Using NGSS to Design Educational Games for Multiple Grade Levels

Introduction. While kindergarten and first grade children may be able to identify a location on a map (DeLoache, 1991), they may not understand abstract symbols, large numbers of symbols, or complexity of symbols (Mohan & Mohan, 2013). This becomes a problem when designing an educational game that targets multiple grades. In our study, we describe the development of an educational game aligned to second grade Next Generation Science Standard (NGSS) content that is developmentally appropriate, and engaging, for multiple grades.

Methodology. To identify problematic aspects of our design that may result from designing for multiple grades, we conducted user tests with paper and digital prototypes during pre-production. Simultaneously, cognitive task analysis provided an approximation of the developmental appropriateness for young learners. The result of these tests was a NGSS aligned cooperative game, where players take turns identifying the location of an elephant on a map, using symbolic representations of items as clues.

Pairs of kindergarten-second graders (n=34) played through the game until they failed a level objective. Data was collected through researcher observation ~~of students' actions~~ and telemetry data.

Results and Implications. Although the content is second grade, kindergarteners were able to complete most of the game. Since first and second graders easily finished all available levels, there is concern that the game is not sufficiently challenging. However, levels in development will also introduce concepts of relative location and relative size – concepts expected to be challenging for younger learners. Future telemetry testing will inform the effectiveness of these additions.