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Original Contribution

CONTEMPORARY INFORMATION AND COMMUNICATION TECHNOLOGIES FOR CONSULTING AND LEARNING OF CHILDREN WITH SPECIAL EDUCATIONAL NEEDS IN INCLUSION EDUCATION

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ABSTRACT
The paper presents the results from implemented experiments for the quality of software system LOGOPED 3.0 for virtual consulting of stuttering children (which we designed and developed in Plovdiv University „P. Hilendarski") and using educational computer games with children with special educational needs in inclusion education.

Key words: stuttering, virtual consulting, inclusion education

INTRODUCTION

In the last few years the question for inclusion education and social adaptation of people with special educational needs (SEN) is a question of present interest. One of the most important tasks of social adaptation is to give to these people opportunity for adequate and quality education. The information computer technologies have an important role in contemporary man's life and his education.

The usage of the computer system in education gives them the opportunity for better organization in education in the inclusion education and alternative methods for introducing of verbal material. Every one of them has an opportunity for the individual development and building of more complicated mental process, in this way the advanced can reach a higher level in its real-cognitive development.

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The widespread using of Internet and contemporary information and communication technologies (ICT), especially a question of present interest is that for the equal access to the electronic information resources and World Wide Web.

Internet and the World Wide Web are important resources in many aspects (education, job hiring, health care and etc.) for everyone, which can utilize them. The virtual space is offering to people with SEN a lot of opportunities for virtual consulting and education.

In front of people with SEN are placed a great number of social barriers such as limited mobilization, embarrassed access to educational service, for work, to participate in public and social life, and so on. Nowadays, the wide embedding of ICT in every area, part of these barriers can be successfully overcome. Unfortunately, a few number of working Internet-sites and systems with various purpose (incl. and implemented in the frame of electronic government) are

accessible for people with SEN. The difficulty in front of web-developers comes from the variety of possible difficulties in Internet-accessibility, provoked by the wide spectrum of possible diseases and impairments. The adequate overcoming and deciding the problems in front of Internet-accessibility for people with special educational needs requires a good knowledge of specifics of the different types of impairments. Frequently, the decisions are only for certain groups of users with SEN.

The wide-spread information and communication technologies create conditions for applying of new methods and forms of consulting, diagnostics and education in the field of treatment of communicative disorders. Electronic consulting or software for therapy of communicative disorders take place of (or complemented) visitations to speech-therapist. In last time, popularity is given to Web-gates and software applications, offering games for treatment of learning disabilities and for universal developing of the children in different fields of education (1). More frequently computer games are used as a means for education, developing fine motor skills, developing visual memory and ability to stay focused comprehensive development. The paper presents the results from implemented experiments for the quality of software system LOGOPED 3.0 (2, 3, 4) for virtual consulting of stuttering children (which we designed and developed in Plovdiv University) and using educational computer games with children with SEN in inclusion education.

The **main purpose** of the research is to create models of classic stuttering therapies and their usage for designing, realization and approbation of relative software tools for virtual diagnostics and consulting of stuttering children.

The **main stages** of the research are: to create suitable models of classic stuttering therapies, designing and realization of relative software application for electronic therapy of stuttering; designing of software application for generating and managing of logopedic phonetic tasks, used for diagnostics and therapy of communicative disorders and evaluation the quality of created models and tools.

The object of the research is methods, models and tools offered by contemporary Internet-technologies in special pedagogy and especially for diagnostics and consulting of stuttering children.

The specific object of the research is models of classic stuttering therapies and their application for virtual diagnostics and consulting of stuttering children.

Our general hypothesis is that using the information technologies in stuttering therapy and especially the e-therapy design conformity with the process of conducting stuttering therapy is very applicable. Other our hypothesis is that the created software application is with high quality.

MATERIALS AND METHODS

LOGOPED 3.0

The main purpose of LOGOPED 3.0 is automation of evaluating technology of speech for electronic therapy of people with communicative disorders. LOGOPED 3.0 includes 3 (three) modules for intonation training, speech fluency improving and virtual interlocutor), which help realization of therapy by remote access (electronic therapy) for people with communicative disorders. This functionality is based on algorithms for extracting voice/unvoiced parts of the speech and parameters like tempo, rhythm and intonation and etc. With means of LOGOPED 3.0 the stages, connected with therapy of stuttering (or other communicative disorder), as well and corresponding types of exercises could be modeled by speech-therapist). Typical of Russian school method, based on the idea of the fully functioning of the

speech apparatus and the nervous system of a person was used to test the system.

LOGOPED 3.0 supports two categories of users: *Patients* (and their parents, especially in the case of children with communicative disorders); *Specialists* (pedagogue and speech therapist). The role of the specialists is to model methods, appropriate for the patients, and to keep an eye on them while implementing prescribed exercises. The first registration of patients realizes the diagnostic stage of the method for correction of Communicative Disorders, and demands from the patients to pronounce defined text. After registration, patients can join on their own (through Internet), to appropriate for them therapeutic course, implemented on the method, prescribed from the speech therapist. Already registered user-patients, on each following session with LOGOPED 3.0, are offered a menu, compound according to requirements of the developed method.

Possible choice of a user-patient, is a program for the day, conformable to reached stage, offering implementation of logopedic exercise (of each type), and conformable with corresponding methods.

Choosing the specific exercise its condition (possibly accompanied with multimedia demonstration), if this is an element of the condition - is visualized, and the user is proceeding to implementation.

In module intonation training the expert can insert new text with different intonation and to create intonation exercises which patient to perform.

In module for improving and practicing speech fluency the user has to read (from a 'running' text line) or repeat (after hearing a speech template) specifically selected phrase or text, recorded in the database beforehand. The user's task is to master the art of fluent speech, produced with different tempo.

Texts for practicing with virtual interlocutor are inserted into database beforehand by the expert (mainly dialogues). Before proceeding to communication with real interlocutor, it is important for user to learn to control his own speech and voice. The purpose of the module is to gain stability in contact with virtual interlocutor, which is a base for effective transfer of work off habit in situations of real communication.
The main purpose of the study we implemented was to measure the quality of software application "LOGOPED", to find out if it can be used for electronic therapy of stuttering and other communicative disorders and to understand if it can be useful in inclusion education.

SOFTWARE QUALITY

Measuring software quality is difficult and can be done in two major ways. The one is to compare our software with another of such type and the other is to use a model that includes factors like understandability, usability, effectiveness, completeness, security, maintenance, reliability and etc. (5).

The question is not if the software system possesses a particular factor, but it is in what degree the software system is corresponding to this factor.

The software quality is also defined by the experience of the end user. This aspect of the software quality is called usability. It is difficult to evaluate the usability of a given software product. Some of the questions that must be asked are:

- Is it easy to do simple operations?
- Is it intuitive the user interface?
- Is there documentation for the users or online help?
- Is it responsive the interface or too slow?
- Is it easy to execute complex operations?
- Does the software gives significant messages for errors?

– Does the software behave as expected?

Usually the software companies, which are offering software products evaluates their product through the users for which it is done, i.e. the user says what he wants, the company implements it and the users try it to find out if it is responding to their requirements, without implementing any questionnaire for its evaluation. The other way is through feedback or an inquiry if the users of the software are many, not only one company or one end user.

For evaluation of LOGOPED we implemented questionnaire after we checked available questionnaires for evaluating of software application such as the one for evaluating of:

– Software quality (6);
– Web-sites (7);
– Usability of software application SUMI (SOFTWARE USABILITY MEASUREMENT INVENTORY) (8) as well as metrics for software technologies (9) and the questionnaire QUIS (10).

We create a questionnaire based on Boehm's model to measure the quality of the created software system, but we choose such factors that are important for electronic therapy.

The factors for quality we choose for the software system for electronic therapy are:

– usability – convenience in using and practically utilizable; it is define by reliability (completeness, accuracy, consistence), effectiveness and using;
– understandability –clearness of purpose; everything in design, manual and interface to be clear and intelligible for the users;
– reliability – to execute the planned functions;
– convenience for using – assimilation and exploitation with minimal efforts;
– completeness – stick to accepted symbols and terminology;
– effectiveness – implementation of the purpose without any loss of resources, time, optimized for speed;
– correctness – correspondence of the specified algorithms and other specifications towards data processing and user documentation.

Every factor is defined by several criteria. To define the values of assessed elements (the most elementary characteristics, which have a quantity assessment) for factors we used the sociological method to gain information namely the values are received through specially developed questionnaire.

For the purpose of our study we created questionnaire according to the chosen model. The same questionnaire we created in variant for specialists in informatics, which must to define the weight of the assessed elements.

The questions in the questionnaire for evaluating of LOGOPED are from the following groups of criteria: *learnability* (facility to manage the system, facility to realize the tasks, is there auxiliary information on the screen?, are instructions understandable?), *screen* (Is the screen information organized understandable?, Are the screens successive?), *terminology* (Are font style and font size understandable, Are used terms understandable?), *system* (Is the system with acceptable speed, is it reliable, presence of many errors and facility to manage them).

The aim of some of the questions is checking for errors in the system, which to be repaired and that way perfecting the system. Other parts of the questions are verifying our general hypothesis.

A study with real users has been done. The participants are total number 19 in two main groups – 14 speech-therapists and 5 specialists in informatics. The work of the speech-therapists is to answer the questions in the

questionnaire, the informatics must to evaluate the questionnaire and the questions if they are suitable and important are for its designed purpose.

The study took place in Plovdiv, Bulgaria, Plovdiv University "Paisii Hilendarski" in "Laboratory for students with special educational needs" and Resource Centre in Plovdiv. The speech-therapists are working with stuttering children in inclusion education. Two of the participants are working as teachers with children with special educational needs, one of them is a specialist in special pedagogic and other 4 are specialists in communicative disorders (speech therapists). Two of the participants are Greeks and are well grounded in stuttering therapies in Bulgaria and Greece.

When "LOGOPED" was introduced to the speech-therapists, they were given the questionnaire, which consist of 54 semantic differentials, along with written instructions describing how to complete the questionnaire. Some of the semantic differentials are as follows:

1. Do you think that "LOGOPED" can be used for stuttering therapy?
2. Do you think that "LOGOPED" can be used for therapy of other communicative disorders?
3. Would you use "LOGOPED" in your work?
4. Do you know method for stuttering correction that can't be modeled with "LOGOPED"?

The speech-therapists were given the opportunity to give advices, notes and to evaluate the design and functionality, to report for errors. The questionnaire has an electronic variant.

The same questionnaire was proposed to the specialist in informatics, but to evaluate the weight of the questions without answering to them. There was a brief description of the system for electronic therapy LOGOPED in the questionnaire.

RESULTS

The speech-therapists that have participated in the study expressed an opinion that the idea for such type of software is very good. They gave the following suggestions when they have the opportunity to test the system for electronic therapy:

- to improve the system design, to be more interesting for children;
- to have more pictures, which to attract children's attention and curiosity;
- possibility to change font size for those children that have visual impairment;

Most of the speech-therapists (93%) think that *LOGOPED* is useful for electronic therapy of stuttering and evaluate the level of usability between 4 and 9 (the scale is 0-9) and would recommend it to their colleagues. Some of them (64%) think that *LOGOPED* can be used for electronic therapy of other communicative disorders, and 93% of them would use it in their job. Most of them (78%) are not grounded with other software systems for electronic therapy of communicative disorders. the speech-therapists do not report for method or exercise, which cannot be modeled with *LOGOPED*. For 71% it is easy to insert new method in the system. According to them it is relatively easy to learn to work with the system. They (64%) are aware of start position if they want to do something specific with system. 60% easily work with the system. All of them understand all the menu items and think that the screen information is clear and clearly organized. According to 93% the font size is readable, but it is a good idea to have the possibility to change it. All of them know the used terminology in the system. The system corresponds to the way a stuttering therapy and an exercise passes.

When the questionnaire was filled in by the speech-therapists and specialist in informatics defined the weight of questions, criteria and factors for the

quality of software for e-therapy, we compute the quality with the corresponding formula on model's instruction. The results we received are in the range 0.6-0.9, when it is known the quality is a number between 0 and 1, and 0.6 is with 34.3%, 0.7 with 28.6%, 0.8 - 14.3% and 0.9 -22.9%.

CONCLUSION

Our admission that using of information technologies in stuttering therapy and especially the electronic therapy designed according to process of stuttering therapy has applicability in inclusion education was confirmed. The system for e-therapy LOGOPED 3.0 can be used for therapy of different communicative disorders, only after the relative exercise for particular methods are inserted. The LOGOPED has a contribution to special and inclusion education. The main contribution is that it is offered e-therapy of stuttering, including creating a model of classic stuttering therapies and relative types of exercises. Electronic therapy is offering opportunity to specialist to exchange information about effective stuttering therapies, using the priority of Internet to connect people from far away, offering an opportunity to communicate more easily.

Other contributions include: designed and implemented is the first web-based software system for e-therapy of stuttering; it is developed automated means for phonetic transcription, dividing into syllables which can be used in another area.

It can be used for e-diagnosis for specifying of the type of communicative disorder and offering the relative therapy; integrated in the platforms for e-learning.

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