

CyGaMEs *Selene*: State of the art 21st Century Educational Technology. Bring *Selene* to your state.

Selene players construct the Earth's Moon,

**Can videogames prepare young people to learn science?  
Can videogames assess how well young people learn science?**

These questions are the heart of CyGaMEs project research. CyGaMEs stands for Cyberlearning through Game-based, Metaphor Enhanced Learning Objects. The CyGaMEs approach to instructional game design and assessment personalizes learning and assessment for enhanced academic achievement. The approach derives from four decades of cognitive science analogical reasoning research and learning science, instructional design, and game design theory. The National Science Foundation-funded CyGaMEs project created the online game and research environment *Selene: A Lunar Construction Game*. Each *Selene* player (ages 9 and up) follows his or her unique path of discovery to experience how the Moon formed and changed over time. *Selene* players construct the Earth's Moon and then pepper it with impact craters and flood it with lava. All through the game, *Selene* tracks each player's behavior to measure learning and the player's response to the game environment (flow).

Difficult geological concepts like accretion, differentiation, impact cratering, and volcanism become more intuitive because *Selene* gameplay requires players to physically discover and apply these science concepts to progress toward game goals of building the Moon. Players also learn the effects of science concepts like density, gravity, and kinetic energy. *Selene* supports national and state science standards (<http://selene.cet.edu/?page=educators>).

CyGaMEs designed a suite of assessment tools that can be embedded within instructional games. Embedded assessment addresses the concerns of learning scientists who believe learning and assessment must occur within authentic contexts. Using *Selene*, CyGaMEs research empirically demonstrates that the assessment suite successfully measures learning and players' perceived experience (flow, apathy, boredom, routine expertise, control, arousal, anxiety, and worry). Using video of *Selene* gameplay to identify a prototypical moment of learning and using gameplay velocity gestures to identify individual players' moment of learning, CyGaMEs researchers have found that the CyGaMEs measure of learning (the timed report) is extremely sensitive, explaining 95 percent of pre/post achievement variance within players. CyGaMEs partners past and present hail from NASA, ARC: the Center for Advancing Research and Communication, Northwestern University, Kent State University, the University of Florida, and Western Illinois University. The *Selene* game and assessment suite are ready for use by players, educators, instructional game developers, and researchers. Working together we'll chart a future of science achievement.

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