Critically Reading a Middle School STEM Project through a Gender Lens

Stacia Stribling

Sheri Berkeley

Leigh Ann Kurz

Amanda Luh

Anna Menditto

George Mason University

American Educational Research Association Conference
Washington, D.C.; April 2016

What we Know

- Females are underrepresented in STEM careers (Blickenstaff, 2005).

- Research suggests that the gender gap in STEM is less about ability and more about individual and global perceptions (Tyler-Wood, Ellison, Lim, & Periathiruvadi, 2012).

- Critical theory provides a framework for understanding the structures that have complicated female participation in the science field (Freire, 1970; Giroux, 1988, McLaren, 2003).

Research Questions

- As members of a research team whose primary purpose was to investigate self-regulated learning (SRL) in a project-based learning environment using Serious Educational Games (SEG) with middle school students identified with learning disabilities, we were simultaneously interested in how this project might contribute to supporting female interest in the STEM field.

- Therefore, we decided to take the data we had collected on self-regulation and science learning to explore the question:

  - **How does gender play out in a middle school STEM project?**

- While the project attracted many female participants, we were interested in digging deeper to better understand the structures and strategies that supported and/or inhibited the connections females might make to the STEM field.
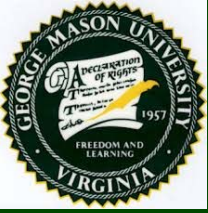
Participants

- 11 students who qualified for disability services under The Individuals with Disabilities Education Act (2003) for a specific learning disability in the area of reading, writing, and/or language according to school district eligibility criteria (i.e., participants displayed average to above average intelligence, but they underperformed academically compared to grade level peers).
  - Four sixth-graders (three female, one male)
  - Four seventh-graders (two female, two male)
  - Three eighth-graders (all female).

Learning Context

Complex project-based science activity

- Phase 1:
  - Science instruction
  - Advantages and disadvantages of renewable energy (solar & wind)

- Phase 2:
  - SEG Planning
  - Storyboarding - scenes, characters, and actions to promote player learning of science content

- Phase 3:
  - SEG Creation
  - Building, problem solving, and revising the SEG based on self-evaluation and instructor feedback

Data Sources and Analysis

- Observations (video-taped and in-time field notes)
- Interviews
- Student Work Samples
- We used Lewison, Leland, and Harste's (2008) critical literacy framework to analyze the interactions between instructors and students, students and students, and students and content
- We looked specifically for evidence within the project of critical social practices:
  - (a) disrupting the commonplace,
  - (b) considering multiple perspectives,
  - (c) focusing on the sociopolitical, and
  - (d) taking action (Lewison, Flint, & Van Sluys, 2002; Lewison et al., 2008).
- In addition, we used a grounded theory approach to dig deeper into the data employing open, axial, and selective coding in order to identify emerging themes that deepened our understanding of gender issues within the STEM project.

- Nancy: Well, I was wondering if there are girl characters yet?
- Researcher: Are there girl characters? Did you guys find any?
- Group: Yeah…
- Researcher: What did you think of them?
- Carson: They're okay. *(laughter)*
- Researcher: They're okay? Say more about that Carson. Do you remember what they were?
- Carson: (shakes his head "no") Not really.
- Evan: I think that I found some castle walls, and I think they should have some already built kingdoms and stuff.
- Nancy: *(muttering under Evan's comment)* Girls are better than boys.
- Cathy: They need a princess.
- Researcher: They need a princess?
- Nancy: If there's going to be a castle, there's gotta be a princess…or a dragon.
- *(Chatter about characters)*
- Researcher: Do you guys remember how many girl characters there were?
- Cathy: Three. *(She had not been on the computer but had been looking over Evan's shoulder while he created his game.)*
- *(The group continues to discuss the girl character choices.)*
- Evan: There's either a glitch in my computer or a glitch in the game like where you place certain stuff down and you can't delete it up again. You have to start all over again.
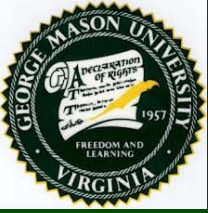
Overt Examinations of Gender
Game Characters

- Cathy: We need more girl characters!
- Nancy: And make them better looking than the boys.
- *(Another researcher asks them to be specific about the girl characters they want.)*
- Cathy: A cowgirl.
- *(Carson brings up matching scenery with character possibilities.)*
- Evan: I didn't have a problem with the characters….the girl characters look a little bit more bright than the boy characters.
- *(Game rep. says this is true, asks if they want them all the same style or with variety.)*
- Nancy: I like variety.
- Evan: Some of the characters' faces look kind of slanted. I don't know if that's a glitch or…just how they look?
- *(Game rep. describes this as "stylized" characters.)*
- *(Carson raises hand and asks about adding old people to his game.)*

Overt Examinations of Gender Gender Identity

- Cathy: He [teacher] doesn't care about his students. He kicked Phoebe out.
- Carson: That's because Phoebe is…[inaudible] *sounds like maybe he said annoying*.
- Evan: Pheobe is a jerk.
- Nancy: She's annoying, not a jerk, annoying.
- Evan: She has to question every little thing.
- Carson: Is she transgender? I thought she was transgender.
- *(Student responses are hard to differentiate between students, but range from "What the hell?!" to "Why would you think that?!" and "What in the world?!")*
- Cathy: *(sarcastically)* …and I thought you were Chinese *(she trails off, can't hear the rest)*
- Carson: She looks like a guy that talks more like a girl.
- Cathy: Because she has most of her Dad's genes *(quietly)*.
- Carson: So her dad made her look like a guy?
- Cathy: Yeah!

Enacting Gender

    There were subtle ways in which students "did gender" throughout the course of the study. Even though students were reluctant to articulate any of these enactments in discussions around the game characters, they did challenge gender stereotypes in their own ways of being.

- o Maureen
- o Melanie

Conclusions

    Findings suggest that creating an inclusive environment in STEM is more complicated than merely recruiting females into the field. There are a host of messages, images, experiences, and barriers with which women (and men) must contend in order for the field to truly change.

    We contend that critical literacy is a vital part of all educational experiences, but especially STEM projects. Creating a critical literacy milieu (Stribling, 2014) could encourage students to disrupt the commonplace, consider multiple perspectives, focus on the sociopolitical, and, most importantly, take action in ways that promote a more inclusive environment in STEM fields.