

Developing Argumentation Skills through Game-Based Assessment

Yi Song, Jesse R. Sparks, James W. Brantley, Tanner Jackson, Diego Zapata-Rivera, Maria Elena Oliveri,
Educational Testing Service

Introduction

Computer games and simulations have the potential to improve students' interest and performance in many academic domains (Klopfer, Osterweil, & Salen, 2009), and have often been used as learning tools (e.g., Dede, 2007; Shaffer, 2006). One understudied domain in educational game design is argumentation, which is an essential skill for many academic and professional settings (Graff, 2003). Notably, the Common Core State Standards put an emphasis on writing logical arguments, requiring that students demonstrate sound reasoning and use relevant evidence (CCSSO & NGA, 2010). However, many students lack strong argumentation skills, leaving them ill-prepared for college and careers. We developed a game intended to motivate students to develop argumentation skills, and to provide evidence of students' current argumentation skill to support formative assessment. We describe a game-based assessment designed to measure multiple levels of argumentation skill within a meaningful scenario context. We also address the utility of argumentation learning progressions for supporting game-based assessment design, using evidence from a usability study.

Using Learning Progressions to Inform Game Design

To gather relevant evidence about students' argumentation skills, we designed game activities around a set of argumentation learning progressions (LPs; Song, Deane, Graf, & van Rijn, 2013), developed under the Cognitively-Based Assessment of, for, and as Learning (CBAL) research initiative (Bennett, 2011). CBAL aims to design a system of assessments that support K-12 teaching and learning; LPs that specify how skills develop over time are critical to this effort. Informed by cognitive and learning sciences research (e.g., Bereiter & Scardamalia, 1987; Graham & Perin, 2007; Hayes & Flower, 1980; Kuhn, 1991), argumentation LPs describe the qualitative shifts that occur as students reach higher levels of sophistication in four strands of skills: (1) **Appeal building**: understanding an audience's interests, values, and beliefs; (2) **Taking a position**: developing a position and understanding other perspectives; (3) **Reasons and evidence**: using reasons, evidence, and examples to support an argument and to evaluate others' arguments; and (4) **Framing a case**: organizing and presenting an argument logically.

LPs are useful for designing game-based assessments. First, they help determine the targeted skills in the assessment, based on an analysis of critical skills in the domain (Deane, 2011). We have used LPs to inform the design of items assessing five levels of performance (from preliminary to advanced). For example, at the preliminary level, students are expected to classify people's positions as being "pro" or "con" regarding an issue; at the intermediate (4th) level, students should be able to identify others' subjective points of view. Assessment tasks could vary from asking students to categorize opinions, or to identify unstated assumptions underlying a claim. Second, LPs help establish appropriate task sequences. For instance, critiquing an argument is a sophisticated skill that rarely develops before college unless instruction or scaffolding is provided (e.g., McCann, 1989). Thus, we might reserve critiques for later levels in the game, or incorporate scaffolding to support students in performing a critique. Importantly, we have designed activities that present varying degrees of challenge, so that students can play the game regardless of their level of skill. As players progress, the difficulty level of the tasks will increase, emphasizing skills at higher levels of the LPs. The level of tasks might also vary *within* a particular game activity, to support the assessment and development of argumentation skills.

Designing Game-Based Assessment Scenarios: The Case of "Junk Food"

In the *Seaball: Semester at Sea* game, players assume the role of students embarking on a worldwide journey aboard a cruise ship, the *SS Seaball*. As they travel, students will explore other countries, serve on the ship's student council, and work with others to solve problems. Throughout the "voyage," players will demonstrate their argumentation skills by engaging in debates with game characters, recommending policies through the student council, and completing various argumentation tasks.

Players start with two lead-in activities: interpreting the persuasive intent in a poster (Appeal Building, Level 1), and persuading parents to give their permission to join the trip (Appeal Building, Level 2). Once onboard the ship, players join the student council and help make a policy decision: whether the *Seaball* should sell junk food to students. This "Junk Food" scenario consists of five activities of varying difficulty. Players must first gather and evaluate information about the topic from different sources. In the *Peer Interview* task, players interview other students

onboard, and must classify their opinions into ban or allow categories (Taking a Position, Level 1). Next, players seek expert advice by *Selecting a Speaker* to address the students about junk food, such as a physician or a food company employee. Players select reasons in support of their preferred speaker, and reasons against inviting the others. In the *Identifying Arguments* task, players listen to the speaker, and identify the main claim, reasons, and evidence for the speaker's arguments. Players then *Make a Recommendation* to the student council (i.e., ban or allow junk food), providing three reasons for their decision. These three activities assess higher level skills (Reasons and Evidence, Level 2) than the *Interview* task. Finally, players must work to *Establish a Criterion* for what counts as "junk food" by talking with other council members; this involves evaluating other people's arguments, making it the most difficult task in the set (Reasons and Evidence, Level 3).

In a usability study, nine middle school students worked on the game prototype that included an introduction to the theme and setting of the game, the two lead-in activities, and the Interview activity in Junk Food. Students performed well on the tasks and thought that the tasks were relatively easy. They considered the game activities interesting and engaging. We will conduct a cognitive lab study with approximately 20 middle school students on the complete "Junk Food" scenario. The findings will provide partial evidence of the validity of argumentation LPs as tools for designing game-based assessments, and will inform revisions to the design of the game activities, to enhance measurement validity and student engagement.

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