INTRODUCTION

The use of psychophysiological data to better understand real-time learning: the fragile balance between the validity of data and the authenticity of data collection contexts

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To cite this article: Charland, P., & Dion, J.-S. (2018). The use of psychophysiological data to better understand real-time learning: the fragile balance between the validity of data and the authenticity of data collection contexts. Neuroeducation, 5(1), 4-6.

DOI: https://doi.org/10.24046/neuroed.20180501.4
Researchers in neuroeducation, through their use of brain imaging, electroencephalography, oculometry and pupillometry, among other techniques, collect psychophysiological data in real time or very close to real time, to better understand phenomena related to teaching and learning. Their work and methodologies could meet a transdisciplinary research need since many researchers, in education sciences and cognitive psychology among others, have been calling for some years now to the development and application of such real-time methods of data collection (e.g. Boekaerts, 2017; Campbell, 2011; Campbell & Pagé, 2012; Gerjets, 2017; Mercier & Charland, 2013; Timms, DeVelle, & Lay 2016), to enrich and develop theoretical models by combining them, notably, to behavioral data. These real-time data collection methods allow the study of processes related to metacognition (e.g. Schwartz, Scott, & Holzberger, 2013), self-regulation and self-regulated learning (e.g. Dion, 2015; Effenev, 2011); learning modalities (Lee et al., 2006), student reflective thinking during learning (Durall et al., 2017), or cognitive state and cognitive load variations in a learning context (e.g. Liu et al., 2017; Mills et al., 2017). There are many application examples of these methods in education and, more recently, they seem to abound in the contexts of e-learning, hypermedia, and technology-enhanced learning (Chen, 2017; Chen & Wang, 2017; Chen & Wu, 2015; Conrad & Bliemel, 2017; Wu, Tzeng, & Huang, 2014), and this is reflected in this issue.

To find out more about the different types of applications of psychophysiological data in education, the reader is invited to consult Antonenko, van Gog, & Paas’ (2014) article, Goswami’s chapter (2010), and the book directed by Masson & Borst (2017).

However, the use of psychophysiological data in real time in the field of neuroeducation is still in development and the studies in this direction, as they emerge, would gain to be known and disseminated in transdisciplinary scientific journals and communities. This very first thematic issue of the Neuroeducation journal aims to regroup some of them and coincidentally puts forward two interrelated challenges, specific to this young field of research: (1) the importance of the validity of real-time data for their interpretation, and (2) nearing as close as possible authentic school contexts or educational environments (e.g. Mercier et al., 2012). These two challenges seem to be interfering to the extent that efforts to achieve one can harm the achievement of the other, and vice versa.

This thematic issue includes two experimental studies and two methodological articles, all of which reflect the emergence of the use of psychophysiological data to address educational issues, as well as the above-mentioned double challenge related to validity and authenticity contexts.

The Skelling-Desmeules (2018) article in science didactics presents an experimental research aiming to understand the impact of learners’ interest in an educational video game in science (Mécanika) on their performance. The cognitive and affective dimensions of situational interest were measured in real time using electroencephalograms and pupillometry.

Di Fabio et al.’s (2018) study aims to describe the impact of gestures (hand movements) on the cognitive load of the child, as measured by eye tracking, in a context of mathematical problem solving on a tablet.

The first methodological article, that of Lapierre (2018), is a proof of concept resulting from the development of a technique generating time markers in a video, according to different types of psychophysiological data of a filmed participant, to facilitate the analysis of the data and possibly the interpretation, for example, of the expression of a cognitive state such as behavioral, cognitive and emotional commitment.

Finally, Léger et al. (2018) propose a series of methodological recommendations to optimize the balance between valid and reliable eye-tracking data, and the most natural interaction possible of young children with a tablet, in a learning context. These guidelines are derived from three similarly designed studies conducted by the authors.

References


