

# Chapter 8

## Detecting Online Learners' Reading Ability via Eye-Tracking

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### ABSTRACT

*Nurturing the motivation to read is an important instructional goal. There can be a number of reasons for a learner to have problems with reading in online learning environments: (1) eyes being unable to scan easily along a line of print; or (2) as a result of concentrating on controlling the eyes concentration, the short-term memory become impaired. The study reported in this chapter used eye tracking method to provide a useful experimental design for exploring reading performance of university online learners. Different eye-tracking experiments were carried out to help informing the teachers to improve the learning environment and be able to do more accurate assessment about what the students were attending to on the screen.*

### INTRODUCTION

Reading problem has been cited as one of the most neglected problems facing the university students (Paracha et al., 2016; Inoue and Paracha, 2016). Several studies have indicated that their respondents faced difficulty in extracting and synthesizing information from various sources and recognizing and acquiring academic vocabulary for use (Cheng et al., 2004; Durkin, 2004; Aspinall, 2003). Especially for engineering students, English reading comprehension ability is crucial in academic settings and to their future careers. To absorb fundamental knowledge in textbooks and deepen professional knowledge

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in their workplace, it is essential for engineering students to read English fluently. Some authors also stress that engineering students should be equipped with specific English skills which will become valuable resources in their careers (Joseba & Ardeo, 2005). Our eyes play a crucial part in everyday learning tasks for instance, the roles of relocating and reorganizing and then, directing the actions to make use of them (Land & Tatler 2009). It reveals significant learning processes as such, eye tracking methodology has gained increasing importance as a new technology-driven research approach in Teaching and Learning Analytics.

Teaching analytics is application of learning analytics techniques to understand teaching and learning processes, and eventually enable supportive interventions (Prieto et al., 2016). It is an emerging field, with a suite of computational and psychological methods and research approaches for understanding how students learn and the setting in which they learn. the concept of Teaching and Learning Analytics can be embedded in the Teacher Inquiry cycle and support teachers engage in continuous reflection. Teacher inquiry is recognized as a prominent method for data-driven reflection on-action and it refers to a process that is conducted by teachers, individually or collaboratively, with the primary aim of understanding teaching and learning in context (Sampson 2016). In order to facilitate this process, emerging Teaching and Learning Analytics technologies such as eye-tracking are at the spotlight of the research and practice communities, globally (Sampson 2016).

The study explored the application of eye-tracking technology to carry out accurate assessments of the students to inform and guide the teachers and school as well as to confirm whether judgements and observations being made previously by teachers were an accurate assessment of the students' reading abilities. This project was an investigation into the use of eye-tracking technology to aid assessment of graduate students with profound and multiple reading difficulties at Kobe Institute of Computing, Japan. The methodology utilized a participatory action research (Dennies et al., 2016) which is an approach to professional development that encourages teachers to take ownership of changes in their practice. The findings were expected to provide information for teachers about what students were processing in their learning experiences when looking at the computer, as the eye-tracking technology enabled more accurate assessment about what the students were attending to on the screen.

The main research question that this work sought to answer is whether or not an eye-tracking technology can be helpful in identifying fluent and non-fluent engineering students. In the following sections, we provide existing literature on the application of eye-tracking in teaching and learning analytics followed by description of what happens in reading and how comprehension develops with the help of theories and reading models. After listing the objectives of this study, the subsequent sections present some eye-tracking experiments to determine how fluent and non-fluent readers process text and images followed by results, discussions, implications and limitations. Finally, we summarize the key contributions of the study and emphasize the implications of the findings for the researchers and practitioners in the real education settings.

## **LITERATURE REVIEW**

Learning is one of the most crucial activities in which human-being engage and it is at the very center of educational process, albeit much of the learning outside of classroom. Since, time immemorial, philosophers and psychologists have sought to understand the nature of learning and how it takes place. Several learning theories have been propounded, and these theories differ from each other. A theory, basically,

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