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WHO NEEDS 3D WHEN LEARNING ABOUT THE UNIVERSE – PERCEPTIONS OF 3D AND ITS IMPORTANCE FOR TEACHING AND LEARNING PHYSICS AND ASTRONOMY

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When entering the discipline of physics, and in particular astronomy, students are faced with many challenges. Not only do they need to learn to "read" and "write" the "language of the discipline", built by all the semiotic systems and resources (tools, representations, and activities) used by the discipline, but also to learn to think spatially, or extrapolate three-dimensionality from 1D and 2D input (Eriksson et al., 2014), e.g. mathematics, diagrams, images, etc. Although identified as very important (eg. Hegarty, 2014; Lindgren & Schwartz, 2009; NRC, 2006; Plummer, 2014; Uttal & Cohen, 2012), extrapolating three-dimensionality is a severely overlooked competency in both physics and astronomy education that poses a real challenge to novice students in their meaning-making; they are often left by them self to try to imagine what an astronomical object may look like in 3D. Furthermore, from the physics and astronomy education research literature, only very few other efforts have been identified to address the challenges associated with extrapolating three-dimensionality (eg. Heyer et al., 2013). Hence, extrapolating three-dimensionality becomes an important educational aspect to consider when teaching physics and astronomy.

In this paper we report on an international study where perception of the third dimension, depth, in astronomical 2D imagery and psudo-3D simulations has been the main focus. We have chosen to focus on astronomical nebulae, because these are very common in astronomy textbooks/teaching material and teaching situations. Astronomy students and professors have been asked about their noticing of depth from astronomical 2D images and psudo-3D simulations in order for us to map their competency in extrapolating three-dimensionality in their minds. In analyzing their responds, we use a standard qualitative research method, and take as our point-of-departure Eriksson et al. (2014) hierarchical categories for multidimensionality discernment. Our preliminary results suggest that the competency to "read" depth in astronomical image/simulation is very limited by new-to-the-discipline students but also that simulations, where motion parallax is offered, could help students in their meaning-making and extrapolation of three-dimensionality in their minds. Implications in regards to our findings will be discussed.

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