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Multimodal Campus Project: Pilot test of voice supported reading

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Abstract

Nowadays, education systems should offer flexibility to serve any kind of learners, including those with special needs. "Campus Multimodal" project took advantage of Moodle Learning Management System to offer students two reading aid tools: *ClaroRead* and *ReadSpeaker*. A pilot test was run with one thousand students during a semester and the mentioned tools usefulness was measured through an interview and user logs. Results confirm the existence of widespread reading and writing problems among higher education students and also the utility of speech technology to minimize them.

Keywords: reading aids; digital accessibility; learning management system; *ClaroRead*; *ReadSpeaker*; text-to-speech.

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1. Introduction

Higher education nowadays increasingly relies on ICT for teaching purposes. Therefore, Learning Management Systems are pervasive in classroom learning and acquire even more importance in blended learning or virtual learning. Educational content can include a big deal of resources in different formats and it constitutes an important a significant support for instruction. However, everybody does not access them in the same way. Some students could experience access restrictions due to sensory impairments (blindness, low vision, eyestrain), due to motor impairments that difficult the standard use of a computer, due to special needs such as dyslexia or dyscalculia, or due to cultural factors such as low language proficiency in case of Erasmus students or immigrants. In fact, on year 2012, there were 228 male students and 167 female students with declared disabilities in Catalan universities, most of them with motor or psychological disabilities, followed by students with auditory or visual disabilities.

To palliate the potential accessibility barriers of educational resources, there exist many technological tools which help to adapt contents to students' profiles and needs. A special category of these tools are reading aids with text-to-speech functions, which permit the computer to read aloud textual documents such as office documents (MS Word, Pages, Open Office, PDF, slides…) or web documents, presenting them in a multimodal (visual+speech) fashion.

After reviewing some of these tools (Granados, Ribera 2013) we selected *ReadSpeaker* as a web tool, and taking into account localization issues, we selected *ClaroRead* as a PC tool which has a complete Spanish speaking interface. *ReadSpeaker* was previously evaluated in Ohio (Using *ReadSpeaker*; the Ohio State University (2013) and Uppsala (Arrenius, 2004). *ClaroRead* was included in a macroevaluation of tools for dyslexic students (Draffan, Evans & Blenkhorn, 2007). Similar tools have been tested with other collectives (Dietz, Ball & Griffith, 2011)

2. Objectives

The main aim of "Multimodal Campus" project was to evaluate the need and added value of incorporating reading-aids within the campus by a pilot test of two specialized software tools (*ReadSpeaker* and *ClaroRead*) in the Learning Management System of Barcelona University during the 2012-2013 term, with a significant amount of students.

ReadSpeaker and *ClaroRead* main functionality is the text-to-speech, but both tools enrich the presentation of text with highlights helping focus the attention to the currently read passage. Additionally, *ClaroRead* contains tools to create schemas, mind maps and abstracts as well as auxiliary resources to cite and compile references.

The first mentioned tool, *ReadSpeaker*, can be deployed within a learning management web and can be executed in any context, not requiring any specific setup by the user; the second mentioned tool, *ClaroRead*, needs to be installed in the student PC and is more focused in reading documents, creating schemas and mind maps, and citing several sources, while it also works on general web content. Both tools can work in several languages such as Catalan, Spanish, French, English and many others.

To evaluate these reading-aids we run a pilot test that provided us a lot of indicators, as explained in the methodology section. This article is centred on the questionnaire results, as they were the principal source of quantitative data.

3. Methodology

The pilot test of *ClaroRead* and *ReadSpeaker* software packages was applied at Barcelona University to a sample of 1200 freshmen of the following studies:

- Law
- Criminology
- Public Administration and Management
- Political Sciences
- Labour Sciences

In order to gather different profiles and needs, we selected students belonging to different classrooms and turns as well as to blended learning modality. However, to grant comparable results, we choose a cross-discipline subject common to all of them (Research and Communication techniques) which is a compulsory subject taught to all the above cited studies (with small changes in its name) and belongs to the basic subjects in Social Sciences studies.

ReadSpeaker was installed within the virtual spaces of the subject in the Learning Management System of Barcelona University and students could easily use it with the uploaded information. *ClaroRead* was offered as a free download in all the teaching groups.

To evaluate the software use and validate its suitability several evaluation techniques were applied:

- Electronic questionnaires to students integrated in the subject virtual space and prepared as a *Moodle* questionnaire. Three questionnaires were administered: an initial survey to identify potential reading difficulties and attitude towards the implementation of the reading-aids; a questionnaire in mid-term to evaluate use and preferences; and a final questionnaire at the end of the term to evaluate satisfaction.
- Connection Logs to *ReadSpeaker* and downloads of *ClaroRead*
- An in depth interview of a small sample of students, selected from the respondents of the first survey. Interviews are a valuable source to obtain qualitative information (Soorenian, 2013)
- Electronic questionnaires to teachers of the chosen subject to evaluate the tools and its integration in the teaching
- A technical report of the installation and settings of *ReadSpeaker*, as it was the first time this tool was implemented within Moodle LMS.
- A report of suggestions and complains received both from students and teachers during the pilot test.

This article mainly presents the results of the final questionnaire, as the richest source of quantitative information. In addition, it also briefly comments on the other results. It should be taken into account that all the data is subjective as it comes from students' appreciation. We did not further classify learning styles (Kastner, Stangl, 2012) as it was a first contact with the tools.

The final questionnaire was administered, as previously said, to a universe of 1200 students, and was divided into four areas:

1. Students' identification and detection of potential difficulties in reading and understanding. We differentiated two collectives, one with those students that stated to have the difficulty diagnosed and one with those that not have a diagnostic.
2. Evaluation of the specific software packages running in the pilot test and its features
3. Usefulness of the reading aids as implemented in our pilot test
4. Strengths and weaknesses of the software packages and suggestions for improvement.

The final comparison was formulated as a nonparametric statistical analysis. To evaluate signification in both collectives we used several methods:

- For qualitative data (true/false) we used Chi square and Cramer's V
- For ordinal data (Likert values) we used Mann-Whitney U

Within diagnosed subjects we compared different types of difficulties applying:

- For qualitative data (true/false) we used Chi square and Cramer's V
- For ordinal data (Likert values) we used Kruskal-Wallis (N group nonparametric analysis)

Finally, to compare satisfaction with the two tools, we used the box diagram (one for each variable).

4. Results

Only 529 out of the 1200 enrolled students to Research and Communication techniques subject (44% of the total) answered the final questionnaire. 50 % of students who answered belonged to Law Career, the largest one.

The following results were obtained in each of the above-mentioned areas:

1.   Students identification and detection of potential difficulties in reading and understanding

- 35,2 % of the respondents had some degree of disability diagnosed, mainly visual problems (69% of the students with diagnosis), followed by dysorthography or dysgraphia, ADHD and dyslexia or dyscalculia. Motor problems were not included.
- In relation to reading and understanding problems, the most common difficulty (among respondents) was attention deficits, followed by difficulties in numerical operations and vision problems.

2.   Evaluation of software packages and their features

Both *ClaroRead* and *ReadSpeaker* were viewed as easy-to-use programs, with a good integration of functions and a small learning curve, able to be used without expert support. More than a half of the interviewees stated they would keep using the programs if they were available. When comparing users with some diagnostic and users without it, this statement was more positive in the first ones. Additionally, this group declared a bit more difficulty to learn the use of *ClaroRead* software.
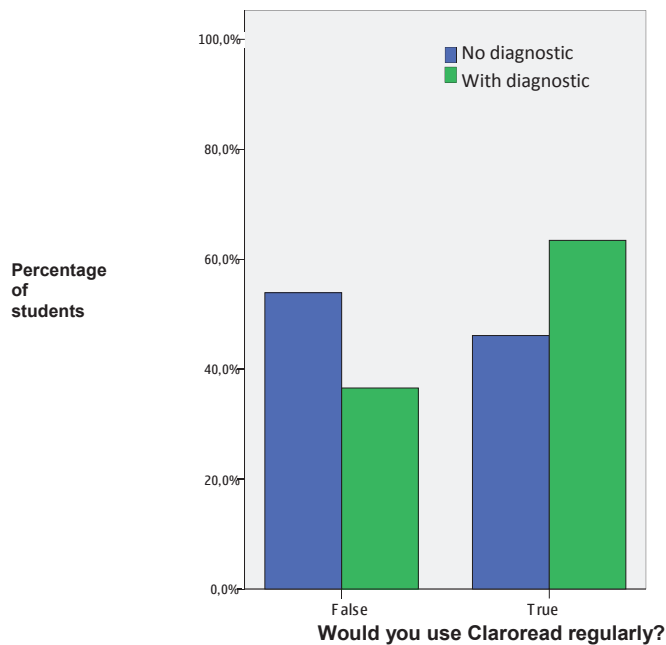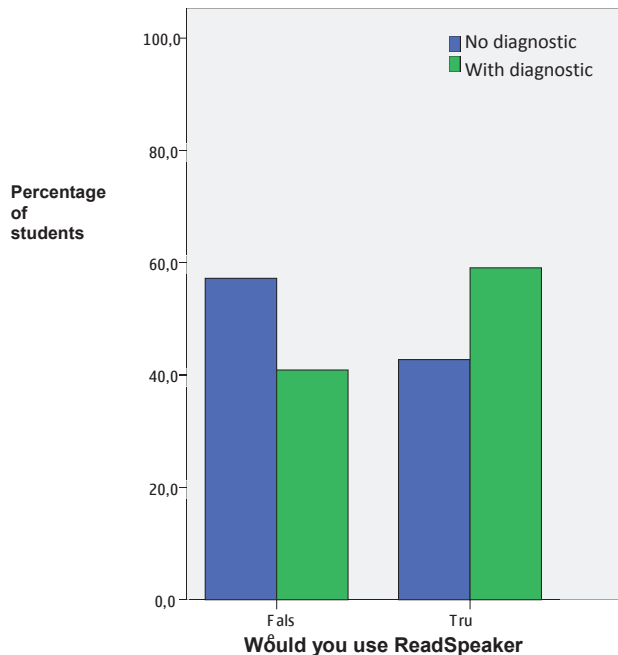
Fig. 1: Evaluation of the analyzed software by users with some difficulty diagnosed.
(a) Would you use *ClaroRead* regularly. (b) Would you use *ReadSpeaker* regularly?

3. Software usefulness:

ClaroRead software was considered useful in improving understanding and memorization of texts (almost 24% of interviewees declared to experience significant improvements in these areas). Exact data for *ClaroRead* for significant improvements were memorization (32.98 %) and text understanding (25.86%). Skills with less significant improvements were reading motivation (19.16%) and reading confidence (19.58 %). With *ReadSpeaker* software, results show that users experienced significant improvements in memorization (25.2 %) and reading understanding (24.5%). Skills with less significant improvements were reading confidence (20.97%) and reading motivation (21.37 %).
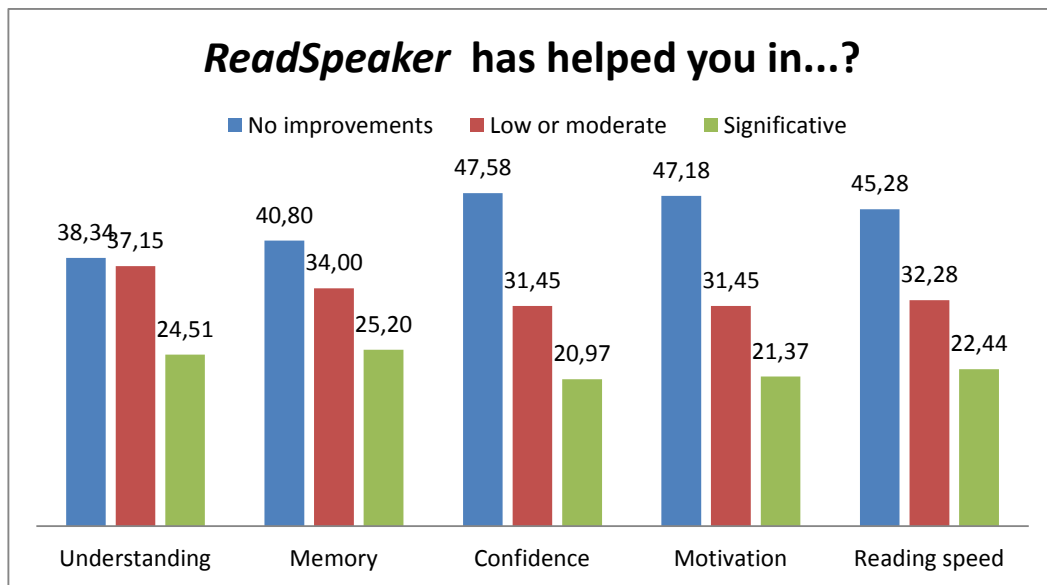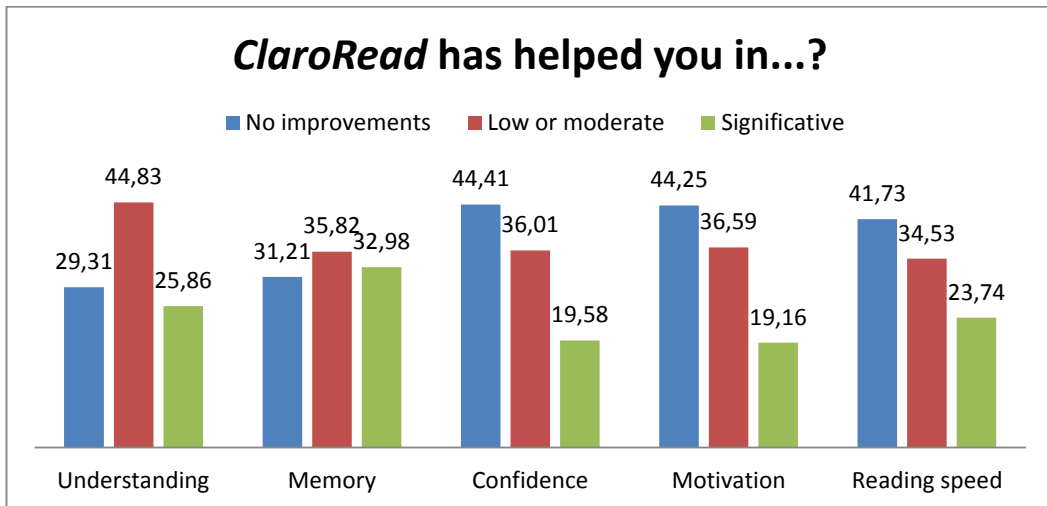
ClaroRead has helped you in...?

■ No improvements   ■ Low or moderate   ■ Significative

	No improvements	Low or moderate	Significative
Understanding	29,31	44,83	25,86
Memory	31,21	35,82	32,98
Confidence	44,41	36,01	19,58
Motivation	44,25	36,59	19,16
Reading speed	41,73	34,53	23,74

ReadSpeaker has helped you in...?

■ No improvements   ■ Low or moderate   ■ Significative

	No improvements	Low or moderate	Significative
Understanding	38,34	37,15	24,51
Memory	40,80	34,00	25,20
Confidence	47,58	31,45	20,97
Motivation	47,18	31,45	21,37
Reading speed	45,28	32,28	22,44

Fig. 2: Comparison between users opinions related to experienced improvements in five different reading skills. (a) *ClaroRead* has helped you in… (b) *ReadSpeaker* has helped you in….

4. Strengths and weaknesses of software packages and proposals

We asked students to identify strengths and weaknesses of the software packages. The strongest point in both programs, *ClaroRead* and *ReadSpeaker* as well, were reading and pronunciation (and writing in *ClaroRead*) (42% of the answers in *ClaroRead* and 51.30% in *ReadSpeaker*) and also the interface (27,46 % and 23.48%). In addition, it is worth noting that users perceived both programs very positively because 34.35% of the respondents considered that no change was required in *ClaroRead* and 53.16 % of them reached at the same conclusion for *ReadSpeaker*. The few suggested changes have been reported to the development companies in order to address them in future versions.
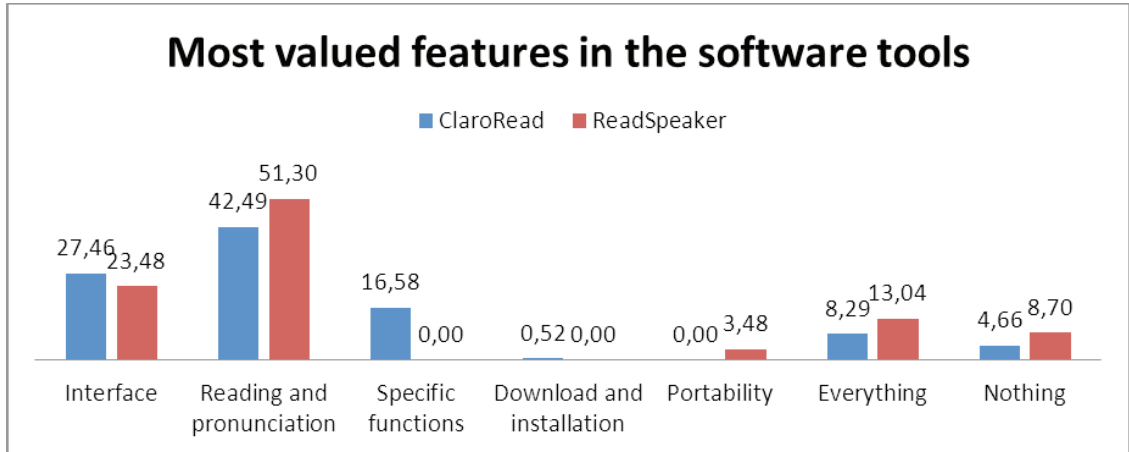
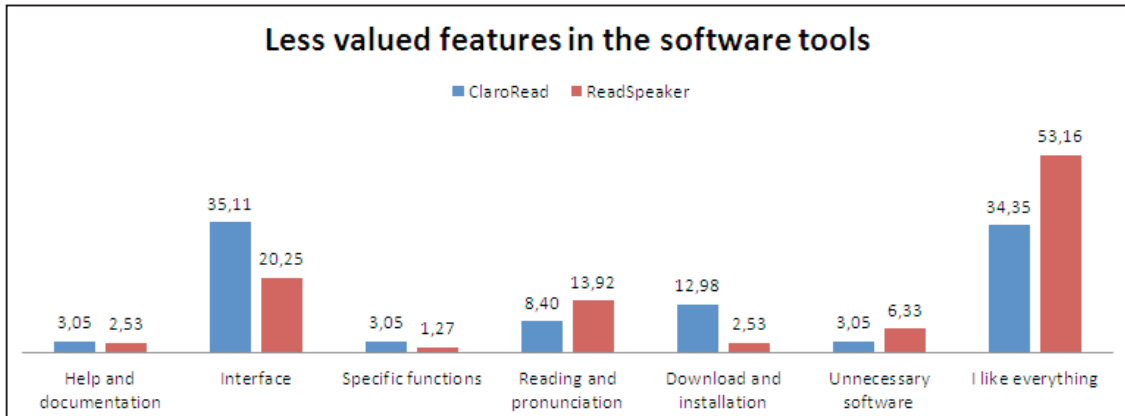Fig. 3: Most valued features in *ClaroRead* and *ReadSpeaker*

Fig. 4: Weaknesses in both software packages

Overall, results show the usefulness of reading-aids in a university context, not only for students with a special need or with a disability, but also for all the students.

5. Conclusions:

After these interviews we can conclude that:

- Our students have a significant amount of diagnosed problems that affect reading understanding (35,20%). Among non-diagnosed students, an important amount declares having some difficulties in reading and studying.
    - As a corollary of these big numbers we can say that professors must be involved in helping these students, even at the expense of other dedications.
- Information technology offers technically and economically feasible solutions to complement learning resources with speech output.

- Multimodal presentation of materials is perceived as a help for a significant amount of students, and particularly for those with difficulties in reading or writing. In fact, previous studies had stated the importance of speech in reading (Neerincx et al. , 2008)
- *ReadSpeaker* and *ClaroRead* are suitable programs to solve deficits in our web and learning management system as well as in homework learning resources.

Taking into account that Spanish legislation and also International trends promote *the creation of an inclusive university,* and that most advanced universities have already lead the path to a real distance learning accessibility, we believe *it is urgent that Spanish universities start walking in this direction* to reach a leadership in classroom, blended and distance learning; and that this path shall not rely on voluntarisms or specific actions.

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