

# E-Drawings as an Evaluation Method with Deaf Children

Ornella Mich  
Fondazione Bruno Kessler  
via Sommarive, 18  
38123 POVO, TN, Italy  
mich@fbk.eu

## ABSTRACT

This paper describes a pilot test on the use of a drawing software program as an evaluation method for experiments with deaf children. As deaf children are visual learners, evaluation methods based on drawings seem to be a good alternative to traditional ones. We tested the effectiveness of such a method with a group of deaf children, all raised orally apparently without any knowledge of sign language, and a few hearing children, from eight to fourteen years old. As a testbed, we evaluated the readability of a set of stories, part of a literacy software tool for deaf children. All participants were relaxed and collaborative during the test. The results are promising.

## Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces—*Evaluation/methodology*.

## General Terms

Experimentation

## Keywords

evaluation methods, deaf children

## 1. INTRODUCTION

Involving deaf children in evaluation experiments may be not easy. As children, they approach technology differently with respect to adult users [3]. As deaf users, they may not have access to audio input/output material or to written material due to their literacy problems [6]. Therefore, adapted evaluation methods may be needed when involving them in an experiment. Methods based on drawings (see, for example, [9]) seem to be a good alternative to traditional methods, because deaf children are visual learners [7], and visual learners use images, colours and maps to organise knowledge and communication.

In this paper, we describe a pilot test aimed at verifying the applicability and effectiveness of a new evaluation method based on the use of digital drawings. As a testbed, we organised an experiment about the readability of a set of stories,

part of LODE<sup>1</sup>, a literacy tool for deaf children [1].

In the following section, we analyse the advantages of an evaluation method based on e-drawings. After that, we describe the structure and the results of our experiment. Finally, we summarise conclusions and future work.

## 2. EVALUATING WITH E-DRAWINGS

One of the possible methods to use in evaluation sessions with children is that of inviting children to make a drawing after completing a given task [8, 9]. This method is suitable for children because, when drawing, children are relaxed and do not consider it a task or a duty, but rather a pleasure. Children's drawings embody a variety of information about the child himself/herself and on his/her experience [2]. Being deaf children who are visual learners, it seems worthwhile to adopt drawing-based evaluation methods when working with them. However, in our first attempt to use this method [4, p. 113], only one child in six wished to draw their experience during the test. Persuaded of the validity of the drawing-based evaluation method, we organised another experiment<sup>2</sup> where we proposed to deaf children the use of a drawing program, TuxPaint, instead of paper and felt tips, to describe their experience in the experiment. As a result, we expected a more active participation by deaf children, as they are generally very keen on using technological tools. We describe this test in the following section. Using drawing software programs in evaluation allows evaluators to directly obtain the drawings in digital format. Furthermore, a semi-automated procedure can be implemented to analyse drawings and extract info on colours used or on the drawing's content such as human faces, body or text. Even the comparison of images from different users becomes quicker.

## 3. OUR PILOT TEST

The aim of our test is to check if e-Drawings and comprehension exercises allow us to measure in the same way how much deaf children understood after reading a narrative text. If this is successful, it means that digital drawings can be used, in similar tasks, as an alternative to traditional comprehension exercises. Our test took place during a conference dedicated to families of deaf children. When parents attended the lectures, their children, with their parents' permission, were asked to participate in our evaluation. Parents

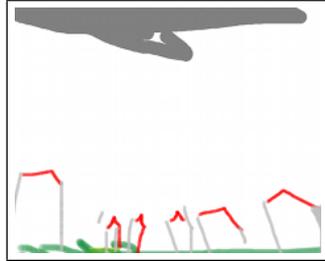
<sup>1</sup>LODE has been developed within a project founded by the Fondazione Caritro, Trento, Italy.

<sup>2</sup>A complete description of the test, the stories used and the produced drawings is reported in [5].

(a)  
M., 9 years old  
profoundly deaf  
11/12 correct answers



(b)  
T., 8 years old  
hearing  
11/12 correct answers



**Figure 1: Drawings Examples.**

filled out a questionnaire about their child’s personal data. Fourteen Italian children, eleven boys and three girls, were involved. Among these were nine deaf children, all oralist, and five hearing children, siblings of the deaf children, involved as a small control group. We first asked the children to read a story, then complete a series of traditional comprehension exercises and finally create one or more drawings with TuxPaint to illustrate the story they read. A simple web application was designed to present the stories and the comprehension exercises to the participants. Before working on the story, children attended a short course (two hours) to learn how to use TuxPaint. After the test, we looked at the exercises’ scores and at the drawings’ content to measure the level of comprehension of the story read. For us, a child was demonstrated to have understood the narrative if he/she got a high percentage of correct answers on the comprehension exercises (above 70%) or if at least one of the main characters of the story and one of the main story actions were represented in his/her drawing. We can say that the e-Drawing evaluation method is a valid alternative to traditional comprehension exercises with deaf children, if drawing analysis and exercise results coincide. Eight participants, five deaf children and three hearing children finished the test. Three other kids attended the training with Tux Paint but refused to read the story. Two other children were not able to read, so we stopped their test. And finally, we missed the results of one child due to technical problems. Both deaf and hearing children gave almost all the answers to the comprehension exercises correctly (11/12 or 12/12); only one deaf child had a low answer rate (3 to 12). The drawings of three deaf children and of two hearing children clearly illustrate an action of the story and at least one of the story’s main characters is represented. Following our criterion, this means that in these five cases the participants have understood at least part of the story read. This result is confirmed by the high number of correct answers (12/12 or 11/12) given in the comprehension exercises by all these five children. The drawing produced by another deaf child

did not represent the story; the same child got a low score in the comprehension exercises (3/12). In the remaining two cases, a deaf child and an hearing child, drawing analysis and exercises scores did not match. Figure 1 shows an example where drawing analysis and exercises’ scores matched and an example where they did not: we had six out of eight cases where drawings and exercise scores matched.

#### 4. CONCLUSIONS AND FUTURE WORK

The results of our pilot test are promising. It seems that the e-Drawings-based evaluation method is a valid alternative to traditional methods in reading comprehension tasks with deaf participants. We believe that improving the training with TuxPaint, including notions on how to create animations and videos, will give even better results. Future work will require the development of better scoring criteria for the drawings, so that it becomes possible to judge the children’s reading comprehension more objectively. More research is needed to study which drawing’s elements can give relevant information on reading comprehension level, in addition to information given by traditional comprehension exercises. Moreover, the proposed method requires testing of different tasks and with a more significant number of participants. The deaf world is heterogeneous and complex because there are different types of hearing loss, different family’s backgrounds (deaf or hearing parents, for example), different types of physical solutions (CI, hearing aids, nothing) and several educational methods. Therefore, a larger and more representative population sampling of the deafness world than that involved in this preliminary study should be considered to get more significant results.

#### 5. REFERENCES

- [1] R. Gennari and O. Mich. Constraint-based Temporal Reasoning for E-learning with LODE. In *Proc. of CP*, 2007.
- [2] R. Jolley. *Children and Pictures: Drawing and Understanding*. Wiley-Blackwell, 2010.
- [3] P. Markopoulos, J. Read, S. MacFarlane, and J. Hoysniemi. *Evaluating Children’s Interactive Products*. Morgan Kaufmann Publishers, May 2008.
- [4] O. Mich. *Usability Methods and Deaf Children. The Case of the LODE e-Tool*. PhD thesis, 2010.
- [5] O. Mich. Evaluating Readability of Stories for Deaf Children with a Drawing Program. FBK Technical Report, 2011.
- [6] P. Paul. *Literacy and Deafness: the Development of Reading, Writing, and Literate Thought*. Allyn & Bacon, 1998.
- [7] J. Reeves, P. Wollenhaupt, and F. Caccamise. Deaf Students as Visual Learners. In *Proc. of the Int. Congress on Education of the Deaf*, 1995.
- [8] V. Scott and M. Weishaar. Talking Drawings as a University Classroom Assessment Technique. *The Journal of Effective Teaching*, 8(1):42–51, 2008.
- [9] D. Xu, J. Read, G. Sim, and B. McManus. Experience It, Draw It, Rate It. Capture Children’s Experiences with Their Drawings. In *Proc. of IDC*. ACM Press, 2009.