The use of Interactive White Boards for the evaluation of reading activities in school

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Abstract

The objective of this study is to evaluate the use of IWBs (Interactive WhiteBoards) during reading activity, which is one among the most common activity practiced on these boards. The efficiency of reading on electronic devices [1] is classically assessed on several dimensions, i.e, visibility, legibility and understanding. The purpose of this study is to use these three dimensions for comparing the effects of IWBs reading activity to other supports as, for instance, personal computers. Our sample includes pupils of 6 years old (1st year of elementary school) and 11 years old (6th grade of middle school).

To estimate visibility on the screen, a psychophysical test measuring a visibility threshold was created. The test consists to detect a point of light shown randomly on the screen. By using a staircase procedure, the luminance will vary according to the detection of stimuli so as to succeed at a value of visibility.

The dimension of legibility will be estimated by a letter search (O/N) inserted into a sequence of random letters sharing (or not sharing) common features with the target. By analyzing signal detection parameters (d' and Xd), it will be allowed to determine a value of discriminability.

The dimension of understanding will be estimated by using texts of expositive and narrative nature in conditions with and without pictures. The objective is to determine a comprehension rate from a set of questions, which will concern various levels of textual representation (surface, semantic and inferential). All these tests will have to give rise to a global indication (reading coefficient) on the efficiency of reading on digital devices.

Introduction

Reading is one of the most important human activities; it represents one of the preferred forms of communication. This topic is of particular interest because of the essential role it plays in the process of learning and training. This activity includes reading of texts and multimedia documents. This reading is the most frequently collective and take place in a school context. This interest has been intensified with the emergence of new digital media involving new forms of reading (IWB, iphone, iPad, etc..) which generates new questions about the influence of these devices on reading. This study aims at evaluating the activity of reading in schools on IWBs in considering three necessary dimensions available on this type of device: visibility, legibility and understanding. These dimensions reflect the different levels of processing in reading and help to assess the usability of these devices.

Currently, the results of multiple international assessments (eg PISA) show the need to improve reading skills, not only for pupils in difficulty but also for all pupils given the growing number of illiteracy. Indeed, in today's society, students need for a high degree of literacy, including the capacity to comprehend complex texts, using different media (books, PC computer, tablet computer, Iphone, interactive whiteboard) [2]. Usually, studies on reading have investigated only two kinds of processes: lexical processes (ie, underlying the identification of letters and words) and comprehension processes

(ie, giving text meaning). On an applied perspective, the current interest is to develop tools for reading assessments that enable better assessment of individual differences in this complex cognitive activity [3]. This work fits into this last perspective, it aims to establish a set of tests that assess the impact of IWBs on orthographical and typographical factors of letters and words (mainly related to the visual form) and on reading comprehension. Most of the work done so far was interested in identifying written words or to process syntactic and semantic integration and were tested on paper or on computer display [4,5]. However, to our knowledge no work has been done on interactive whiteboards, taking into account three complementary dimensions: visibility, legibility and understanding. Thus the objective of this study is to evaluate the use of IWBs for the reading activity on these three dimensions. Furthermore, we will study the efficiency of collective reading in classroom context with regards to classical individual situations of reading on computers.

Visibility test

Many studies in the field of education show the importance of taking into account the lighting of the classrooms. They show that excessive illumination causes visual discomfort and impairs the performance of students [6]. To assess the visibility on screen, taking into account natural lighting conditions, a psychophysical task measuring a visibility threshold has been established. It consists to detect a rectangular point of light (15 x 19 pix) randomly displayed on the screen by using a Staircase procedure [7]. The luminance of that point is variable according to the detection of the stimulus so as to succeed at a value of visibility. Different factors affecting the detection task have been taken into account: the distance (near distance - first row of the classroom, far distance - last row of the classroom) and the direction of vision (90 ° and 45 °) to the board. Both distance and direction might have an effect on reflectance. Luminance measurements of the IWB as well as the classroom are also taken. The same test is also been run on a computer display for comparative purposes.

Legibility test

Legibility is defined as the set of visual properties representing letters and / or symbols. This dimension determines the ease with which characters are recognized [8]. Among the main parameters of legibility, there are the font size, spacing between characters, spacing between words, the length of lines, the display resolution, color, luminance, polarity, the angle of view etc.. Various studies show that the legibility of texts can affect reading performance [9,10]. Poorly designed devices can quickly entail visual fatigue, leading to a slowdown in reading or in information retrieval [11]. Many studies show that many factors can influence the performance of reading (number of errors, reading time), for example, typographical settings: font, character spacing, justification and line length, etc.., [12,13], color combinations [14] resolution and task type [15].
In the present work, the dimension of legibility will be estimated by a letter search (O/N) inserted into a sequence of random letters (non word) sharing (or not sharing) common features with the target [16]. 12 non-words using a font Courier New seven letters each are generated for each condition. Both on IWBs and computers, the main factor considered is the character size (6/18 dots for IWBs and 8/18 dots on computer). We also manipulated the presence / absence of the target and the type of feature (shared, unshared). By analyzing signal detection parameters (d' and Xd), it will be allowed to determine a value of discriminability.

Comprehension test

Comprehension consists in linking three types of elements: the Reader, the Text, and the activity or purpose for reading" [2 p. xiii]. This means that during reading several factors are involved, such as cognitive abilities (memory, attention ...), motivational aspects, the reader's knowledge, the nature of the text, but also the goal for reading. We used two types of texts: narrative and expositive texts. Understanding these two types of texts is a cognitive activity more or less complex [17]. The narratives are more predictable while the expositive texts require more elaborate information processing as inference-making [18] allowing to retrieve information from prior mental models [19]. Various studies

have investigated also the role of illustrations on reading comprehension [20,21] and to what extent these illustrations facilitate or create interference in the construction of mental models. We introduced these illustrations to assess their role in understanding. Our main objectives are: to test the role of text type used (expositive / narrative), the role of illustrations (with / without) and device (IWB / computer) on comprehension and memorization of texts.

Participants

120 pupils participated in this experiment. 60 from 1st grade elementary school (mean age 6.5) and 60 from 6th grade middle school (mean age 11.4). Half of each group of pupils received the tests on the IWBs and the other half on a computer.

Procedure

We conducted three tests in the classroom. Tests of visibility and legibility were individual and the comprehension test was collective. In visibility and legibility tests, the subject's task is to respond by clicking the mouse of the computer if "yes" or "no" he / she has seen the stimulus. E-prime™ software was used to retrieve the response time and the type of the subject's response. For comprehension, pupils collectively read the text on the IWB, and individually on computer. In both cases they had to provide written responses to three types of issues (surface, semantic and inferential comprehension). A score was assigned to each question.
Results are underway.

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