Afgestudeerd

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Inclusive classroom note taking

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Introduction

More than 1.5 million people in the Netherlands have some form of hearing impairment. The expected number of hearing-impaired students in the Netherlands would approximately be 1300 out of a total student body of 633,000 (Fortnum, e.a., 2007; OCW, 2010). This number is, however, far from reality as estimations by Thoutenhoofd & Van den Bogaerde (2010) indicate a realistic number of around 400 hearing-impaired students. Their study has shown that hearing-impaired students in mainstream education experience great difficulties, and this under-participation is to be expected. During my graduation I studied the world of Deaf and Hearing Impaired (D/HI) students. To gain a designer's empathy I used workbooks, participatory sessions, observations, interviews and a visit to the gathering of the LinkedIn group DoofStuderen as inspiration.

Problems

Most problems D/HI students experience, are related to in-class participation and information gathering. D/HI students use visual aids like interpreters and lip-reading to counteract the reduced amount of information received. Retaining information through note taking is difficult, as D/HI students must focus all their visual attention to receive information. Literature has shown that this leads to passive participation (Hastings, 1997) and social exclusion (Lang, 2002).

Concept

The desire to participate on an equal base as hearing peers through mainstream technology (e.g. SMS) appeals to D/HI students (Power, 2007). Additionally, with the rise of electronic note taking (Reimer, 2009) and success of crowd sourcing (e.g. Wikipedia) the classroom could become a more open collaborative environment. The idea is to combine the note taking of multiple students. This means all students, including the deaf, can share and learn from each others notes during a lecture. This is technically possible with collaborative real-time editing. This enables multiple people to work simultaneously on the same document, see each other's typing and respond immediately.

User study

Realization of this concept is complex in human-product interaction as well as in technical functioning. In an initial user study the human-product interaction with four types of technical functioning (figure 1) were researched. This study aimed to find whether a simple chat interface (conditions A and B) would suffice or a more complex collaborative real-time editing (conditions C and D) would be needed. In the study the effects of group interaction (conditions B and D) opposed to individual note taking (conditions A and C) were also compared.

A prerequisite of the concept is mainstream acceptability, thus this first study focused on hearing students only. The four conditions were evaluated with 40 students from the TU Delft (figure 2 and 3).
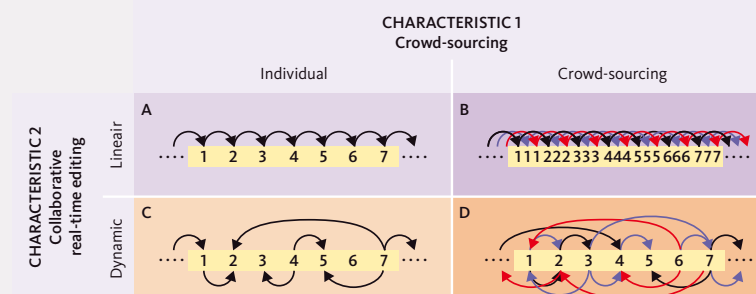

Figure 1. Technical functioning of four test conditions (matrix of crowd-sourcing and collaborative real-time editing options)

Figure 2. Multiple students in condition B (linear & crowd-sourcing)

Figure 4. Interface design sample (explanation in red boxes)

Figure 3. Multiple students in condition D (dynamic & crowd-sourcing)

Reflection
I am grateful to the positive and kind D/HI students who helped me. My graduation was done at Calendar42, a high tech start-up at YES!Delft who are creating a new smart calendar system. Their know-how in technology and entrepreneurship was of great value during my graduation.

Results
The study showed a strong preference towards condition D – dynamic crowed sourcing – as it allowed the most freedom in editing and formatting. Students experienced the added value of in-class collaboration in (1) the freedom to discuss the content of the lecture and (2) co-creation of notes. Interface design required improvement as the tested tool required too much attention (e.g. it was hard to distinguish chat from content and it was difficult to follow when two or more students were typing).

Conclusion
The user study contributed to a new design interface (figure 4). This was tested briefly with D/HI students and initial reactions were positive. The final product features a spatial canvas (similar to video editing software), question and answer collaboration and a rich variety of formatting and input options.

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