Conversations with Clay: Experiencing Acceleration Through Tactile Modeling

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Objective: Providing a Medium for Transmodal Exploration of Kinematic Perception

Haptic-tactile engagement surfaces elements of a learner's experience of perceptual phenomenon. The concretizing of these elements in material representation makes them visible to others involved in the learning space: peers, teachers, researchers, designers. This affords important pedagogical research opportunities.

Background: Multimodal Learning and Manipulatives

As students are taught to formally model kinematic phenomena, they participate through many sensory modalities, not only sight. However, our current educational tools do not afford this multimodal participation in a robust way. When asked to "show one's work", one's thought process is shown via mathematical symbols, intended to show the steps that have led up to a final solution. Explorations, stumblings, and intuitions are difficult to convey in this way and are often lost. (Lemke, 2003). Gestures and mental grasping such as metaphor are put aside in favor of formal symbolism. This multimodal pre-conceptual substance is critical within the problem-solving process, yet is overlooked (Petitmengin, 2007).

A more hands-on approach involves using manipulatives to model acceleration, such as a car rolling down a ramp. However, these approaches too do little to highlight the richness of individual perceptual phenomenology, and afford little opportunity for the expression of one's sense-making over time, especially across modalities. This research effort seeks to support students in attuning to and expressing the gestalt of their perceptual phenomenological experience across modalities. This is done through clay, a medium with rich tactile affordances, to surfaces learners' inner gestures and enable a transmodal express of the felt sense of visually observed kinematic phenomenon.

Design: Contemplative-Affective Metarepresentational Modeling Activity

"The essence of understanding some scientific concepts lies precisely in developing strategies that allow for the perception of 'noticing' the relevant entities and relations" (Bamberger & diSessa, 2003). Thus, applying enactivist, gestural, material-engagement, and semiotic-cultural theories (Valera et al., 1991; Malafouris, 2020; Radford, 2003), this design facilitates an attuning to one's felt sense of perception and provides materials that afford the transmodal expression of this experience. By divorcing the object of manipulation from the object of inquiry, there may be more opportunity to explore the process of formation of transmodal semiotic systems.

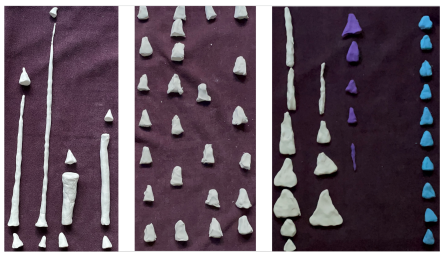

Figure 1: Results of metarepresentational modeling of acceleration using clay.

This design aims to elicit a conversation with the materiality of clay. This conversation begins by establishing a contemplative affective space for learners that emphasizes sensitivity to the tactile-perceptual experience, drawing heavily on work in accessing felt experience and inner gestures (Petitmengin, 2007). Then, clay is used as a transmodal medium for semiotic means of objectification, in order to surface vital aspects of the felt experience of visual perception for learners.

Conclusions

Clay is a valuable tool for exploring the process of sense-making during visual perception of kinematic phenomena. We see how it might reveal a trajectory of understanding via material representation, enabling important pedagogical opportunities.

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