"SEE and SEE": An Educational Tool for Hard of Hearing Children

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Abstract

An educational software, namely "SEE and SEE", that aims to enhance literacy skills of deaf or hard of hearing children is presented in this paper. The proposed computer-based educational environment, takes into account children's visual learning characteristics. The software provides a series of adjustable functionalities to the teacher, so s/he can create visual-kinetic educational information for each pupil. Moreover, pupils have the opportunity to use bilateral presentations of the information content, by evoking sign language video for each text sentence, accompanied with comprehensive diagrams and pictures. A series of test-questions are also incorporated that reflect the contribution of each educational process to the learning curve. The whole activity is logged and archived at a local database that outputs statistic/activity reports and files. "SEE and SEE" can prove to be a useful learning object that contributes to the normalization of the educational environment towards the children needs.

1. Introduction

Deaf children face various difficulties in the development of reading skills, which are associated mostly with their poor language experiences when they arrive at school [1], [2].

Contrary to hearing children, deaf children have a limited access to language from the very first moment of their birth; hence, communication with their environment, even within the family, is merely achieved and after significant effort [3].

When deaf children have a rich language background in sign language, they are required to learn to read in another language, which is very demanding, partly because deaf children learn to read and in parallel learn a second language [1] and also because the transition from signing to the written form of an unknown spoken language is a more complicated procedure [4], [5].

So far, a series of efforts have been made in order to adapt the education curriculum to the language needs of deaf or hard of hearing children [6], [7].

In this project, a new educational software, namely "SEE and SEE", is presented that enriches reading school texts with visual information with an aim to enhance reading comprehension levels of deaf and hard of hearing readers.

## 2. Structural characteristics

"SEE and SEE" consists of separate modules that are integrated on a common basis, i.e., to involve deaf kids and educators in an efficient educational environment (see Fig. 1).

The first module refers to the teacher, who could modulate the educational environment according to her/his selections. In particular, using the pallet tool, the teacher is capable of creating the relevant body text, either by uploading and/or creating her/his own text, and associating with it either video (of sign language or context-based) and/or pictures and/or diagrams.

The text editing/deletion options, provides her/him with the opportunity to modify even existing body texts, making them more adaptable to children's knowledge skills. Moreover, a series of outputted reports are
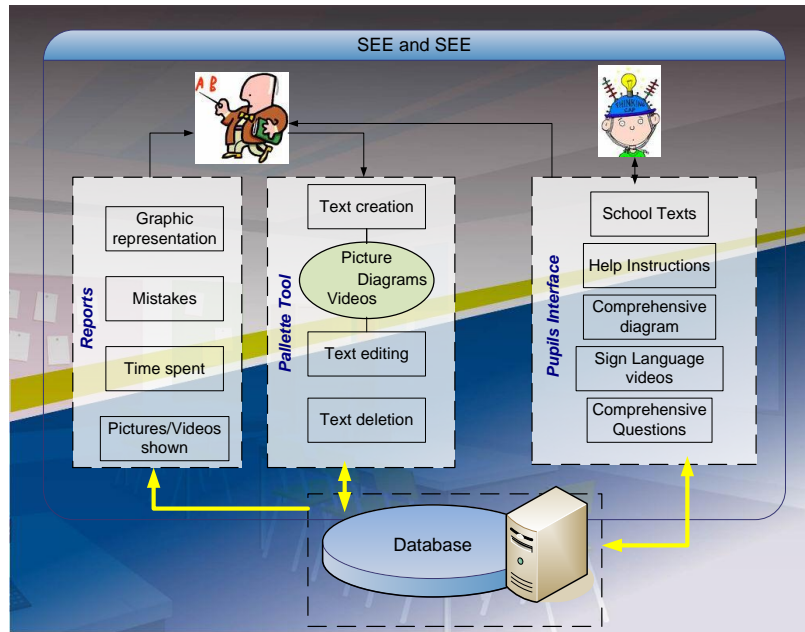
Figure 1. Structural block-diagram of "SEE and SEE". The separate interfaces for the teacher (left) and the pupil (right) are connected to a common database (bottom).

produced by the software, reflecting children's activity, i.e., software interaction, mistakes (associated with each separate event) and distribution of events across a timeline, both as graphics and as files compatible with SPSS and MS Excel software for statistic analysis. The second module is the pupil's interface (see next section), which consists of a series of available body texts (drawn from the Greek education curriculum for deaf children), and a video player, accompanied by operational buttons. Using the latter, the pupil has the capability of selecting help instructions; see a comprehensive diagram or pictures (related with the content of the current sentence); evoke the video that translates the current (highlighted) sentence (or paragraph or the whole text) to Greek sign language (GSL); respond to comprehensive questions. The total activity is archived in a local database (see Fig. 1) that is used as the bedset for outputting the statistical reports (files). This gives the opportunity to the teacher, to evaluate each component of the educational process and proceed to appropriate modifications and customizations, according to the comprehensive level of her/his pupils. In this way, "SEE and SEE" acts as a dynamic educational tool.

3. User's scenarios

The user of "SEE and SEE" could follow the structural paths of the software (summarized in Fig. 1), previewed as a step-sequence in Fig. 2.

The user is initially prompted to the introductory page of the software (see Fig. 3(a)). By entering the system, a login page is evoked, where the user can enter into the system either as a pupil or a teacher, using an appropriate username and password (see Fig. 3(b)). The user can identify his/her self as a preexisting or a new user; in the latter case, appropriate information is inputted into the system using the corresponding menu (see Fig. 3(c)).

Logged as a pupil, s/he can select, with the guidance of the teacher, a text from a variety of prepared enhanced texts, according to the curriculum corresponding to her/his age and comprehension ability. This evokes the central pupil's page (see Fig. 4(a)), where a main window presents the text to the pupil in the form of sentences and paragraphs. By selecting a sentence with a mouse-click, a video translating the sentence in Greek sign language is previewed in the video-window above the text-window (see Fig. 4(a)), and the sentence corresponding to the video is highlighted, indicating the synchronization between the current text and video. The video-window has a media-player like functioning, i.e., play, stop, pause; hence, the pupil could navigate through the video according to her/his needs. In the default texts, all sentences are linked to Greek sign language videos; in some cases, however, the teacher could link selected text only either with Greek sign language videos or some additional videos related to the general content. In both cases, the pupil could see
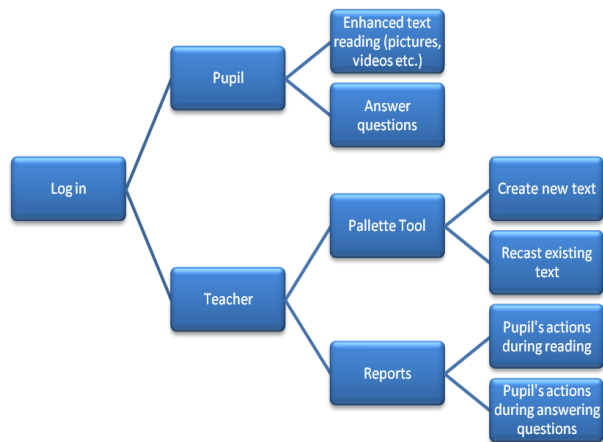
Figure 2. Step-sequence of "SEE and SEE" functionality, according to its structural characteristics illustrated in Fig. 1.

which sentences are hyperlinked with video and which are not during her/his interaction with the software.

In many cases, at the end of a sentence a hyperlinked icon exists that, when clicked, evokes a drawing previewed at the video-window area, which relates to the content of the corresponding sentence or paragraph in a descriptive way. Zoom in/out facilities are available both for text- and drawing-windows.

A diagram is also available for each text, which could be evoked at any time during the educational process and can be used as a content-map that could serve as a comprehension scaffolding tool. In addition, the whole text is linked with a video which plays the whole text from the beginning throughout the end, helping the pupil to unify the meanings of the separate sentences and paragraphs of the text and realize its overall content. In all cases, help is available, either in Greek sign language video or as a text.

By pressing the Greek question mark button (see Fig. 4(a)), the pupil is prompted to a new window that includes a series of comprehension questions (see Fig. 4(b)). The video-window is preserved in this form and it is activated when the pupil left-clicks on the text, evoking the corresponding Greek sign language video. The pupil selects from multiple-choice type available answers and gets a reflection message if her/his answer
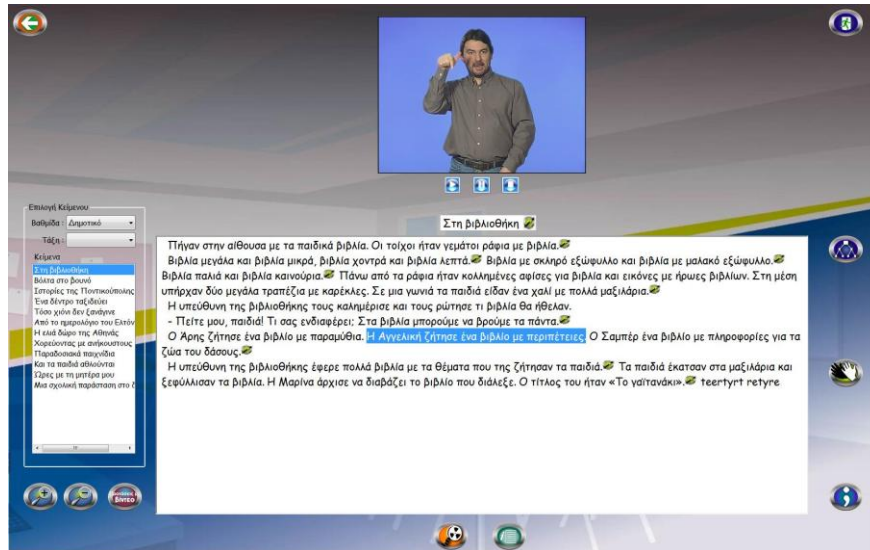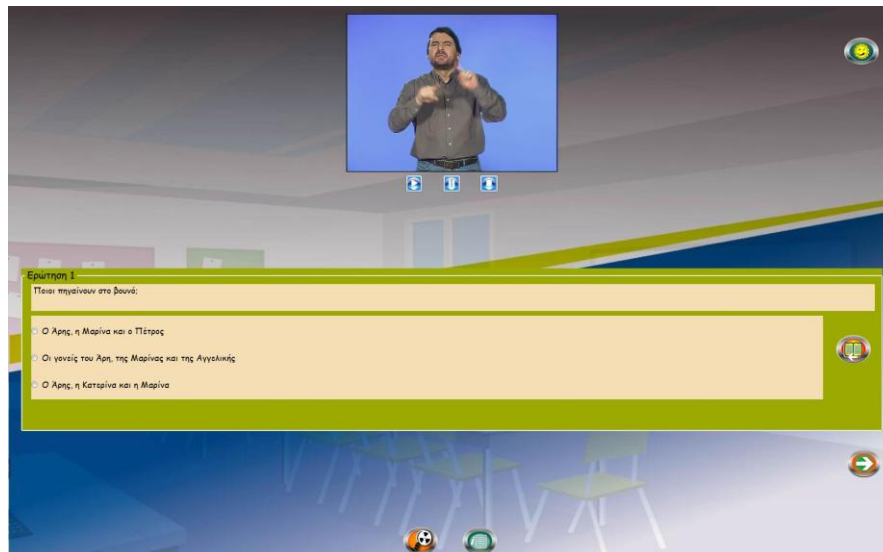

(a)

(b)
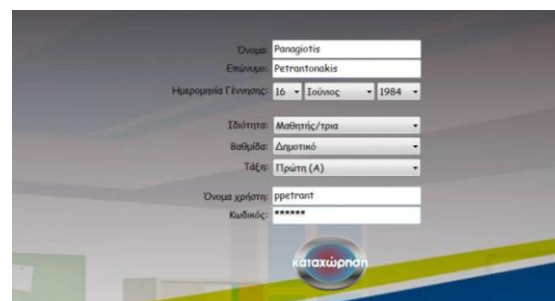
(c)

Figure 3. (a) The introductory page of the "SEE and SEE" software, (b) the login page where the user can enter as a student or a teacher using a username and password, (c) the insertion of a new user menu (here a student of First Grade is created).

is correct or not. Moreover, at any time s/he can return back to the text to draw more conclusions upon her/his answer selection.

(a)

(b)

**Figure 4. (a) The central pupil's page with text- video- and selection-windows, along with se-
lection buttons (help, zoom in/out previewing, drawings, diagram, video for the whole text)
and link buttons (back, exit, questions), (b) The question-page which includes multiple-choice
type questions with links to Greek sign language video and return to text-window for assist-
ing pupil's comprehension and respond.**

From the teacher's perspective, when s/he logs into the software, s/he can select either to use the pallet tool or to preview some reports (see Fig. 2). In the first choice, s/he can edit a preexisting session (see Fig. 5(a)) by modifying the text and the linked material (e.g., video, drawings, diagrams etc), whereas in the second one, s/he can create a whole new session, by adding new text and new linked material (see Fig. 5(b)). Finally, the teacher can preview a series of statistics and reports regarding to the interaction of the pupil with the software, as in all cases, pupils' clicks are logged into the system. The previewing of the statistics is implemented with barline-plot (see Fig. 6); the teacher can select the statistics of individual and/or grouped interactions by selecting the appropriate check-boxes.
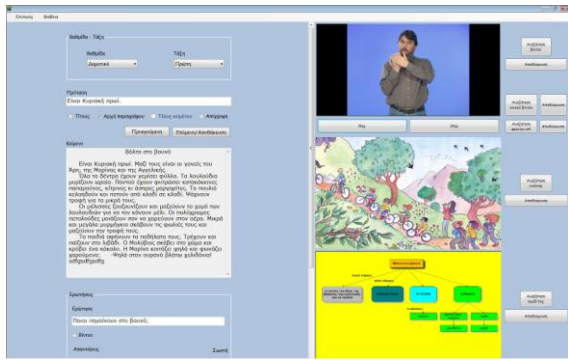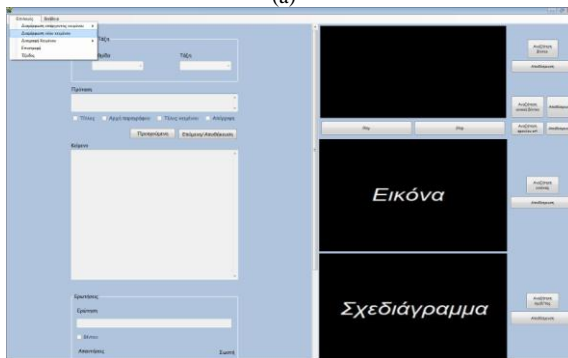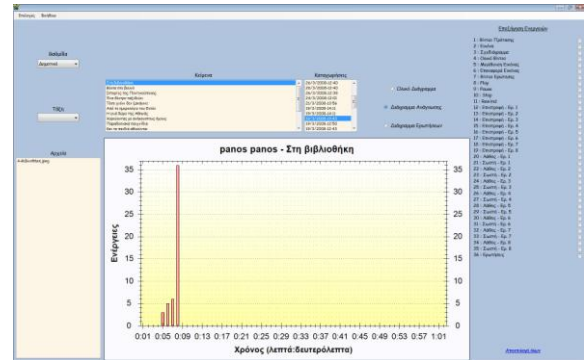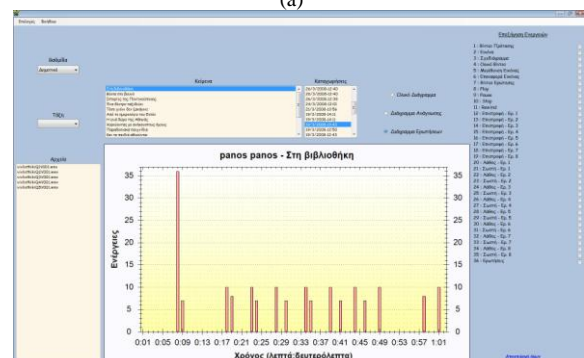
Figure 5. The pallet tool of the "SEE and SEE" software for (a) editing preexisting session or (b) creating a new one.

Figure 6. Example of the reporting page of the "SEE and SEE" software for monitoring pupil's interactions during (a) reading comprehension, (b) answering the questions.

4. Concluding remarks

The bilateral preview of the language information within the "SEE and SEE", i.e., in Greek and in GSL, covers the whole spectrum of deaf or hearing impaired children, communicating either in Greek or in GSL, as the visual information is processed and evaluated according to each pupil's needs. As vision is important aspect in acquiring and understanding information for these kids [8], the visual-kinetics aspects of "SEE and SEE" contribute towards comprehension enhancement.

Moreover, this type of software could initiate and motivate the educators to reflect upon their educational strategies within the classroom and, in turn, expand them in a way that could reform the current curriculum and increase pupils' social inclusion and assist their profession capabilities [7].

5. References

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