Book review

Bello Díaz, Rafael Emilio, & Bello Llinás, Karen (Eds.). *Manual de Neuroeducación y Neurociencias del Bilingüismo*.

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The book *Manual de Neuroeducación y Neurociencias del Bilingüismo* (Handbook of Neuroeducation and Neuroscience of Bilingualism) is written by Dr. Rafael Emilio Bello Díaz, professor of Neurosciences and Geriatrics at the Catholic University of Santo Domingo, and Dr. Karen Bello Llinás. However, the publication of the book is the responsibility of the Vice-Ministry of Supervision, Evaluation and Control of Educational Quality -of which Bello Díaz was Vice-Minister- from the Government of the Dominican Republic.

Beyond his political work, we can highlight that Bello Díaz graduated in Medicine from the Autonomous University in Santo Domingo in 1976. He would later emigrate to Buenos Aires, where he discovered his interest in research, predominantly in Neurosciences, but also in other areas such as Geriatrics, Critical Medicine, Diabetology and Nutrition. In 2018, he published the book Neurosciences and Learning in co-authorship with his daughter, Dr. Karen Bello Llinás, with whom, in 2022, he would publish the present object of the review. This handbook on neuroeducation and neurosciences of bilingualism is structured as follows:

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- Chapter 1: *Cerebro y lenguaje* (Brain and language)
- Chapter 2: *Bilingüismo y cerebro* (Bilingualism and brain)
- Chapter 3: *Neurociencias y bilingüismo* (Neuroscience and bilingualism)
- Chapter 4: *Bilingüismo* (Bilingualism)
- Chapter 5: *Mente bilingüe* (The bilingual mind)
- Chapter 6: *La lengua como medio de comunicación de los pueblos* (Language as a mean of popular communication)
- Chapter 7: *Aprendizaje del cerebro y su repercusión en el proceso de adquisición enseñanza de la lengua extranjera en la educación bilingüe* (Learning and repercussion on the acquisition process. Foreign language teaching in bilingual education)
- Chapter 8: *Neurolingüistica: cómo el cerebro bilingüe aprende palabras* (Neurolinguistics: how the bilingual brain learns words)
- Chapter 9: *Bilingüismo y funciones ejecutivas* (Bilingualism and executive functions)
- Chapter 10: *Conclusiones* (Conclusions)

These chapters can be classified into three sections. The first section includes two introductory chapters; the second section revolves around the brain and bilingualism (Chapters 1, 2, 3, 4 and 5), and the third section focuses on other areas associated with language, such as learning, neurolinguistics and other functions.

The **Presentation** opens by linking the growing interest in bilingualism to factors such as emigration, globalization and the diffusion of new technologies that make a large amount of information available to the public. Already in this section it is introduced that, given the complexity of the study of neurolinguistics and the variety of study approaches (anatomy, cognitive psychology, language pathologies, etc.), this manual intends to approach the subject from all possible perspectives. This is followed by a series of considerations from the Ministry of Education of the Dominican Republic, which serve as a pretext for the Vice-Ministry of Evaluation, Supervision and Control of Educational Quality to produce and publish this manual.

The **Introduction** is a summary of how, historically, research in neurolinguistics has evolved. Thanks to advances in study techniques, bilingualism has gone from being considered in the late nineteenth and early twentieth centuries as an impairment in intellectual growth, to being conceived as a tool for increasing mental flexibility (Peal and Lambert, 1962).

Chapter 1, entitled Brain and language, introduces the foundations of neurolinguistics, emphasizing the neurological locations of language in the brain. It is a more developed historical introduction, starting with Whitaker (1998) and going through Broca and Wernicke's areas, explaining the association of passive communicative activities with Wernicke's area, as well as that of active activities with Broca's area.

After going into more depth about the areas involved in language production, the authors go on to differentiate four types of communication: written production, listening comprehension, written comprehension and oral production. The latter is detailed in more depth when dealing with language pathologies. The components that are affected in cases of aphasia and how they are affected are discussed. The chapter ends with a short introduction to the relationship between memory and language, with emphasis on operative memory.

Like the previous chapter, **Chapter 2** begins with a brief historical contextualization that postulates the interest of neuroimaging, with special reference to positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) techniques in the 1990s (Klein et al., 1995).

The authors present the hypothesis of distinct neuroanatomical organizations, which emerged in the 19th century to explain different models of language processing (e.g. inhibitory model, integrated neurolinguistic model and lateralization model). Later on, the neural basis of linguistic control is discussed, which leads to the theorization of bilingual production models. Finally, the chapter ends with a summary of the mapping process in monolingual reading.

Chapter 3 is introduced on the pretext that structured second language learning alters brain structure (Osterhout et al., 2008). The authors describe how the

psycholinguistic tradition observed that it is necessary to first learn the basic concepts in L1 before starting to learn L2, and how today, thanks to the advent of the encephalogram (EEG), we can record learning even in the first few hours. This is followed by a brief explanation of the functioning of the brain of a multilingual infant, a study that has made great progress in a short time thanks to non-invasive magnetoencephalography (MEG). According to the research presented in this manual, an infant who learns L1 and L2 simultaneously learns both languages in the same way as a monolingual would. The difference lies in the increased brain activity and plasticity, which is explained by the increased content load in correlation with the monolingual.

This chapter also discusses the impact on the executive functions of adolescent bilinguals, which has been approached more from a social point of view, referring to the benefits in personal development. Here the question of the definition of bilingualism and its types is introduced. The answer is multifactorial, as it depends on the learning mode, age and, above all, the sociological context of the speaker. The authors argue that, in pedagogical contexts, it is important to define bilingualism as a vehicle for learning, without forgetting the need for the affective bond, which allows for beneficial results at the social level by influencing the development of identity.

Chapter 4 commences with the presentation of different types of bilingualism measurement tools. Theoretical perspectives give way to an explanation of the declarative memory model (more related to late bilingualism) and the procedural model (related to early bilingualism). Among other types of bilingualism, individual bilingualism is separated from social bilingualism, and here the authors take the opportunity to contextualize the concept of diglossia (different social functions and domains of use for each language).

Chapter 5 seeks to answer the hypothesis of compartments, that is how are several languages stored in the brain, as presented in previous sections. For this purpose, after a brief contextualization in which the authors go through studies such as that of Siguán (2001), it is concluded, citing Paradis (2000), that there are two subsystems that are

integrated into a larger one. In this sense, it is argued that both languages operate under the same central processing system (Núñez, 2007).

Subsequent sections of the chapter focus on the relevance of neuroscientific advances, such as near infrared spectroscopy (NIRS), while the last sections are devoted to the sociocultural and psychological aspects of bilingualism. The chapter ends with a section that refers to the growing need and consequent quest for multilingual education, which brings with it different teaching modalities.

Chapter 6 emphasizes on the social aspects of bilingualism from a neuroscience perspective. The creation of a translingual identity is linked to the understanding of the world (the so-called worldview), which is responsible for encoding and constructing the representation to store it in brain memory. After defining these bases, we go on to describe the psychological and social consequences of bilingualism. Among these is the consolidation of relational dynamics in social groups and collective cohesion, a theory of Vygotsky (1979), who considers language as a modulator of thought and the value system.

Chapter 7 opens with a review of two terms together: language and emotion, giving way to the concept of *emotional intelligence*, first coined by Mayer and Salovey (1995). According to Salas (2003), learning will be optimal if two key circumstances are present: a non-threatening environment and an environment that stimulates risk-taking. This is how the authors connect emotions with the school learning environment. This is specifically important in language learning, if we consider a language as a way of looking at the world.

For risk-taking to be contemplated without the threat deteriorating the pace of learning, two types of motivation must follow one another: intrinsic (seeking satisfaction within oneself, supported by curiosity or self-esteem) and extrinsic (arising from wanting to avoid punishment or through the pursuit of a reward). The chapter ends with the basic definitions of aspects that the authors considered important in the classroom, such as metacognition, learning style, attitude (understood here as a reflection of motivation), and the role of the teacher and the student.

At the beginning of **Chapter 8**, which deals with Neurolinguistics, it is shown how, thanks to the technique of event-related potentials, it is possible to monitor the learning of new words. Thanks to this technique, a cognitive difference between early and late bilinguals has been discovered. Furthermore, the authors also refer to the importance of the environment. These circumstances generate different cognitive functions in bilingual speakers, separating them into balanced speakers, developing speakers, speakers with productive competencies, speakers with receptive skills, etc. The chapter finishes with the exposition of several clinical studies in relation to lexical and phonetic use, as well as morpheme learning.

Chapter 9 focuses on a series of case-control studies testing the executive and cognitive functions of language learners in monolingual contexts. This is followed by a classification of positive and negative effects of bilingual education. Among the positive aspects are the learning of new cognitive strategies, increased cognitive control and the development of metalinguistic awareness. Among the negative aspects are the difficulties in speakers with language problems, the decrease in verbal fluency given that the cognitive field is wider, and finally, linguistic interference.

The last section of this chapter is devoted to bimodal bilingualism (sign language and spoken language), where the lack of studies on the subject is discussed. Some authors argue that there are no executive benefits in cases of bimodal bilingualism, whereas they share key similarities such as lexical processing or double activation.

The concluding chapter of this book includes a proposal for new investigations focusing on microanatomical levels. Likewise, it also deals with the consideration of social conditions and the previous knowledge of the students on the design of language lessons.

All in all, each chapter of the book presents between fifteen and twenty subtopics, offering a diverse exploration of neurology and bilingualism without adhering strictly to a single thread of study. While this structure may seem fragmented at times, it allows for a detailed examination of specific aspects within the field. The wealth of cited information throughout the text enhances its credibility, making it a valuable resource for research purposes despite any stylistic shortcomings.

Although the progression of the book is not always immediately clear, this may be an intentional choice, reflecting its design as a handbook. Beneath its dense theoretical content, there is a discernible structure, subtly connecting the sections. This careful balance between depth and breadth ensures its utility for readers (e.g. learners, scholars) seeking a comprehensive yet rigorous guide to the subject.

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