

Integrating STEM and Digital Literacies with Adolescents

Ji Shen (University of Miami) & Blaine E. Smith (University of Arizona)



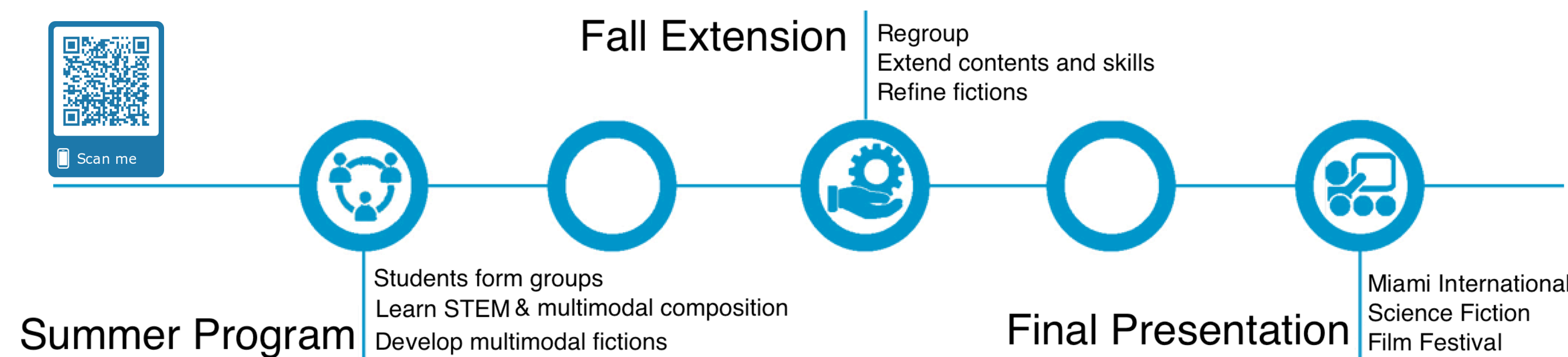
Context and Key Questions

The STEM + Digital Literacies (STEM+L) project investigates science fiction composing as an effective mechanism to attract and immerse adolescents (ages 10-13) from diverse cultural backgrounds in socio-scientific issues related to environment.

The participating students (G5-8) work in small groups to design and produce STEM content rich, multimedia science fictions during the summer (1 week) and the academic year (4-6 2.5hr sessions). Culminating activities include student presentations at a local science fiction film festival.

The research component employs an iterative, design-based approach that investigates the following questions:

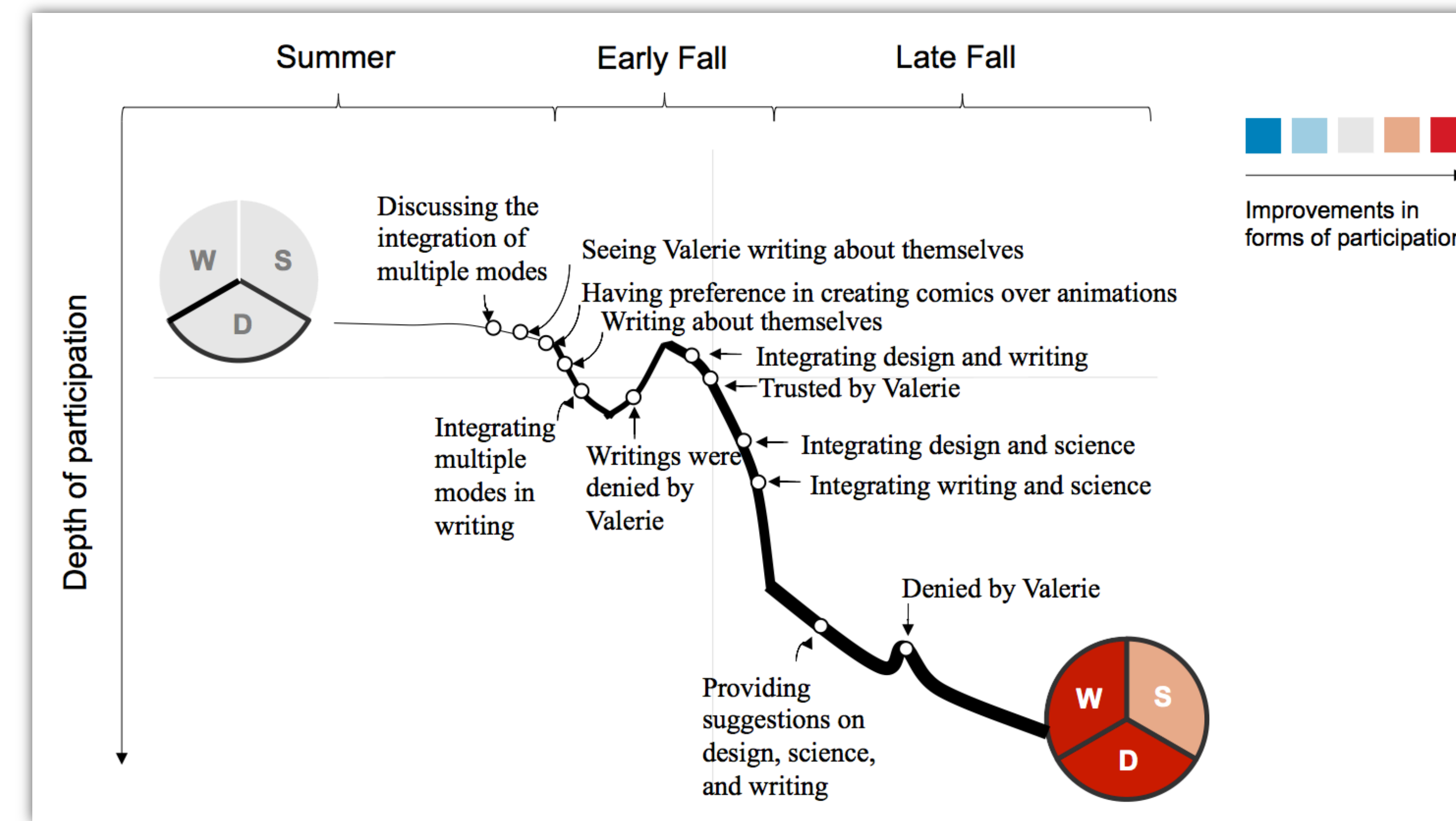
- (a) How do students learn in an integrated way (e.g., STEM content, multimodal digital literacies) in STEM+L?
- (b) How do we support students' participation and learning in STEM+L?
- (c) How do we assess student learning in STEM+L?



Theoretical Framework



(a) How do students learn in an integrated way in STEM+L?



- **Trajectories of disciplinary identity development** are coupled with their role-taking behaviors (e.g., single role → hybrid roles; Jiang, 2018).
- **Multimodal composing** offers multiple points of entry for participation (Jiang, Smith, & Shen, 2019).
- **Collaboration, cooperation, and competition** co-exist in team work.
- **Integrating science in narratives** took multiple forms.

(b) How do we support student learning in STEM+L?

Structured workshop: Structured activities are developed to simultaneously support disciplinary learning and multimodal composing, integrating individual and collaborative learning, and balancing prescribed STEM contents and individualized interests and composing paths (Smith & Shen, 2017).



Multimodal composing (MC): Students learn a variety of tools (e.g., Scratch, Pixton, MovieMaker, Pixlr) and ways to integrate modalities for MC (Smith, 2014). We also develop specific functionalities in a CSCL platform (ikos.miami.edu) to support collaborative MC.

Disciplinary role-taking: Students take disciplinary roles (e.g., scientists, writer, and designer) to work on group-based projects (Jiang, Shen, & Smith, 2019).

Authentic audiences: Students learn from guest speakers (e.g., scientists, filmmakers) and present their sci-fis in multiple venues (e.g., Miami International Science Fiction Film Festival) (Smith & Shen, 2017).

(c) How do we assess student learning in STEM+L?

Multimodal artifacts: Student-generated multimodal narratives can be analyzed from different perspectives:

- Orchestration of modality (Smith et al., 2019)
- Integration between science and writing (Jiang, Shen, & Smith, 2016)
- Imaginative capacity (Kolovou, Shen, & Smith, 2019)

Multimodal reflections: Students develop meta-awareness of their collaborations, role identities, composing, and learning processes through completing multimodal reflections at different stages of the project (Smith et al., 2018).

