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Antonin Rubin, Nicolas Revel, Yana Weinstein-Jones, Mathieu Hainselin

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5 Antonin Rubin<sup>1</sup>

6 Nicolas Revel<sup>1</sup>

7 Yana Weinstein-Jones<sup>2</sup>

8 Mathieu Hainselin<sup>1,3</sup>

9

10 <sup>1</sup> Université de Picardie Jules Verne, Département de Psychologie, Amiens, France

11 <sup>2</sup> Independent Scholar

12 <sup>3</sup> CRP-CPO, UR UPJV 7273, Université de Picardie Jules Verne, Amiens, France

Which matters more when it comes to learning styles: Introspection or experimental data?

The theory of learning styles is widely popular in classrooms. A recent research paper focused on its impact to distance learning (Costa et al., 2020), a topic of great interest, especially since the beginning of the Covid-19 pandemic. The authors focused on the association of the learning styles theory and distance education, to assess their interaction within a Virtual Learning Environment, using the CHAEA questionnaire. They didn't find correlation between these elements and suggested it may be an indicator of the lack of coherence between these theories. While evaluating teaching approaches and student satisfaction is important, we have some concerns about learning styles.

The idea of learning styles refers to the view that different people learn in different ways based on their preferences (Pashler et al., 2009). The most common theory about learning styles is VAK (Visual, Auditory, Kinesthetic) learning styles. According to this theory, learners have a preferred modality of learning: either visual, auditory or kinesthetic. The idea is that more learning will occur if learners are allowed to study information in their preferred modality, as compared with other, dispreferred modalities. This can manifest itself as people stating they are "visual learners" after having trouble with a difficult text. Beyond a personal preferred modality, many people can think they are visual learners because of the picture superiority effect (i.e., the finding that pictures are more likely to be remembered than words) (Paivio, 1963).

Despite the popularity of the learning styles theory (Scudellari, 2015) there is currently little empirical evidence for it in the literature. No study that matches learning modality to preferences and does so in a scientifically rigorous way has yet shown a direct link between satisfying these preferences and increasing learning (Pashler et al., 2009). To support learning styles theory, so-called visual learners should have better performance for visual than auditory information, while so-called auditory learners should have better

performance for auditory than visual information. Thus, an interaction on performance should be found when preferred and actual learning styles are manipulated. One study does support the idea that tailoring instruction to student learning styles can be effective (Sternberg et al., 1999), but this study comes with methodological issues. The learning style-by-instruction interaction was found only with derived measures, and the untransformed outcome measures were not reported by condition. Additionally, only a third of the participants were in the interaction-group for the final analysis; the interaction was achieved after outliers were excluded for unspecified reasons. This interaction is not found in any other study, so the learning styles theory currently only applies to subjective aspects of learning – i.e., preferences – whereas the data do not support effects of satisfying these preferences on objective aspects of learning – i.e., performance (Knoll et al., 2017).

Despite these arguments, the practice of matching learning styles to preferences is widespread in higher education (Dekker et al., 2012; Gleichgerrcht et al., 2015; Macdonald et al., 2017). Also, the learning styles theory is attractive because it is more intuitive than the complex body of scientific evidence surrounding academic performance (Chater & Vitányi, 2003; Lewandowsky et al., 2012). Lots of people – including teachers and learners – like learning styles theories despite concrete evidence, maybe because of the theories' intuitiveness, and confirmation bias (Pasquinelli, 2012).

Confirmation bias is a tendency to notice and remember more of the evidence that supports our point of view than evidence that confronts it. For example, a teacher who believes in learning styles might explain a difficult theory to a supposed “visual learner” first with words and then by showing a picture. If the student struggles with the verbal explanation but later understands the theory after seeing the picture, the teacher might take it as confirmation of the student's visual learning style. In this example, the teacher couldn't have known whether the student understood because the picture provided a better

demonstration than the teacher's verbal explanation, whether the student just needed another explanation or more time to understand it (Willingham et al., 2015).

The authors of the article themselves admit that many researchers show that the VAK learning styles suffer from a lack of evidence. They cite 10 articles with negative findings on learning styles in the introduction section. Yet, Costa and his colleagues planned to "verify that there is still much to study on the theory of Learning Styles". In this perspective, they used a simplified version of the CHAEA 80, the CHAEA 32 questionnaire, which had no validation in a peer-reviewed journal. In the Analysis of results section, the authors cited both Kirschner's (2017) and Knoll's (2017) papers explicitly saying that "there is a huge difference between the way someone prefers to learn and what actually leads to an effective learning" and "learning styles are associated with subjective aspects of learning, but not with objective aspects of learning". Hundreds of other papers had the same message, and most of them ask not to use learning styles anymore. In Costa and collaborators' paper, while preferences or enthusiasm are different across participants, there was no effect of matching strategies to those preferences on learning. Where performance was assessed, learning styles were not found to be relevant, as expected by the many previous papers on learning styles myth. We share the authors' conclusion on the educational interest to identify and define the way an individual learns to facilitate student's learning and changing education planning. However, this should not be referred to as learning styles, known in the scientific community to be a myth. Future research might use a different name when studying individual learning optimal characteristics.

In this commentary, we wanted to pinpoint that the original article doesn't fully address the effectiveness of matching learning preferences to instruction, but only looks at student satisfaction. This is an issue because the article promotes learning styles-based instruction despite lack of evidence that this type of instruction is effective for learning. This

applies to the classic learning styles concept (VAK) as for the Alonso et al. (2012) classification as cognitive, affective and physiological traits. Repeatedly promoting any information, even when it is false, makes it more familiar and increases the chance that people will believe it. This leads to the propagation of (neuro)myths (Lewandowsky et al., 2012), especially among non-experts in cognitive science (Dekker et al., 2012). This is why we urge authors, editors and reviewers to stop promoting learning styles theories without actually testing their effectiveness. Instead, future papers should focus on effective learning strategies (Weinstein et al., 2018).

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