing before the speech learning, not having thus, auditory memories. As a consequence, not dominate the English language, and may encounter difficulties in performing simple tasks, due to the predominance of textual information on the Web [4].

Works carried out show that language difficulties user profile, such as difficulties of understanding of Portuguese due to the process of signification of words [9] and, although the Brazilian Sign Language (Libras) does not have its own system of writing, should the deaf using the written form of the Portuguese language during reading and writing as a second language [12].

The Semiotic Engineering (SemEng) is a theory of Human-Computer Interaction (HCI) in which the design and interaction are part of a communicative process. According to this theory, the designer communicates with the user through the system (interface) to tell them how, why and what they (and may need) to communicate with the system to achieve their research goals [5,6].

SemEng enables exploring new forms of user interaction with limitations. One of those ways is through the use of mediation dialogs with the tool "Web Navigation Helper " (WNH) , which enables you to create adaptive dialogs that try to help the user achieve their goals in the web. The creator dialog should know the skills, preferences and language of the end user and must be able to adapt the writing style of the dialogs to the language skills of the user [5,6].

This exploratory research was based on a single explanatory case study with multiple units of analysis, and aimed to evaluate the adoption of new communication strategies improves the interaction of pre-lingual deaf bilinguals in an organizational context.

To achieve the goal we analyzed the interactions of pre -lingual deaf people with the Intranet of an institution of science and technology in healthcare , which has an agreement with the National Federation of the Deaf Education and Integration (FENEIS) , employing about 150 workers deaf [8]. The stage of data collection and observation involved the participation of eight volunteers. We used the method to evaluate the communicability (CEM) EngSem for identifying communicability breakdowns.

The analysis sought to investigate the understanding of the users of communication designers in two ways: (1) from the interaction with the original intranet interface, and (2) from the interaction with dialogue mediation. The dialogs were created by a Libras interpreter, the dialogs provided direct instruction and familiar examples on how to interact with the system and report the requested data. The texts were written in Portuguese in a simplified way, as an attempt to translate the signals from Libras to Portuguese writing.

2. Web Accessibility and Hearing

In the web environment, the resources most used, as assistive technologies for deaf, aimed to remove barriers to access to information available in audio, through the use of subtitles or transcript of all audio content for Portuguese or Libras [13].

However, in general, there is no indication of technological resources that aid navigation of web pages in bilingual deaf where most information is presented verbatim. In the web environment the autonomy of the Deaf is limited, having to enlist the assistance of others in the interpretation of the text to the Libras and the dictionary for the meaning of unfamiliar words, which can generate even more doubts and frustrations [15].

Thus, it should be understood, in addition to various levels of deafness and their specificities, deaf culture and the libras linguistic structure in order to not standardize deafness as only, the lack of hearing [2].

For deaf Brazilians, the process of meaning of words comes from the translation of the Libras, natural language of the deaf, for Portuguese written [3,9]. This limits the reading and interpretation, since most of the portuguese language words does not exist in Libras, hindering the interaction of this group of users on the Web [4,21].

The Libras does not include a structure based on articles, prepositions and conjunctions, possessing distinct verb conjugation of Portuguese. The concept of "word" or "lexical item" of the Portuguese language, when in Libras, called signal, being composed by the combination of five parameters: the setting, the movement the direction, the pivot point of the hand and facial expression.

In this language, most verbs is expressed in the infinitive form. There are no inflections of gender and number in nouns and adjectives. The notion of time is indicated by adverbs that indicate whether the action is taking place in the present, like today and now, in the past, like yesterday and the day before, or will be in the future as tomorrow. As in Libras there is no gender distinction as in portuguese, where necessary its textual representation, you should use the @ symbol to reinforce this idea, a written sentence is quoted in Libras: " Question : I INVITE YOU SEE ME @ HOME. YOU CAN D-A-Y? Answer: NEXT SATURDAY, I CAN" [7]. This example illustrates, even if briefly, the differences between the libras and the Portuguese language written.

The libras also does not have its own system of writing, i.e. deaf individuals should use the written form of the Portuguese language in performing the activities of reading and writing [12]. Another difficulty is the case of Portuguese words that do not exist in libras, as names of people and places. In such cases, we should use the manual alphabet in order to represent such words [7,9].

In Brazil, define themselves as deaf, people with severe and profound deafness who have, respectively, hearing loss between seventy and ninety decibels and more than ninety decibels; generally are individuals with impaired verbal comprehension, difficulties in acquiring language course oral [23].

Currently, there are approximately 5.7 million Brazilians with hearing impairment, representing 3.38% of the population [11], it is crucial to recognize the specificities of these users interact with information systems in order to minimize barriers that may impair or prevent the use of information systems.

2.1 The use of the Web Navigation Helper (WNH)

The Web Navigation Helper (WNH) is a Web browsing assistant that helps accomplish tasks, particularly for those with limitations through dialogues previously established that mediate the interaction with the user interface [16]. The WNH is an extension of Mozilla Firefox, and the tasks previously automated by CoScripter, macro recorder developed by IBM [16] . From the script, it creates the dialogs which are used in end-user interaction with the page's original site [16].

Monteiro's research indicates that the development of dialogs mediation is done by volunteers who are family or have a personal relationship with the person with limitations because if changes in pages to which scripts are associated causes problems for the user to use the WNH, they can ask for help from volunteers [16].

The interaction from WNH, the user can browse the web more simply than the standard form, made through the web pages. The tool enables the inclusion of explanatory text aimed to assist the interaction, as well as offering the possibility of access to a session of questions specific to each dialog, where the end user can access questions and answers previously created on the dialogue in question. The WNH behaves as an interpreter not only the page that is associated with, but all the navigation through it. The end user, a priori , interacts only with the previously created dialogues, saving up page of any problems, be they usability, navigation, communication, accessibility, etc. [16].

In this research, the creation of the dialogues that were used in user interaction with the page 's original site, it was decided to select a volunteer who was interpreter libras, possessor of the requirements for making a communication most appropriate to the user end WNH [16].

2.2 Evaluation of interfaces as of the perspective of Semiotic Engineering

To guide designers in developing accessible systems are recommendations and directives with guidelines on how accessible systems should be designed. In the case of existing systems, it is necessary that the interfaces have their accessibility verified. For this purpose, programs were developed in order to evaluate automatically the systems level of accessibility of the systems [13].

However, the system accessibility process not only provides an interface that validates automatically, it also requires a validation is done with humans, both with the participation of experts and users with limitations. When engaging the user in the process, it becomes possible to observe, analyzing their difficulties and skills, enabling the alignment requirements of usability with accessibility guidelines, resulting in a harmonious interaction and ensuring content understandable and navigable [13].

The evaluation of interfaces is a systematic process of collecting data in order to examine how to use a system to perform tasks [25], allows the detection of systems communication breakdowns. Among the evaluation methods that involve users, there are some that rely on Semiotic Engineering (SemEng), such as the communicability evaluation method (CEM), used in this research [5-6].

3. Methodology

This exploratory research was based on a single explanatory case study with multiple units of analysis, and aimed to evaluate the adoption of new communication strategies improves the interaction of pre-lingual deaf bilinguals in an organizational context. There were two sessions of observation of interactions, considering each session as a unit of analysis, which allowed a comparison between the results.

The research was conducted at Oswaldo Cruz Foundation (Fiocruz) and included eight volunteers. Since participants were pre-linguistic bilingual deaf, two Libras interpreters were required during the various stages: at the reception of participants, in the translation of the consent form, at the test scenario, at the interviews, and during the observations. In order to facilitate the performance of each interpreter during the different stages of the research, these were coded by Feneis_interpreter and Fiocruz_interpreter.

The research was done in four steps: (3.1) test environment preparation, (3.2) mediation dialogs development (3.3) observation of users' interactions, (3.4) analysis of the results through the Communicability Evaluation Method (CEM).

3.1 Preparation of test environment

Users participants were chosen considering the following characteristics: profound pre-linguistic deaf, bilingual literacy, possess libras as a first language and Portuguese as a second, frequency of computer use more than three years and education level from high school (in order to make homogeneous the knowledge of the Portuguese language).

In order to guarantee the anonymity of the participants, their names were encoded in U-1, U-2, U-3, U-4, U-5, U-6, U-7, U-8. Five participants had completed high school, another in progress, only one elementary school, and a third in progress to university.

It was determined that testing occurs at Fiocruz, in a controlled environment, created specifically for the research. elaborated the scenario so that users take on all actions sequentially, enabling the identification of failures in the interpretation of the information system. The task set was to update their registration, which consisted of 47 fields in filling data entry.

3.2 Mediation dialogs development

The researchers invited the participant interpreter_Feneis who assisted in conducting the tests concerning the first unit of analysis of the case study, where the deaf participants interacted with the original interface of the system, that is, without the help of the wizard WNH. The invitation was due to the fact that the interpreter working in Feneis and professional experience, with four years of work dedicated to the welfare toward the audience deaf.

The dialogues were created by Feneis_interpreter, you entered the new proposed textual content regarding the 47 fields of data entry form directly in WNH. This activity lasted 125 minutes. Scripts of interaction were previously created by the researcher. Observe that, to present signals in Libras verbatim, by convention, we use words of Portuguese in capitalization [23]. Regarding the writing style, the participant decided to create short texts and goals, explaining exactly how the user should proceed.

The interpreter explained about the difficulties of creating texts, since Libras has no textual representation. In her speech, she pointed out: "There is no written form fully accepted by them. We try to get the closest possible to the way they would understand. This is what I think during construction: how should I say this in Libras?".

Then, some observations extracted from the performance of this task should be pointed out, and which are important for understanding the relevant aspects in the construction of the dialogs, which in turn seek to express the intention of the contents of each field of data entry.

In the dialog regarding the input field "undergraduate", the participant reported that recently was contacted by a deaf interested in going to college and that in seeking information on the Internet, was faced with unknown words from your vocabulary, such as graduation, university, higher education, baccalaureate, graduate.

When creating the dialog for input field "orally," the volunteer said: "I think they also know that they know that word orally". In addition, created the dialog "ORALLY NEED CHOOSE YES OR NO".

Regarding the field "emergency contact" it is interesting to comment on the care of the interpreter in creating the dialog, when she sought to describe the word emergency unequivocally, since in Libras this word has more than one meaning. Creating this dialog lasted about five minutes, which was too long in relation to the previously created dialogs, thus demonstrating the difficulty in creating mediation dialogs in order to define words of wide meaning.

The same care was also observed while creating the mediation dialog for input fields related to "dependents". However, unlike the word emergency, that word is not in the vocabulary of Libras. With respect to the dialog "degree of deafness" the participant said that many deaf people would not understand this question, because they ignore the classification of their degree of deafness. The participant pointed out that usually the profound deaf know their classification due to their extreme degree of deafness. The interpreter pointed out: "There are two guidelines for deafness: one related to the clinical aspect, which assesses whether deafness is profound, or moderate, and other which is social- anthropological, where the degree of deafness is not important, but their level of identity, i.e., how much the difficult subject recognize themselves as a participant of this group and uses Libras as their language".

3.3 Observation of users' interactions

Observations and evaluation of communicability were performed by two evaluators beginners in the CEM. The synergy between the experience and expertise of the evaluators, one with experience in usability and accessibility and another with extensive knowledge of deaf culture and information architecture, which is also interpreter Libras, enabling identify breakdowns in the communicability of user interaction with the system. In this research identified as interpreter_Fiocruz.

There were two interviews: one prior to the tests aiming at collecting information about users' experiences in using computers and Internet access, another, post-test, sought to answer questions that could influence the tagging stage and elucidate the general impressions of the participant on the system. An interview with deaf consists of four steps: reading by the interpreter of the questions that are in Portuguese, translation of questions to Libras, also held by the interpreter, conducted in Libras, writing and translation into Portuguese of the responses of the deaf, a task performed by the interpreter.

3.4 Analysis of Results

The Communicability Evaluation Method (CEM) by EngSem was used, consisting in the following stages: tagging, interpretation and semiotic profile creation. This analysis is detailed in the next section.

4. Analysis of Results

This section presents the results of each of the units of analysis of the case study based on the Communicability Evaluation Method CEM.

4.1 Analysis of the results of users' interaction without the use of WNH

4.1.1 Tagging

This step consisted in identifying the failures in the original interface communication system with user, chosen from a set of thirteen possible expressions of communicability (tags) proposed by the CEM. Initially, the evaluators analyzed 106 minutes of video interaction between system and users together with the notes taken by the researcher. Then they were compared with the responses provided by participants when questions were conducted online, through the task of updating of their databases.

The figure 1 table shows the frequency of the tags present in the task, as well as the total number of tags per user. During the tagging stage there were no user behaviors that could lead to assignment of tags: "Where am I?", "I can do otherwise", "Why does not work?", "No thanks." "Where is it?" Proposals by CEM method, not being shown in the table of Figure 1.

Tags	Total tags frequency
I give up!	45
Looks fine to me	34
I can't do it this way	8
What happened?	2
What now?	3
Oops!	5

Tags	Total tags frequency
Help!	54
What's this?	4

Figure 1 - Tags identified in users' interaction without mediation dialogs.

An example on the label "looks fine to me" occurred in completing the field "Responsible for the sector", where two-thirds of the participants answered the name of the unit in which they work, as they did not know the word "responsible."

With respect to the five questions on leisure present in the task of updating their registration data ("What do you like to do on holiday?"; "Do you practice some kind of sport?"; "Do you practice some other cultural, family activity?" "Would you like to know other subjects "; " Dou you have any suggestions for the social project? "), only the U-7 participant answered all the questions correctly. Of other users, only the participant U-2 and U-4 responded correctly to the question "What do you like to do on holiday?". However, they both answered at the second attempt, as the first they understood that the question was referring to their favorite month to go on vacations. After relecture and reflection, they deleted the wrong answer, including the correct one. The other participants did not understand the questions, not answering the five questions of the topic on Leisure.

4.1.2 Interpretation

The task of updating of the databases held the most relevant tags: "Help!", with 54 occurrences categorized as temporary failures, "I give up!", with 45 occurrences, and "Looks fine to me", with 34 occurrences categorized as complete failures, accounting respectively for 51% of occurrences.

The temporary failures raise issues relating to the difficulties of bilingual deaf users in dealing with words there are not in the vocabulary of their first language. The label "Help!" is used when the user explicitly asks for help, as it occurred with all participants. As they did not get answers when help was requested, most participants left the input field blank, assigning the label "I give up" or trying to infer the meaning of the question, believing, mistakenly, that they had completed the task successfully, and to this behavior the label "To me, it's fine" was attributed.

4.1.3 Semiotic Profile Creation

A Finally, the semiotic profile creation the analysis process was concluded with a characterization of the receipt of metacommunication messages, which is the interpretation of the data identified in the previous stage, seeking to rebuild the met message, which the designer wants to convey through search interface [6].

The met message of the organizational system is: "In my interpretation, you are an employee user Fiocruz who has experience in interacting with computers and is fluent in Portuguese. Here is the system that I designed for you. I understood that you would like to use the intranet to solve specific problems such as updating your registration information in a practical and quick way. I also realized that the designer sought to reach only the listeners group, excluding the deaf, who are potential users of the system".

4.1.4 Evaluation Results

It was concluded that even the deaf experienced in using computers encounter difficulties in understanding the linguistic terms present in the interface of organizational systems that prevent them from performing simple tasks.

4.2 Analysis of results of the users' interaction with the use of WNH

4.2.1 Tagging

E During this stage there was identification of the failure of communicability of the mediator designer, i.e. focusing on mediation dialogs, taking into account only the mediation dialogs created with the division of the same sub stages of the tagging stage 6.1. A total of 200 minutes of video interaction between system and users and the notes taken by the researcher were analyzed, comparing the answers provided by users through the mediation dialogs with those provided by the users when the questions were asked by Feneis_interpreter.

At the end of the tasks, there was an informal interview with open questions, aiming at collecting information on: general impressions about the interaction with mediation dialogs, quality of mediation dialogs, the independence of the user with the continuous use of WNH and the use of the tool on the web.

The U-3 participant reported that he liked the "SMALL WINDOW", referring to WNH, and wished it could be used it on other pages, noting that if they did not understand the information on web page, they would use the "SMALL WINDOW" to understand it . With regard to the independence of WNH, the same participant reported that continued use of the tool for about a year, would enable them to avoid the use of the dialogs; they also said that they liked the quality of the texts, understanding the information present in the dialogs.

All approved the quality of the dialog created by the interpreter, highlighting the easiness of comprehension of the texts. The U-2 participant stressed the difficulty in answering the questions in Portuguese, although understanding the question. The U-5 participant highlighted the easiness of understanding of the questions with the help of mediation dialogs. The participant U-6 compared the mediation dialogs with the special public telephones for deaf people using keyboards, where communication is done using Portuguese, and they also said that they had doubts in a few words they did not know. The participants U-6 and U-7 referred to the tool as "SUBTITLE". Participants U-1, U-2, U-3, U-4, U-5, and U-6 reported that they would like to use the WNH in other sites. The user U-7 reported that the application of WNH would depend on each web page and that there are sites with very complex sentences, emphasizing the difficulty of reading the Portuguese language, highlighting the excellent quality of the subtitles and the use of examples as factors that facilitated the understanding of questions. This same participant emphasized the importance of dialogs in preparing the answers, because during testing, unknown words on the original page of the Intranet, were understood with the aid of the text of "SUBTITLE", referring to WNH. Regarding the independence in using the tool, participants U-1, U-4 and U-5 reported that they would continue using the "SMALL BOX", referring to WNH, in face of the easiness of text understanding, while U-2 and U-3 said that the use of the tool was unnecessary, as soon as they learn to navigate in a particular page.

Figure 2 shows, on a consolidated basis, the frequency of tags present in the task of updating of the databases with the use of mediation dialogs. During the tagging, there were no behaviors that would lead to the assignment of tags: "I can do otherwise.", "What now?" "I can't do it this way.", "Why does not work?", "Oops, what happened?", "Where Am I?"; "Oops! Where is it?" Thus, these were not presented in the table of Figure 2.

Tags	Tags frequency
Looks fine to me	11
I give up!	4
No Thanks	6
Help!	4
What's this?	2

Figure 2. Tags identified in users interaction without mediation dialogs.

4.2.2 Interpretation

It was identified that users have approved the interaction with the tool, and as a consequence, there were fewer breakdowns of communication. Figure 3 highlights some important observations, organized by mediation dialogs, extracted during the task analysis. It should be noticed that in order to present signs in Libras verbatim, by convention, we use capitalized Portuguese words [23].

Field in the form	Dialog created By the interpreter	Participant	Filling details	Interpretation
"Affiliation mother" Answered	NEED TO PUT NAME YOUR MOTHER	U-2	The user filed besides the full name of the name the information "IS DECEASED"	The user filled out the information in WNH as dialoguing with the tool, it is clearly noticed the presence of the interpreter in the dialogs.
"Do you practice any cultural family activity?"	" WRITE WHAT LIKES TO DO. EXAMPLE: WALKING TOGETHER FAMILY, GO SHOPPING, GO BEACH, NOT GO OUT OR OTHER.	"U-6"	SHOPPING AND GO BEACH VERY TASTE GOOD!"	The user understood completed the mediation dialog created by interpreter, filling out in WNH as dialoguing with the tool, and there is evidence of the attempt of the user in creation sentences

Figure 3. Observations on the interactions of users with mediation dialogs.

4.3.3 Semiotic Profile Creation

The met message of the mediation designer is: "In my interpretation, you are an employee user of Fiocruz who has experience in interacting with computers and are not fluent in Portuguese, having Libras as first language and Portuguese as second language. Here is the system that I designed for you. I understood that you would like to use the intranet to solve specific problems such as updating your registration information in a practical and quick way. Since you have difficulties in reading and interpreting Portuguese I have used communication strategies respecting your linguistic abilities".

4.4.4 Assessment Results

From the characterization of the met message, it was noticed that the use of mediation dialogs followed the development-oriented to the accessibility of pre-linguistic bilingual deaf without the exclusion of those listeners' users using the system.

The participants understood and interpreted most of the dialog mediation, but showed limitations while writing. In these cases communicability tags were not assigned. The use of mediation dialogs can be considered as a tool to encourage reading, allowing the interpretation of texts, making them more autonomous and participatory.

The constancy of similar results obtained during the analysis indicates that many of the flaws present in communicability in mediation dialog could have been minimized with the implementation of a pre-test to evaluate the quality of the dialog created by the volunteer interpreter.

There is mention to the example "orally" where the performer did not create a mediation dialog supposing that this was a known word to the deaf. The word "ORAL" contained in the web page of the Dictionary of sign language could have been used by the interpreter in order to create the following dialog: "ORAL KNOW? MUST CHOOSE YES OR NO" Instead of "ORALLY MUST CHOOSE YES OR NO".

At the end of the tasks, there was an informal interview with open questions, aiming at collecting information about users' general impressions about the interaction with mediation dialogs. All participants said they loved using the WNH, from those, the participants U-2 and U-7 emphasized the importance of WNH in accomplishing tasks.

All of them approved the quality of the dialogs created by the interpreter, highlighting the easiness of comprehension of the texts. The U-2 participant stressed the difficulty in answering the questions in Portuguese, although understanding the question. The participant U-6 compared the mediation dialogs with the special public telephones for deaf people who use keyboard, where communication is done in Portuguese, it was also said that there was doubt on a few words they did not know. It is noteworthy that the participants U-6 and U-7 referred to the tool as "SUBTITLE".

5. Conclusions

This exploratory research relied on a single case study with multiple units of analysis, in order to evaluate the use of mediation dialogs in the interaction of profound pre-linguistic bilingual deaf in an organizational context, in order to identify if the adoption of a new communication strategy improves the quality of the interaction of pre-linguistic bilingual deaf.

The participation of deaf people in corporate environments implies the need for detailed studies on the specific interaction of these users, with the aim of identifying possible barriers that may impair or prevent the use of corporate information systems on the web.

Addressed the concepts related to hearing impairment, in particular, the difficulty of the deaf in learning Portuguese as a second language due to the process of signification of words, web accessibility and interaction difficulties of the deaf and a brief introduction about the theory of semiotics Engineering, the conceptual basis for the development of research.

There were two sessions of observation of interactions, with and without the use of mediation dialogs. The stage of data collection and observation involved the participation of eight volunteers. We used the method to evaluate the communicability (CEM) Semiotic Engineering, to compare the user's interaction in browsing activities and data entry in the organizational system, investigating the quality and communication breakdowns of the interactive system.

The development of mediation dialogs with the participation of a libras volunteer interpreter, possessing the necessary knowledge to perform a more adequate communication to the end user. Its main function was to translate the communication Libras, she would use if were helping a deaf user interaction in a face to face, to communicate in Portuguese written following the grammar of libras, which is the main feature in this communication mediation dialogs. The table in Figure 4 shows a comparison table of the results of evaluations of communicability with the original interface of the system and the use of new communication strategies through WNH.

Total Tags	Original Interface (without use of WNH)	Mediation dialogs (with use of WNH)
I give up!	45	4
Looks fine to me	34	11
I can't do this way!	8	-
What happened?	2	-
What now?	3	-
Oops!	5	-
Help!	54	4
What's this?	4	2
No Thanks	-	6

Figure 4 - Results of evaluations of communicability with and without the use of new communication strategies.

The interaction without WNH was very difficult for all users. Using WNH, despite some difficulties all users completed the tasks successfully. Interaction with WNH revealed interesting issues related to communication between creators and users dialogs.

For example, as the interpreter knew all users, she was able to give real examples and contextualized for users, allowing them really help during data entry. We also observed the impact of mediation WNH in the communication process. The text of the dialog was a way of the self-representation of the interpreter through software. May evidences were gathered on their self-expression and self-representation, observing how users could communicate directly with her, as if she were "there." Another study WNH is dedicated to discuss this matter thoroughly [17].

Compared with the most commonly used features such as assistive technologies for deaf, the WNH stands for guiding navigation by linking web pages dialogues with automatic scripting of interaction. Once on a page rich in information and navigation options, but not necessarily accessible, WNH serve as a guide, leading the user to the necessary information to perform a specific task, with fields to be filled, choices to be made, etc. all assisted by help texts previously defined.

The results showed clear evidence about the needs of this audience, especially in relation to language, which must be considered in the development of systems, improving the quality of metacommunication, promoting accessibility during interaction with the system.

As future work we propose to conduct research using the mediation dialogs at sites rich textual information.

References

1. Alves, A. S. Estudo do uso de diálogos de mediação para melhorar a interação de surdos bilíngues na Web. 2012. 156 f. Dissertação (Mestrado em Informática) - Universidade Federal do Estado do Rio de Janeiro, Rio de Janeiro, 2012. <http://arca.icict.fiocruz.br/handle/icict/6225>.
2. Bueno, J. G. S. Surdez, linguagem e cultura. Cad CEDES v.19, n.46, pp.41-56, Set. 1998.
3. Corradi, J.A.M.: Ambientes informacionais digitais e usuários surdos: questões de acessibilidade. Mestre. Dissertação Mestre. Universidade Estadual Paulista, Marília-SP. 2007.
4. De Souza, C.S.: The semiotic engineering of human-computer interaction. The MIT Press, Cambridge. 2005.
5. De Souza, C.S., Leitão, C.F.: Semiotic engineering methods for scientific research in HCI. Morgan & Claypool Publishers, California. 2009.
6. Felipe TA.: Libras em contexto: curso básico: livro do estudante. WalPrint, Rio de Janeiro. 2007.
7. Federação Nacional de Educação e Integração dos Surdos. Fiocruz: além da porta de emprego: a visão do profissional surdo. Revista da Feneis 7, (31), p.17-21. 2007.

8. Goldfeld, M. A criança surda: linguagem e cognição numa perspectiva sócio-interacionista. São Paulo, Plexus, 2002.
9. Hanson, V.L.: The User Experience: Designs and Adaptations. In: Proceedings of the 2004 International Cross-Disciplinary Workshop on Web Accessibility (W4A), pp. 1-11. ACM Press, New York, 2004.
10. Instituto Brasileiro de Geografia e Estatística.: Censo 2010.: Dados referentes à deficiência. 2010. <http://www.censo2010.ibge.gov.br/calendarioresul.php>
11. Kozlowski L.: O modelo educacional Bilingüe no INES. Revista Espaço (18-19), p. 102-105. 2002.
12. Leal Ferreira SB, Nunes R.: e-Usabilidade. LTC; Rio de Janeiro (2008)
13. Leal Ferreira, S.B., Santos, R., Silveira, D. S.: Panorama da Acessibilidade na Web Brasileira. Revista de Controle e Administração III, (2) 205-234. 2007.
14. Leporini, B., Paternò, F. Applying web usability criteria for vision-impaired users: does it really improve task performance? International Journal of Human-Computer Interaction 24, (1) 17-47. 2008
15. Monteiro, I.T., Souza, C.S.: Embedded Cultural Features in the Design of an Accessibility Agent for the Web. In: Proceedings of the 6th International Conference on Universal Access in Human-Computer Interaction Design for all and Einclusion, pp. 295-304. HCI, Orlando, EUA. 2011.
16. Monteiro, I.T., Souza, C.S.: The representation of self in mediated interaction with computers. In: Proceedings of IHC'2012 XI Simpósio Brasileiro de Fatores Humanos em Sistemas Computacionais, pp. 5-9. IHC, Cuiabá, Brasil (2012)
17. NBR 9050. Associação Brasileira de Normas Técnicas. Acessibilidade de Pessoas Portadoras de Deficiências a Edificações, Espaço, Mobiliário. Rio de Janeiro: ABNT 1994.
18. Nicholl, A. O Ambiente que Promove a Inclusão: Conceitos de Acessibilidade e Usabilidade. Assentamentos Humanos Magazine, 3, 2. Dez, 2001.
19. Nielsen, J.: Projetando websites. Campus, Rio de Janeiro. 2000.
20. Oliveira, D.R.R., Dias, J.S., Muller, M.F., Pinto, F.C., Souza, G.L., Prates, R.O., Bernadino, E.L.A.: Avaliação da Acessibilidade do Sítio da Receita Federal para Deficientes Auditivos. In: Simpósio de Fatores Humanos em Sistemas Computacionais, Belo Horizonte, MG, Brasil. 2010.
21. Queiroz, M. A. (n.d). Bengala Legal. Acesso em: 15/3/2012 from <http://www.bengalalegal.com>.
22. Sacks, O.: Vendo vozes: uma viagem ao mundo dos surdos. Companhia das Letras, São Paulo.1998.
23. Senai. DN. Capacitação dos docentes do SENAI para comunicação em LIBRAS com alunos surdos. Brasília. P.161, 2002.
24. Prates R.O., Souza C.S., Barbosa S.D.J.: A method for evaluating the communicability of user interfaces. Interactions 7, (1) 31-38.200.
25. Preece, J., Rogers. Y. S. H. Design de interação: além da interação homem-computador. Porto Alegre, Bookman, 2005.