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**The heart is a *pump* but also a *dollhouse*, a *four-door car* or a *ship*: Metaphors that young students create on the fly to understand and explain core scientific concepts in biology**

The important role metaphors play in understanding scientific concepts, particularly in an educational context, has been widely acknowledged in the literature (Cameron, 2002, 2003; Low, 2005; Knudsen, 2003, 2005; Littlemore 2017). Drawing on Cameron's seminal work on metaphor in educational discourse, we aim to examine how metaphors used in the Romanian biology textbook for lower secondary education may facilitate the simplification and understanding of scientific concepts. To this end, we have adapted Cameron's think-aloud data collection protocols to analyze how young students aged 10 to 13 years understand and interpret metaphors used to explain the structure and functioning of the heart. We have conducted 8 focus groups with 17 participants (2 participants/ focus group, with one exception) in which we used a short extract from the biology textbook as a starting point for a conversation about the heart and its functioning. Later, we showed two short videos about the same topic, one containing the same metaphor as the text – heart as a *pump* – and the second in which a different metaphor was used – heart as a *factory*. During the focus groups, the intervention of the interviewer was kept to a minimum, and participants were encouraged to converse and, thus, to make sense of the metaphors in the text and the videos through collaborative thinking-and-talking. Our preliminary findings show that young students struggle to make sense of the metaphors in the text and that a lack of knowledge of the source domain seems to undermine their understanding of the functioning of the heart as a pump. As the conversation progresses, participants come up with their own on the fly metaphors to explain the structure and functioning of the heart, which soon replace the metaphors in the text. Our findings are consistent with previous studies that have shown that embodied sources favor understanding (Niebert et al., 2012). Furthermore, we have also found that in learning about scientific concepts students are willing to take up metaphors and further extend them, sometimes at the expense of scientific accuracy (Cameron, 2003; Littlemore, 2001; Deignan et al., 2019). Interestingly, among the metaphors created in conversation, those whose source domains evoke vivid imagery are preferred and further extended by the participants. Finally, we discuss the

implications that the identified on the fly metaphors may have for (mis) understanding scientific ideas and how this might impact on young learners' preparedness to make sense of the world we live in and, ultimately, on their future engagement with and interest in science.