

Design and Development of Accessible Educational and Teaching Material for Deaf Students in Greece

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Abstract. The project of the Institute of Educational Policy: “Design and Development of Accessible Educational & Instructional Material for Students with Disabilities” in part aims at developing accessible educational material with Greek Sign Language (GSL) as the main access mode. Material for GSL teaching as a first language to Deaf children is also under development. Part of the project is the development of best practices and standards to be followed in the process of designing, developing and documenting GSL material. The study and the project results, as well as the proper use of the material will be the main focus of an in-service training course for professionals working with deaf children.

Keywords: Deaf children, Greek Sign Language, accessible educational material.

1 Introduction

In the last decade, since the official recognition of Greek Sign Language (GSL) as the first language of Deaf children (Public Law 2817/2000), there has been an expansive development of various types of educational material for teaching content subjects, including GSL, in the primary and secondary education of the Deaf in Greece.

Recently (April, 2012) Greece adopted the UN Convention on the Rights of Persons with Disabilities as a public Law ([N.4074/12](#)). In Article 24, on Education, the convention clearly states: “*States Parties shall take appropriate measures, including: Facilitating the learning of sign language and the promotion of the linguistic identity of the deaf community;... and ... to employ teachers, who are qualified in sign language* [1].

Universal Design for Learning (“Universal Design” or “Design for All”) foregrounds educational practices by creating diverse educational environments, tools, educational materials and support services [2].

The rapid increase in numbers of Deaf students with different and diverse educational needs in the general school system is a reality requiring new educational practices. Ensuring equal opportunities and encouraging equal access to knowledge for all students, no matter what type of school they attend, is considered a basic and non-negotiable principle in any democratic society, in order for the education system to

play a significant role in mitigating social inequalities [3]. The communicative environment for most deaf children in Greece and many other countries, is restricted since they are not exposed to quality adult models of sign language communication [4].

In the above context, the need of extensive electronic language resources for Greek Sign Language (GSL) has increased. Moreover, the necessity of educational applications together with their implementation in educational platforms has been made clear [5]. Besides, in recent years there has been an increasing interest in multimodal interfaces regarding human-computer interaction (HCI), [6, 7].

The curricula development supported by the Hellenic Pedagogical Institute (2004) for Deaf students, raise a number of requirements regarding the content, the use and the accessibility of educational materials by Deaf students[8].

Educational software is an excellent tool for both the student and the teacher, not only for learning purposes but also for teaching sign language and teaching with sign language. The introduction of such software in the educational process of Deaf children has been evaluated by the educational community and has proved to be an enjoyable and interesting supplement to standard studying practices [7, 10, 14, 12].

Furthermore, video recording of a translated printed text into sign language in either a digital document with a synchronized multimedia content, or books read on DVD co-occurring with sign language, are developed in many countries [13, 9]. Sign language on the web is becoming a much greater possibility and web-based video is more practical for educational purposes. Video web services, such as YouTube, are becoming more and more widespread because information presented through sign language video increases its accessibility and its usefulness by deaf people [15, 16]. In this work we present the methodological approach as well as the relative standards for the development of educational and teaching documents for deaf students in Greece.

2 Method

For the implementation of this project we have developed a methodology and guides for adapting textbooks of all curricular subjects with a concentration on the first two grades of primary school level, so that to be fully accessible by deaf students and other students with different types of disabilities.

There is an increasing need to develop educational material both in printed and digital form in GSL. The use of suitable digital technology will make school materials fully accessible.

We are developing a dedicated web-based information system to be used for adaptation and integration of the educational content in digital environments accessible to deaf students as a major implementation tool that complies with all published standards of accessibility (See Web Content Accessibility Guidelines WCAG 2.0).

We have chosen to develop the material in both DVD and web designed format that have been proven to enhance mental imagery, may be an enjoyable and interesting supplement to standard educational or teaching practices and work well with deaf students. We avoided the use of signing avatar technologies based on the quality of the natural signing representations they offer. We have followed reported best

practices for the production and development, such as: filming strategies, choosing signers, sign selections and associations, the process of inventing signs, natural variations in signs and teacher education and in-service professional development [13, 3, 15, 17, 18].

2.1 Development of Bilingual Applications

The multimedia electronic form (either in the form of a single DVD copy or a web application) combines the presentation of the original printed book in GSL, the text in subtitles underneath the presentation of the GSL in the video, as well as the voicing of the text by a native speaker. The data in multimedia PDF, video and audio files will be available in independent files for multiple uses.

Major attention has been paid to the relationship between the spoken and the sign language text, so that end-products will be used effectively in bilingual educational practices.

The signed text is in accordance with the Greek text at a word, phrase or period level. The quality of the text in GSL is the most important aspect of accessibility and will also play a key role in the evaluation of the end-product. The translation of a text in GSL can be either very close to the original structure or a free translation. Within the same textbooks, the authors sometimes either seek for content comprehension or put emphasis on learning vocabulary, Modern Greek grammar or on the development of phonological awareness. If the objective is to understand the text, then the signers - interpreters will follow a more liberal approach. If the objective is grammatical, syntactic or phonological awareness, then interpretation mostly follows the original source.

It is made evident from all the previous productions that signing Greek texts is an extremely demanding and difficult task. The signing of the texts was done in cooperation with experienced native signers, deaf tutors or consultants (all fluent in Greek) on the one hand and professional interpreters of GSL on the other. These two categories of professionals worked collaboratively as a team of bilingual translators. The subject knowledge, knowledge of the target group and experience in educational interpreting are also important factors and has been taken into account.

As far as the process of signing Greek texts to GSL is concerned, we have proposed the following methodology. Firstly, the text is divided into smaller sections, so that they can be easily memorized and explained in front of the camera. Secondly, the interpreter who is a native speaker of Greek translates the text into GSL. Finally, the native signer and the interpreter watch the signed text twice or three times and compare the signed text with the Greek text. It is emphasized that, during the conversion of textbooks in accessible educational materials, signed text is crucial because the efficiency of GSL is the core of the project.

2.2 Development of Applications for Teaching GSL

A large part of the program is aiming at designing and developing two new applications for both the Kindergarten and for the two first grades of the primary school. The

first one involves educational materials for teaching Greek Sign Language (A and B grade) and the second learning materials for Greek Sign Language (GSL) readiness (Table 1).

The contents of these applications will be developed in accordance with the objectives of the Greek Sign Language Curriculum for the Kindergarten and the first grades of the primary school. Moreover, the organization and structure of the content will follow a language acquisition sequence. Besides, the presentation of the application contents will be accomplished in a way to facilitate learning of complex concepts and generalizations, which are usually difficult for students that do not possess GSL as a first language. It will also include illustrations for visual recognition and understanding of concepts, as well as diagrams needed for overall comprehension.

Another parameter defining the content is that of the lexicon and grammatical structures used for the development of multimedia applications. The lexicon and grammatical structures should be rich, homogeneous and consistent with that of the language textbooks for grades A and B. The objective is to facilitate the learning process through comparative teaching practices in the two languages. In this context, the creators of the material document the correlations and the potential deviations (when required for educational reasons) in the vocabulary and the grammatical structures between the GSL and Modern Greek language.

Another factor related to the content of the materials is that they will include additional references from the Internet in order to raise the students' interests in applications contributing to maximizing the educational effect. In addition, all material will be in a format that can be used by the proposed web based platform for teaching GSL.

3 Results

3.1 Educational Material

The digital educational material is either a bilingual application or an application for teaching GSL. We had to cover the communicative needs of young deaf children in the nursery and primary school and that of their hearing teachers and parents. The materials address all levels from the Kindergarten to the Second Grade of the primary school (K-2) (see Table 1).

3.2 Teacher Training

Teacher training is a part of any new innovation in the educational practice. Teachers have expressed the need of in-service training as an integral part of their daily educational practice and their career development [19]. We have designed an in-service training program that will be implemented for more than 1500 teachers, in the thirteen administrative Regions of Greece. Teachers selected for in service training will be working with disabled students in either general or special needs schools. The training will be initiated when all material is developed and will focus mainly on the use of the material.

Table 1. Digital educational materials development for deaf students 2011-2013

	Title of the support materials	Target Group	Content	Means of recording	GSL learning
1	Mathematics Primary	Grade A Grade B	Bilingual (Greek - GSL) application (Math)	DVD	First, second
2	Language	Grade A Grade B	Bilingual (Greek - GSL) application (Language)	DVD	First, second
3	Study of the Environment	Grade A Grade B	Bilingual (Greek - GSL) application (Social studies)	DVD	First, second
4	Literacy Anthology	Grade A & B	Bilingual (Greek - GSL) Literacy	DVD	First, second
5	Greek Sign Language readiness	K-1	GSL application (Language)	DVD	First
6	Greek Sign Language	Grade A Grade B	GSL application (Language)	DVD	First
7	Purchase of software (platform) for GSL digital content	1-6	All the above	Web based platform	First, second

4 Conclusions

The Project "Design and Development of Accessible Educational & Instructional Material for Students with Disabilities" is fully compatible with the Convention on the Rights of Persons with Disabilities. The deliverables of the Project enable students with disabilities to be included in the general education system, where they can access an inclusive, high quality and free primary education and receive the support required in order to maximize academic and social development. Furthermore, it facilitates the learning of sign language and the promotion of the linguistic identity of the deaf community. The training of professionals incorporates the use of appropriate modes, means and formats of communication, educational techniques and materials to support deaf students effectively.

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References

1. Convention on the Rights of Persons with Disabilities,
<http://www.un.org/disabilities/convention/conventionfull.shtml>
2. Mace, R.L., Hardie, G.J., Place, J.P.: *Accessible Environments: Toward Universal Design*, North Carolina State University, The Center for Universal Design, Raleigh, NC (1996)
3. Kourbetis, V., Hatzopoulou, M.: *With my Eyes: Educational Perspectives and Practices for Deaf Children*. Kastaniotis, Athens, Greece (2010) (in Greek)
4. Kourbetis, V., Adamopoulou, A., Ferentinos, S.: *From Disabling to Enriching the Deaf World: Forms of Discrimination Deaf People Encounter in Europe*. OMKE, Athens, Greece (2001) (in English and Greek)
5. Sapountzaki, G., Efthimiou, E., Karpouzis, C., Kourbetis, V.: Open-ended resources in Greek Sign Language: Development of an e-learning platform. In: *Proceedings of the Workshop on the Representation and Processing of Sign Languages*, LREC 2004, Lisbon, pp. 13–19 (2004)
6. Elhadj, Y.O.M.: Multimedia educational content for Saudi deaf. In: Huang, T., Zeng, Z., Li, C., Leung, C.S. (eds.) *ICONIP 2012, Part IV. LNCS*, vol. 7666, pp. 164–171. Springer, Heidelberg (2012)
7. Karpouzis, K., Caridakis, G., Fotinea, E., Efthimiou, E.: Educational resources and implementation of a Greek sign language synthesis architecture. *Computers and Education* 49(1), 54–74 (2007)
8. Arampatzi, K., Grtis, K., H.M., Kourbetis, V., Zografou, E.: Design and Development of Accessible Educational and Teaching Aids for Students with Disability. In: Tseles, D., Malafantis, K., Pamouktsoglou, A. (eds.) *Education and Society: Research and innovation in new technologies*, pp. 22–27. Synchroni Ekdotiki, Athens (2012)
9. Cannon, J.E., Fredrick, L.D., Easterbrooks, S.R.: Vocabulary instruction through books read in American Sign Language for English-language learners with hearing loss. *Communication Disorders Quarterly* 31(2), 98–112 (2010)
10. Gentry, M.M., Chinn, K.M., Moulton, R.D.: Effectiveness of multimedia reading materials when used with children who are deaf. *American Annals of the Deaf* 149(5), 394–403 (2004)
11. Johnston, T.: Language standardization and signed language dictionaries. *Sign Language Studies* 3(4), 431–468 (2003)
12. Andrews, F., Winograd, P., DeVille, G.: Deaf children reading fables: Using ASL summaries to improve reading comprehension. *American Annals of the Deaf* 139(3), 378–386 (1994)
13. Hladík, P., Gůra, T.: The hybrid book - one document for all in the latest development. In: Miesenberger, K., Karshmer, A., Penaz, P., Zagler, W. (eds.) *ICCHP 2012, Part I. LNCS*, vol. 7382, pp. 18–24. Springer, Heidelberg (2012)
14. Gentry, M., Chinn, M., Moulton, D.: Effectiveness of multimedia reading materials when used with children who are deaf. *Am. Ann. Deaf.* 149(5), 394–403 (2004)
15. Fels, D.I., Gerdzhev, M., Hibbard, E., Goodrum, A., Richards, J., Hardman, J., Thompson, N.: Sign language online with signlink studio 2.0. In: Stephanidis, C. (ed.) *UAHCI 2009, Part III. LNCS*, vol. 5616, pp. 492–501. Springer, Heidelberg (2009)

16. Debevc, M., Kosec, P., Holzinger, A.: Improving multimodal web accessibility for deaf people: Sign language interpreter module. *Multimedia Tools and Appl.* 54(1), 181–199 (2011)
17. Lang, H.G., Hupper, M.L.P., Monte, D.A., Brown, S.W., Babb, I., Scheifele, P.M.: A study of technical signs in science: Implications for lexical database development. *Journal of Deaf Studies and Deaf Education* 12(1), 65–79 (2007)
18. Signing Books Website,
<http://www.sign-lang.uni-hamburg.de/signingbooks/>
19. Major Training Program Website, Training Needs Study – Results,
<http://www.epimorfosi.edu.gr/>