

Citing external sources in Educational Neuroscience articles: in search of an interdisciplinary stance and voice

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Research on interdisciplinarity in academic discourse is growing in importance (Oakey & Russell, 2014; Petrić, 2006; Teich & Holtz, 2009; Thompson, 2015). Mostly, though, contrasting disciplines are compared with each other rather than with truly interdisciplinary writing. Starting from an understanding of writing as 'dialogical' (Bakhtin, 1981), the aim of this paper is to distinguish the 'voices' of external authors and the 'stance' taken towards their contributions (Thompson, 2012) in the interdisciplinary field of Educational Neuroscience through the study of citations in a corpus of research article introductions. So as to provide some parameters of comparison, two sub-corpora have been added to the interdisciplinary corpus. These consist of research article introductions from the two single-domain disciplines that give rise to the interdiscipline: Neuroscience, a 'pure hard' discipline, and Education, a 'soft applied' one (Becher & Trowler, 2001). Thus, this study might contribute to the description of the epistemic nature of interdisciplinary discourse.

One hundred and twenty research article introductions (152,202 words) from the three mentioned disciplinary fields have been analysed. Bibliographical citations and every other linguistic feature signalling the presence of external sources have been identified and analysed manually. Cases of 'indirect attribution' (Williams, 2010, p. 621), known as 'attribution without citation' (Thompson, 2005, p. 38), have been also considered and counted as individual citations. In addition, all citations that do not convey attribution but are part of averred statements have been counted too.

Thompson (2012) sees both 'voice' and 'stance' as 'existing on a number of levels, ranging from the proposition through to the whole text'. For the purpose of this work, it is important to pay attention to the propositional level, through which we would 'distinguish the voice that is responsible for a given statement', being this the writer or 'some other source', and also 'the stance that the writer takes towards a given proposition' (Thompson, 2012, p. 119). A theoretical framework has been developed that distinguishes three parameters: the 'strength' and the 'visibility' of the external sources, and the 'credit' given to previous research. Once these individual parameters have been analysed, different patterns of parameter co-occurrence have been identified and described.

'Strength' refers to the strength of the external author's voice. The strongest author's voice will be represented by a citation that introduces an attributed proposition embedded in a *-that* clause. In contrast, the weakest author's voice will be represented by a citation embedded in an averred statement. As for the 'visibility' of the external source, the distinction between 'integral' and 'non-integral' citations (Swales, 1990) must be considered first, before referring to the degree of 'personalization' or 'objectification' of the cited source (Hood, 2011; Coffin, 2009). The more depersonalised and/or objectified the sources, less visible they become.

'Writer stance' (Coffin, 2009) towards the attributed proposition is the position taken by the article writer 'in relation to the words, observations or viewpoints' presented by the referenced source. This is used to measure the amount of 'credit' given by the writer to the external author's words, and, consequently, to the authors themselves. For instance, an 'endorse' stance gives more credit to the attributed proposition while a 'contest' stance gives less credit to the external author's words or assumptions. The

amount of 'credit' given to external voices embedded in averred, rather than attributed, sources is not an easy feature to describe. In those cases, we might find citations used to describe a research process or procedure carried out by the external author or citations used to summarise results found or claims made by the external authors. In none of these cases is the external author responsible for the proposition; in fact, it is 'the writer who is responsible' (Thompson, 2005, p. 36) for the summary of the findings or the report of the process carried out. So, if we consider the amount of credit given to those averred sources, summarised findings and claims would be given more credit than described research processes or procedures, taking into account the distinction made by Hyland (2002) between higher and lower 'communicative risk' involvement on the part of the writer.

After the three parameters are described in each corpus, 'citation patterns' are identified and described. In the context of this study, I define a 'citation pattern' as a particular combination of the choices available from the three parameters described above. However, the description of this interweaving of choices is not an easy task, since we need to combine different categories that belong to different taxonomies, each of which highlights a different aspect. In fact, as Hunston (2011, p. 34) explains, taxonomies 'tend to be complicated' because they deal with several questions at the same time: not only with the question of 'who is the speaker of the proposition', but also with issues such as 'how that speaker is represented' and whether the author 'delegates or reclaims responsibility for the proposition'.

Different citation patterns can tell something about the authorial presence of the external sources in a text. For instance, we might encounter a citation pattern in which this presence is the most powerfully marked by the inclusion of a 'human', 'identified' source embedded in an 'integral' citation in which the writer takes an 'endorse' stance towards the attributed proposition, as in the following example:

- (1) Indeed, *Brankaer, Ghesquière, and De Smedt (2011)* found that children with MID had impairments in numerical magnitude processing (*Educational Neuroscience*).

Clearly enough, the voice is the strongest ('attribution' through a verb + *that* clause) and the most visible ('integral', 'human identified' source) and the attributed proposition is given the most credit ('endorse' stance).

At the other extreme, a citation pattern in which a 'non-integral', completely depersonalised source (only present for 'identification' purposes) is part of an 'averred' statement, where no process is explained and no findings are summarised and the proposition is expressed in the words of the writer, would show the least powerfully marked authorial presence of the external voice, as in the example that follows:

- (2) Cocaine facilitates the induction and maintenance of different forms of LTP in several areas of the brain including the hippocampus (*Thompson et al., 2004; Del Olmo et al., 2006b; Huang et al., 2007a*). LTP is a flexible event that can be erased by subsequent low frequency stimulation (LFS) in the hippocampus (*Bashir and Collingridge, 1994*) (*Neuroscience*).

Between these two extreme cases, there are many combinations that occur in different proportions and with different degrees of prominence. However, certain citation patterns are more or less frequent than others in the different corpora. This suggests important disciplinary and interdisciplinary differences in the ways in which the authorial voices of external sources are manifested in a text.

When articles from Neuroscience and Education are compared, preliminary findings show that Neuroscience sources are given more credit but are less visible, and that Education sources are more visible but are given less credit. As for strength, Education sources are slightly stronger. When citation patterns are considered, similar findings are observed. These results are predictable from what is already known about the difference between hard and social sciences: educators make other sources more visible but they give them less credit because they are entering into a debate with previous authors; neuroscientists, on the other hand, give more credit to other researchers' findings but do not enter into a debate with them; rather, they 'stand on their shoulders'.

When the findings obtained for the Educational Neuroscience corpus as a whole are compared with the Neuroscience and Education texts, several conclusions can be drawn. First, the external voices in Educational Neuroscience texts are slightly stronger than in Education and considerably stronger than in Neuroscience. Second, these voices are more visible than in Neuroscience but less visible than in Education. Third, and perhaps more importantly, new patterns that are not observed in the two pure disciplines emerge as typical features of the interdiscipline, such as longer blocks of attribution. These blocks connect pattern sequences whose possible general effect is to make external sources more powerfully marked. Finally, the discovery of new 'citation patterns' might lead to similar conclusions to those reached by other interdisciplinary studies which do not deal with citations. For example, Thompson (2015) concludes that interdisciplinary researchers write papers for a 'broader audience composed of researchers from several disciplines'. Thus, the members of this new interdisciplinary audience are not all necessarily experts on the topics dealt with. The evidence found in the present study also highlights the presence of distinctive citation patterns that respond to this need to reach a broader audience of non-expert readers. These other external voices are part of the 'imagined readership' that appears to be connected not only with the world of academia but also with the world of work. In this way, the study of interdisciplinary audiences through the presence of external voices other than cited sources appears as a promising topic for future research. In a way, we would be giving rise to the study of new audiences for new disciplines.

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