Digital Gestures in a Math Game

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Objective

Autumn Hostetter and Martha Alibali (2019) framework called *Gestures as Simulated Action* (GSA) suggests that people's cognitive processes trigger gestures. It does not yet account for digital interactions and environments. In 2011, Alibali et al. conducted research examining the role of limiting physical gestures on reasoning. When playing a game to develop math knowledge, players have a digital world and a controller that all play a role in the gesturing process. The primary research question of this poster is: How does inhibition in the digital space work when a player is reasoning in a game designed to improve fraction knowledge?

The brain is the intersection of reason, perception, and movement. Nemirovsky et al. (2012) asserted that the "understanding of mathematics is expressed in and constituted by perceptuo-motor activity, and learning of mathematical ideas is shaped in non-deterministic ways" (p. 288). Math is often understood as grounded metaphor (Lakoff & Nunez, 2000) Videogame levels can be grounded metaphors for participants to experience virtually to support their fraction knowledge development.

Methodology

This study took place at a large university located on the East Coast. The participants were four soon-to-be first-year students at the university who were enrolled in a remedial summer program. Students played Mario Maker 2 levels designed to evoke the actions in fraction number schemes. Students were asked replay the levels and to make connections between game levels and mathematical content of a fraction worksheet given that day. These replay interviews were transcribed using gesture-enhanced transcription methods. This study used a thematic analysis.

Results

There were three different categories of gestures that occurred. The most common types of gestures were with one hand on the controller using the other free hand to gesture and as a pointing device, and with no hands on the controller and gesturing with both hands. There was also one player who kept two hands on the controller and used the avatar to gesture within the game, including slowing down the avatar to focus on parts of the screen (displaying the game) and making the character jump/move as a pointing device. The controller affected student play and gestures.

The act of play and the digital gestures associated with making connections can be in conflict with one another. It appears that players who see the act of play as incompatible with the digital gestures of connection-making physically gesture outside of the game, whereas players who see the act of play as compatible with such gestures digitally gesture with the avatar. We need studies to highlight what exactly is the difference in connection strategies between digital avatar gestures and physical gestures. Designers of educational games need to actively consider the player avatar movement in their design.

References

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