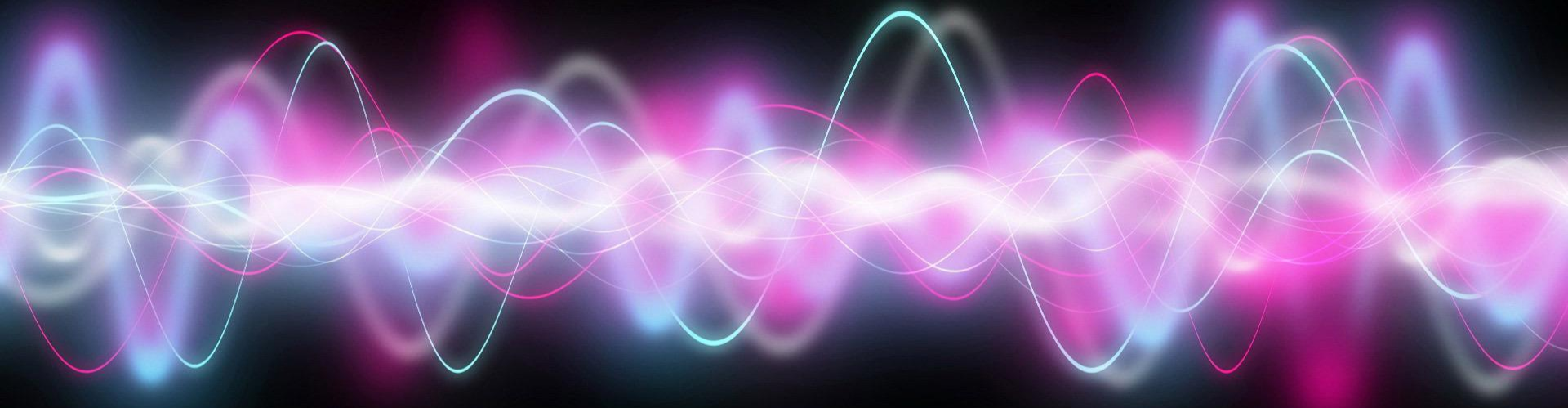
METATUNING



Game Design-based Learning for a Generative STEM Education

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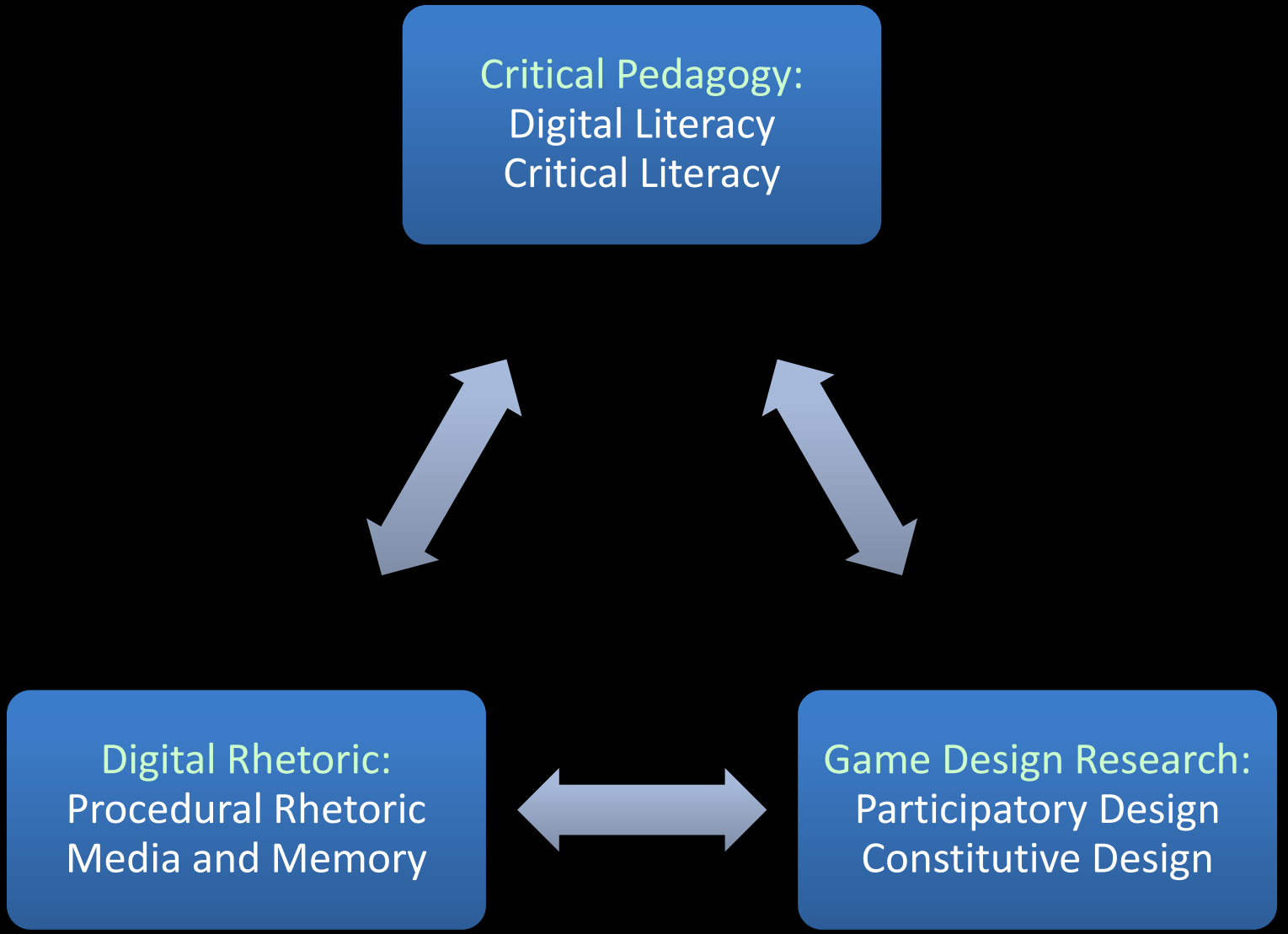
Today's Goals

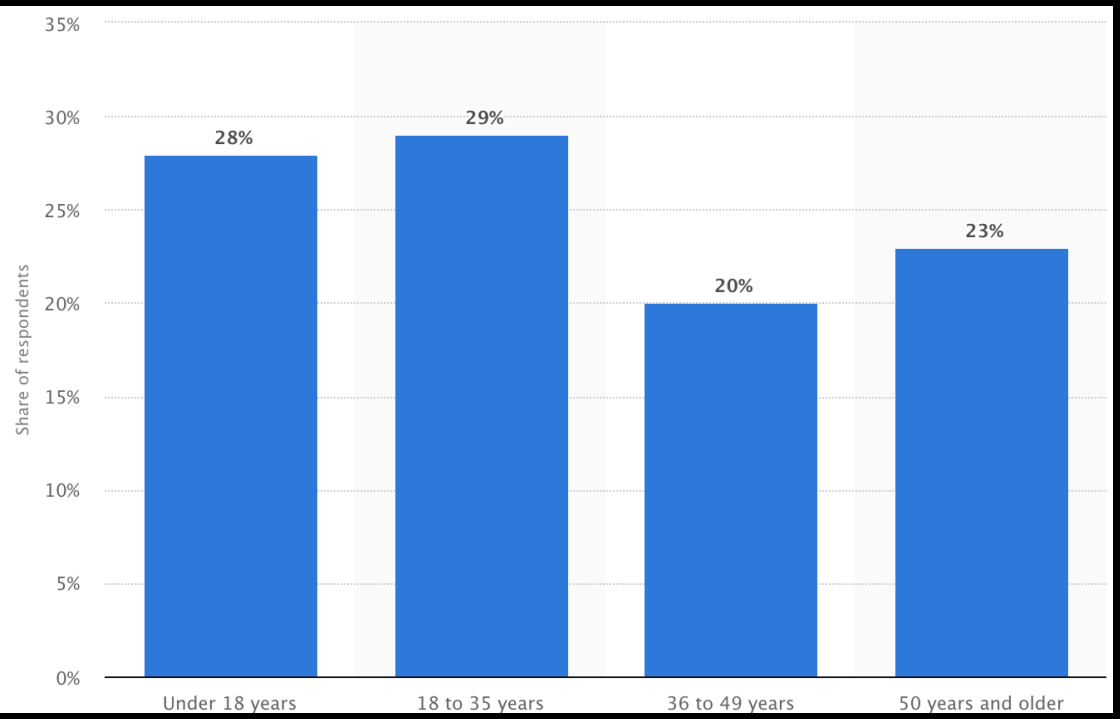
Metatuning aims to create and mobilize discovery learning through game design activities that educate students through STEM concepts in a generative manner, where the knowledge-construction activities are valuable to the students and their social spaces.

- Why Metatuning?
- Metatuning as Framework
- Tes' Case Study
- Q and A

Reimagining Game-based Learning



DEEP!



(Statistica 2016)

DEEPER!

African American youth between the ages of 8 and 18 play games 30 minutes more per day than white youth, while Hispanics play an average of 10 minutes more (Kaiser Foundation 2010)

TABLE 27: Time Spent Playing Video Games, 8- to 18-Year-Olds

Among 8- to 18-year-olds, average amount of time spent playing video games on each platform in a typical day

	White	Black	Hispanic	Asian
Console player	:32[a]	:32[a]	:45[b]	:38[ab]
Cell phone	:09[a]	:29[b]	:24[b]	:28[ab]
Handheld player	:15[a]	:24[b]	:27[b]	:32[b]
Total video games	:56[a]	1:25[b]	1:35[b]	1:37[ab]

(Center on Media and Human Development School of Communication Northwestern University 2011)

- 34 years old
- 85% white
- 74% Male
- 83% Heterosexual
- 70% No Children
- 69% Degree

3% African American

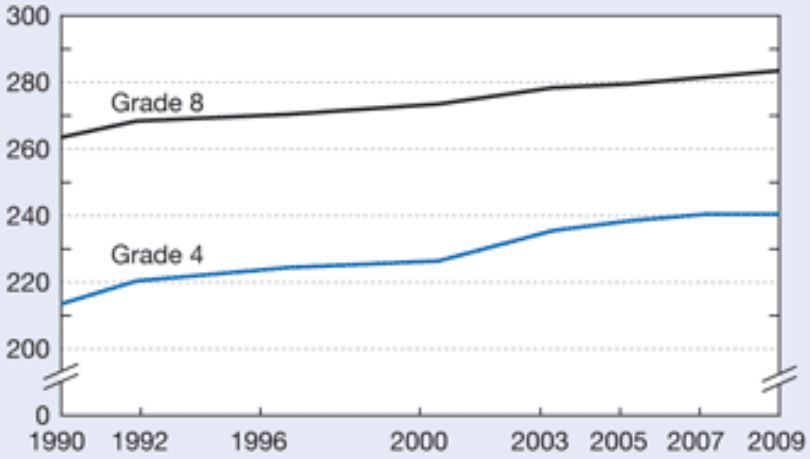
Is Diversity in Game Dev Important?


YES!

…and YES!

More incongruities

Figure 1-1
Average NAEP mathematics scores of students in grades 4 and 8: Selected years, 1990–2009



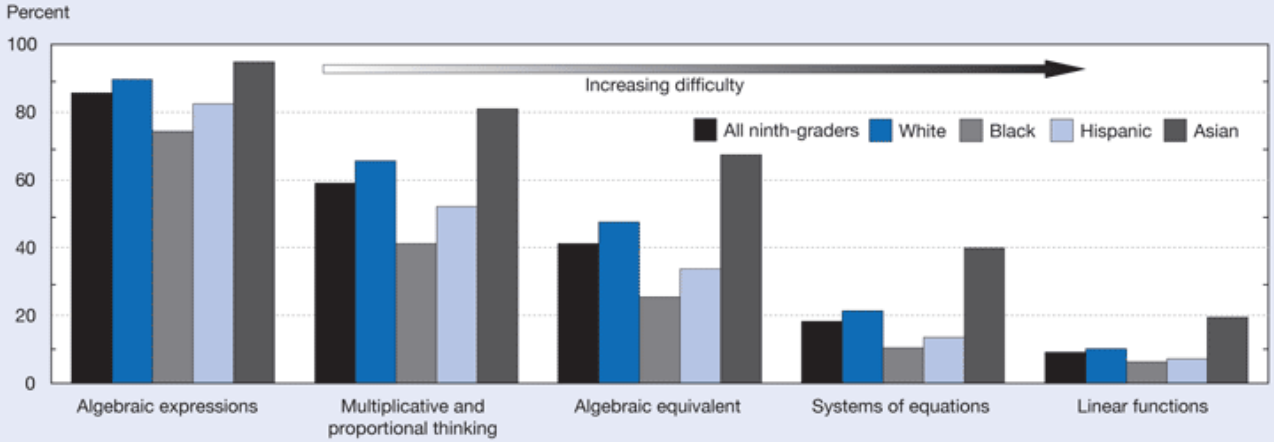
NAEP = National Assessment of Educational Progress

NOTES: NAEP mathematics assessment scores range from 0 to 500 for
1996 on, data shown are for students allowed to
lations.

ience Foundation, National Center for Science and
special tabulations (2010) of NAEP 1990, 1992,
5, 2007, and 2009 mathematics assessments,
ucation Statistics. See appendix table 1-1.

Science and Engineering Indicators 2012

Figure 1-3
Ninth-graders proficient in various algebra skill areas, by race/ethnicity: 2009



NOTES: Skill areas are arranged in a hierarchy such that proficiency in a given area assumes proficiency in all lower areas. "All ninth-graders" bars also include students in other racial/ethnic categories that are not shown separately.

SOURCE: Ingels SJ, Dalton B, Holder TE, Lauff E, Burns, LJ, *High School Longitudinal Study of 2009 (HSLS:09): A First Look at Fall 2009 Ninth-Graders*, NCES 2011-327 (2011). See appendix table 1-5.

Science and Engineering Indicators 2012

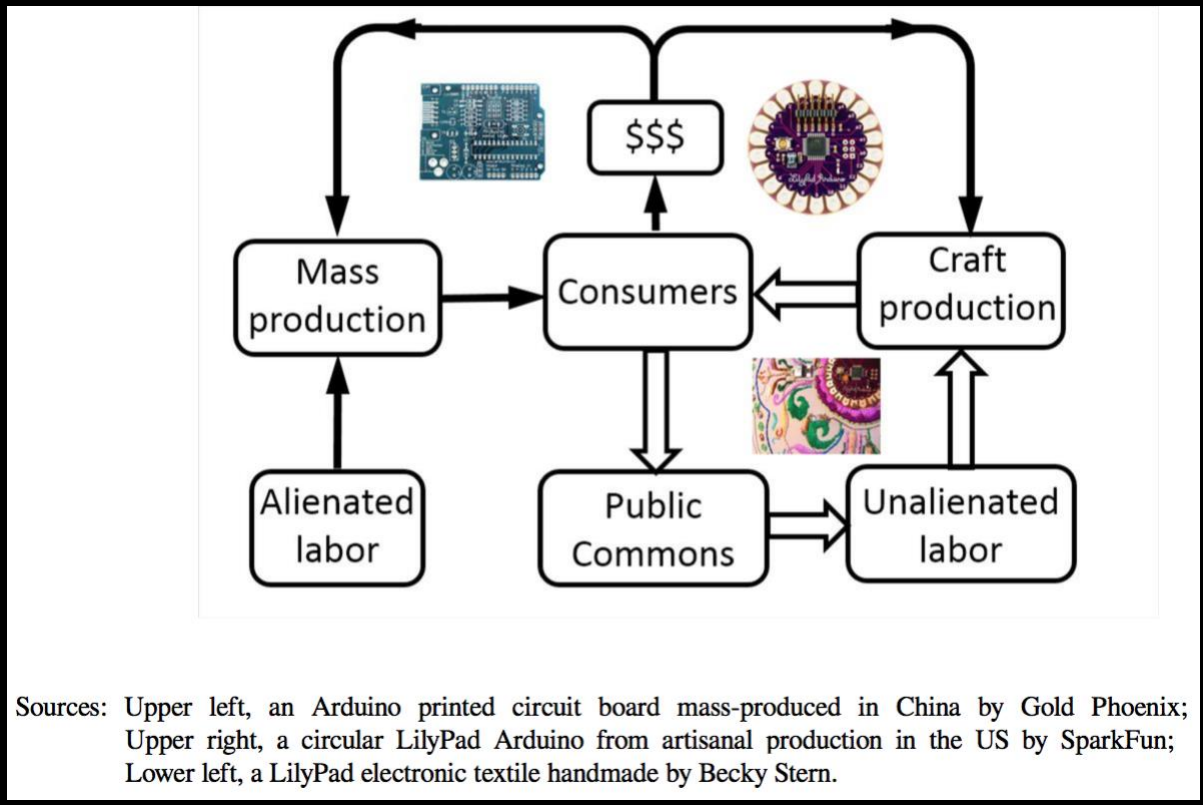
(NSF, 2012)

Longterm Inquiry

1. How can we get the games industry (driven by profit) and the needs of low-income and underrepresented youth (driven by principles of social equities) to thrive together?
2. How can we develop a *generative justice* framework to facilitate this hopeful synergism?

Generative Justice

- The universal right to generate unalienated value and directly participate in its benefits
- the rights of value generators to create their own conditions of production
- and the rights of communities of value generation to nurture self-sustaining paths for its circulation. (Eglash 2016)



Sources: Upper left, an Arduino printed circuit board mass-produced in China by Gold Phoenix; Upper right, a circular LilyPad Arduino from artisanal production in the US by SparkFun; Lower left, a LilyPad electronic textile handmade by Becky Stern.

From Tuning to *Meta-tuning*

TUNING

METATUNING

Intertwining of the Social, Material, Conceptual

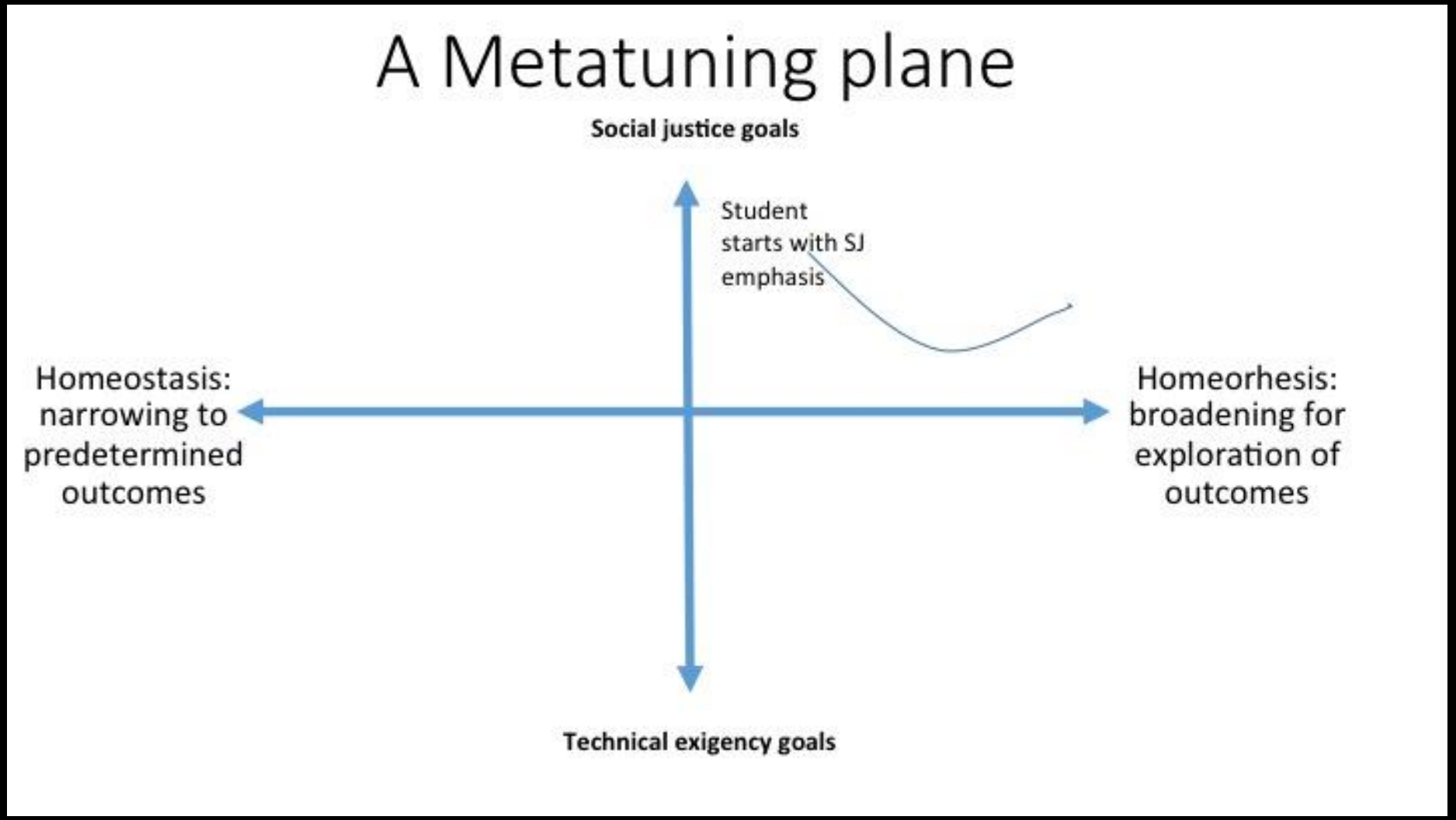
The Mangle of Practice is a “goal-oriented and goal-revising dialectic of resistance and accommodation [hence trial-and-error,] where the overall practice encompasses the dialectic.” (Andrew Pickering, 1995)

Artist Charis Tsevis

Game Design-Based Learning

- Iteration
- Systems based Thinking
- Collaboration
  Intercultural Thinking

Finding the Sweet Spot: Underrepresented Youth As Game Designers!



My Goal…

Create a generative game-based Ed for complex-dynamic (perceived as homogenous but heterogeneous) underrepresented groups where…

- Social and cultural value circulated
- Transformative knowledge

Uniquely Metatuned Sites

Seeing and Coding the World:

- Subjects: 5 Females/1 Male
- Location: RPI
- Technology: Academic
- Goals: Dr. Betty Shabazz

TABLE 1

QUESTION #16 "GAME DESIGN CAN TEACH ABOUT HOW SYSTEMS WORK"

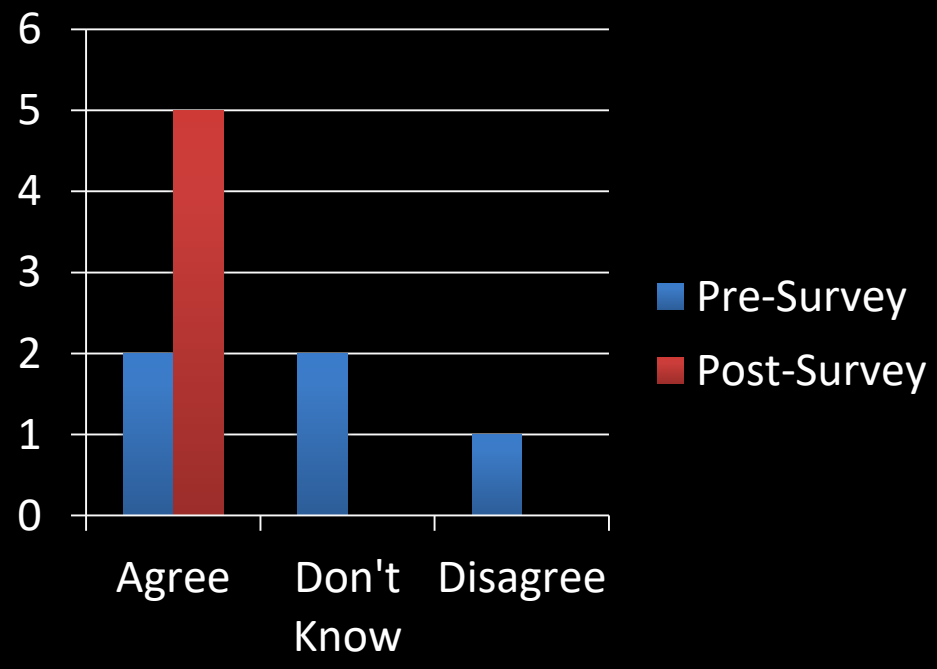
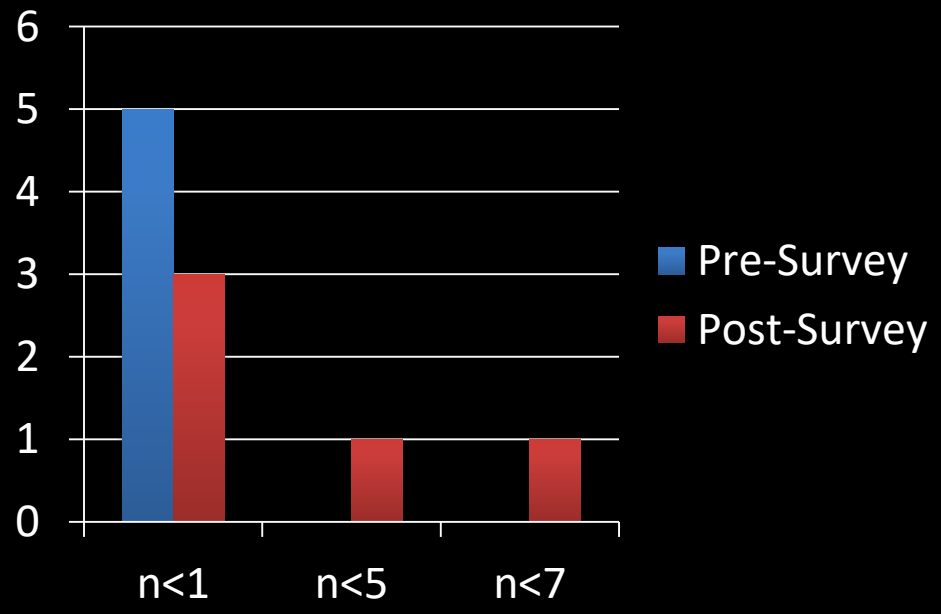
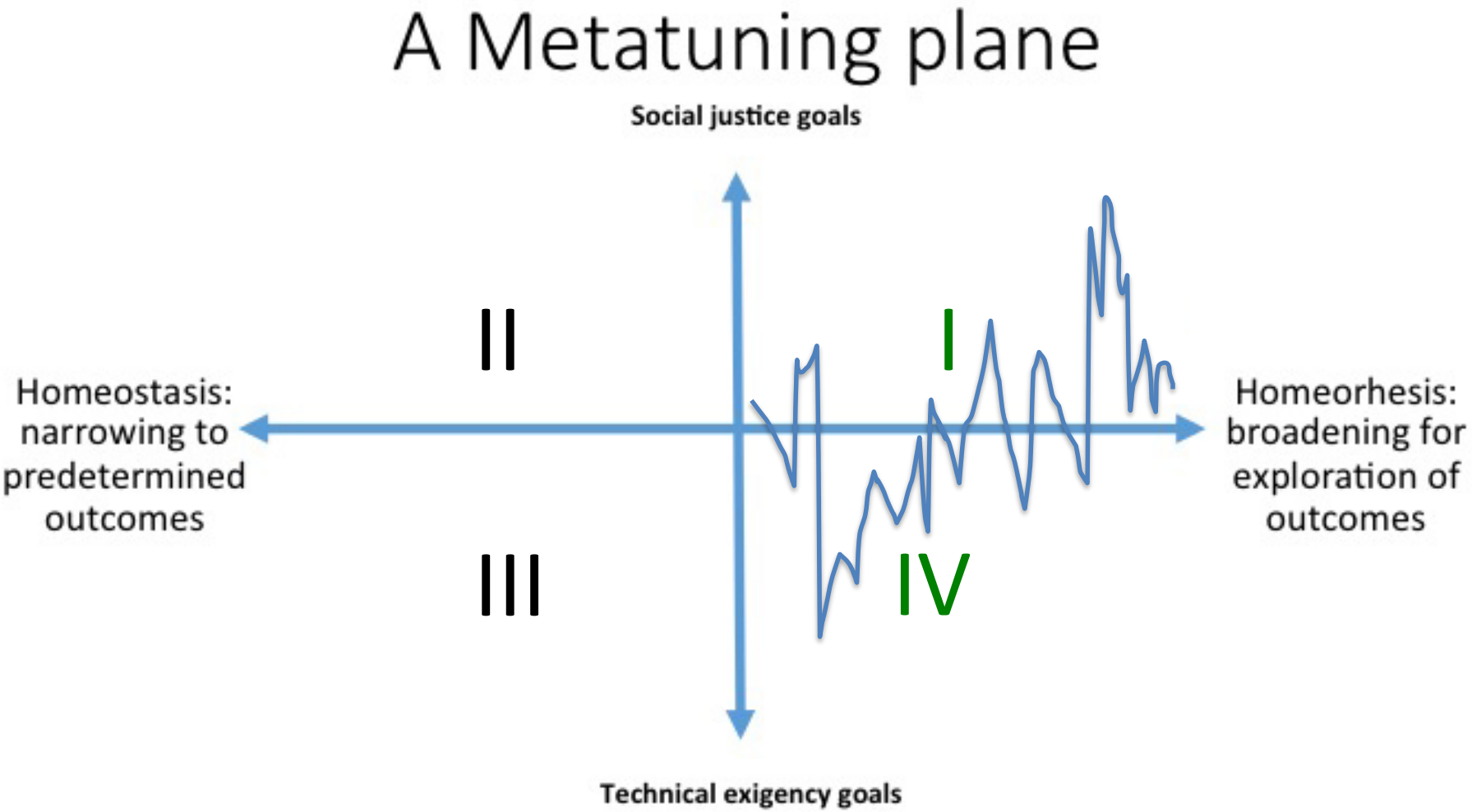


TABLE 2

SYSTEMS BASED THINKING DEFINITIONAL QUESTIONS FROM



Tes’



(Cooke, 2016)

Game Overview Sheet:

(Create this in .doc format PLEASE)

"Asteroid Miner"

Promo Blurb:

Game Philosophy

The WHY FACTOR: Why create this game? Why would someone want to play it? Who is your audience? Someone would want to play this game to know how ~~to~~ to take care of ~~people~~ children.

This game teaches:

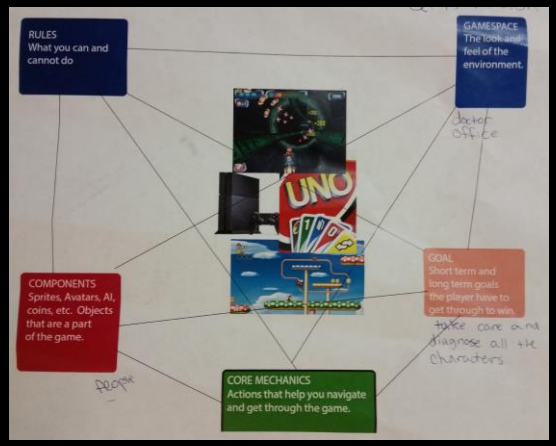
How to care and have sympathy for others.

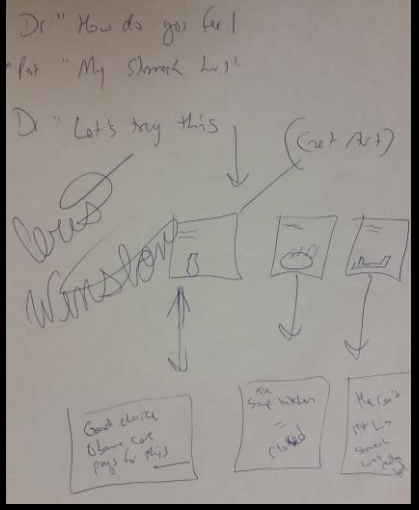
This game will impact

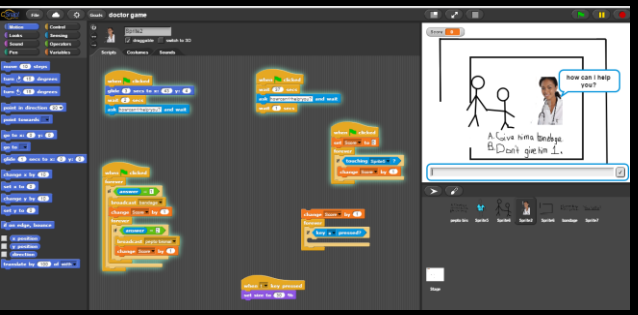
people

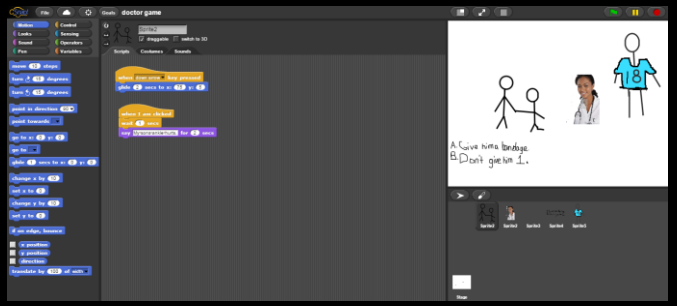
My target audience

Children





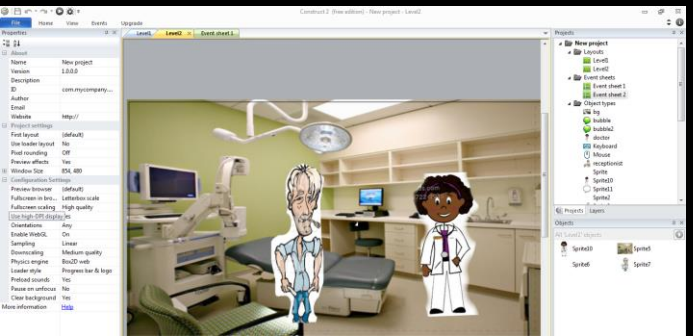


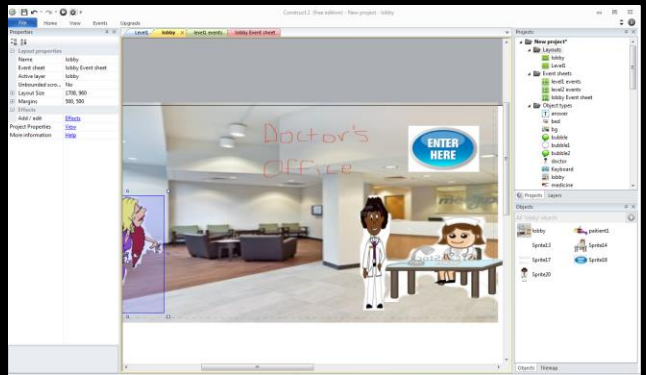


lobby story
receptionist in lobby
poor person first

poor person
black person
spanish person
rich person

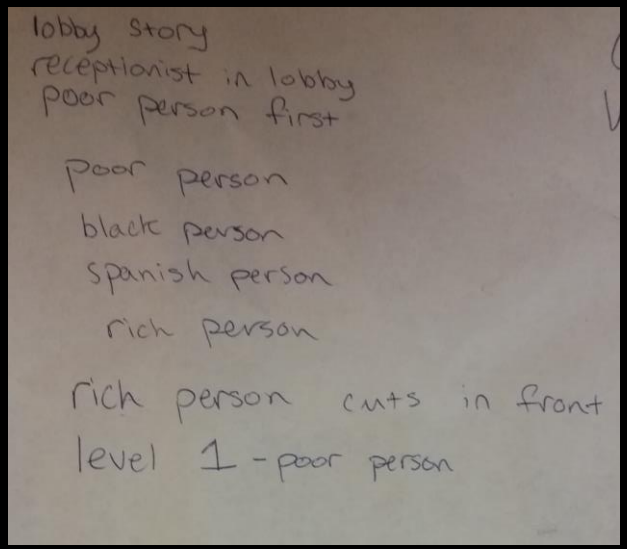
rich person cuts in front
level 1 - poor person

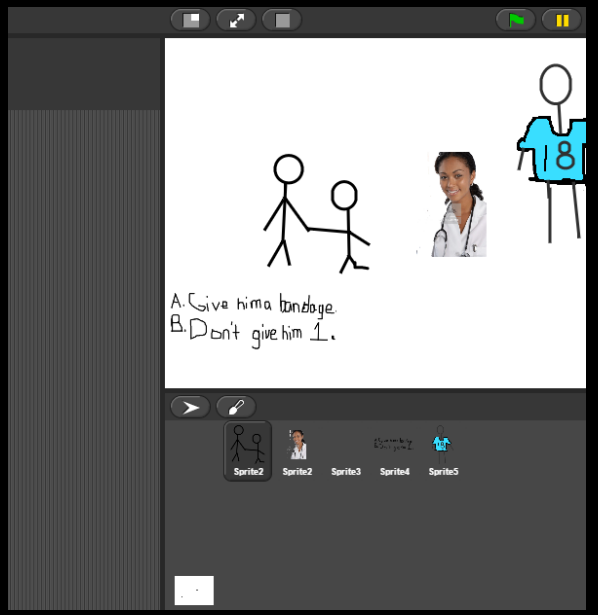


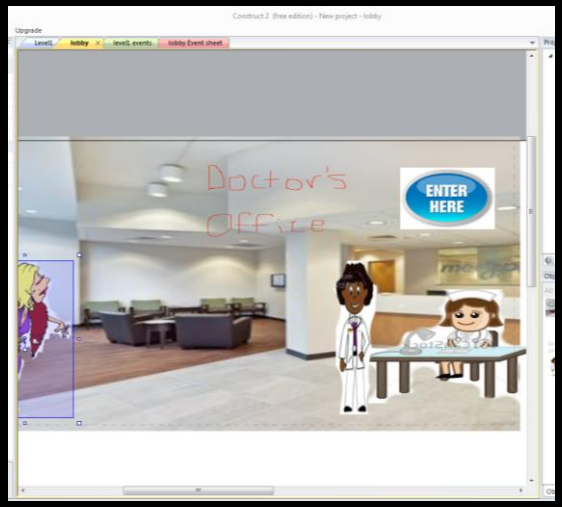


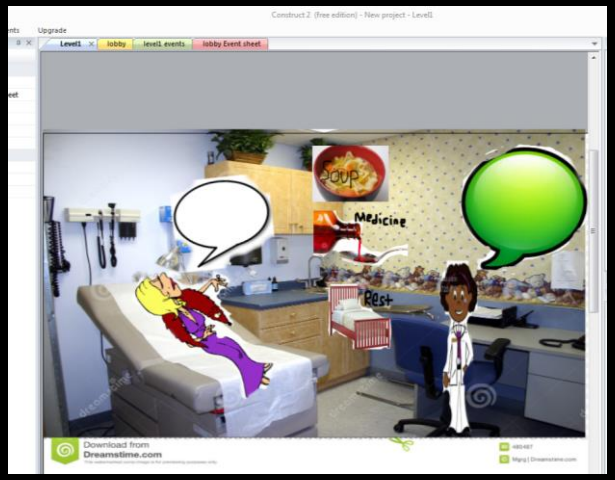
Metatuning Quadrant I: Social Values and *Identity*

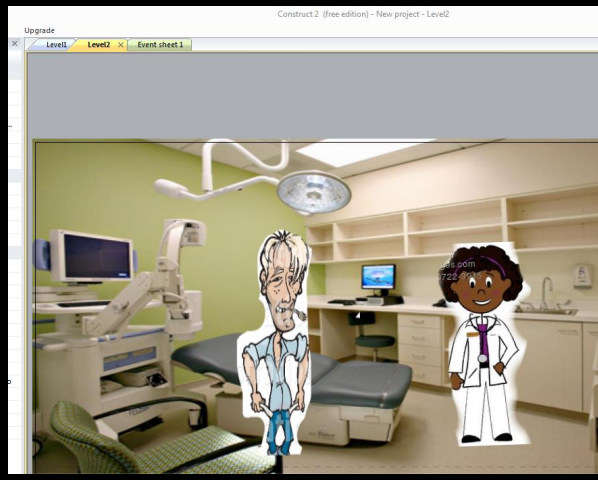
Metatuning Quadrant I and IV: Level Design & Social Justice



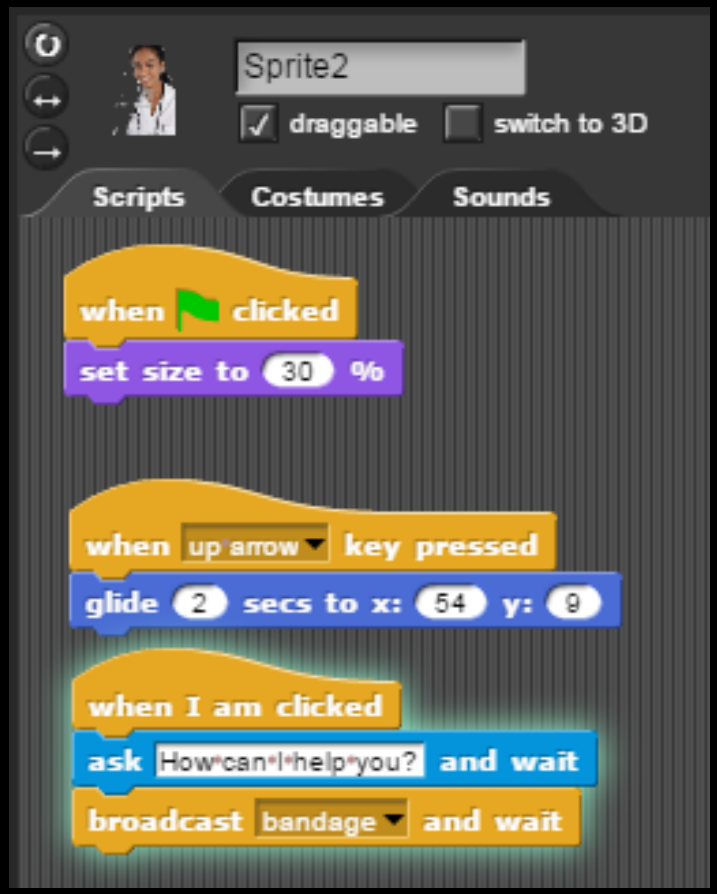




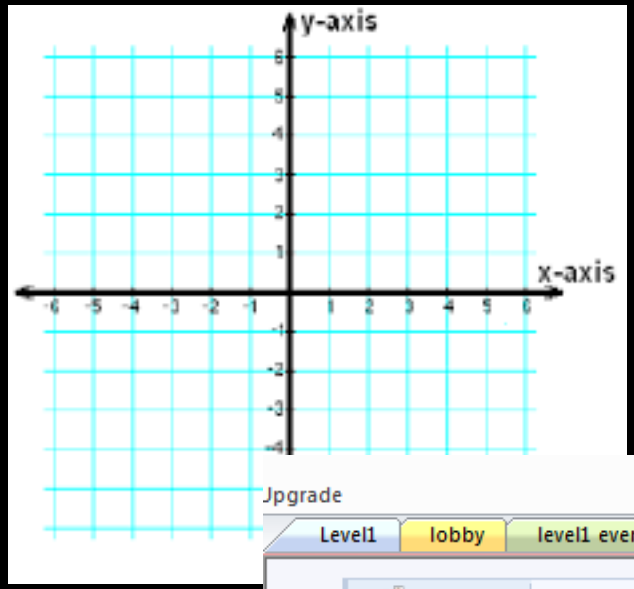


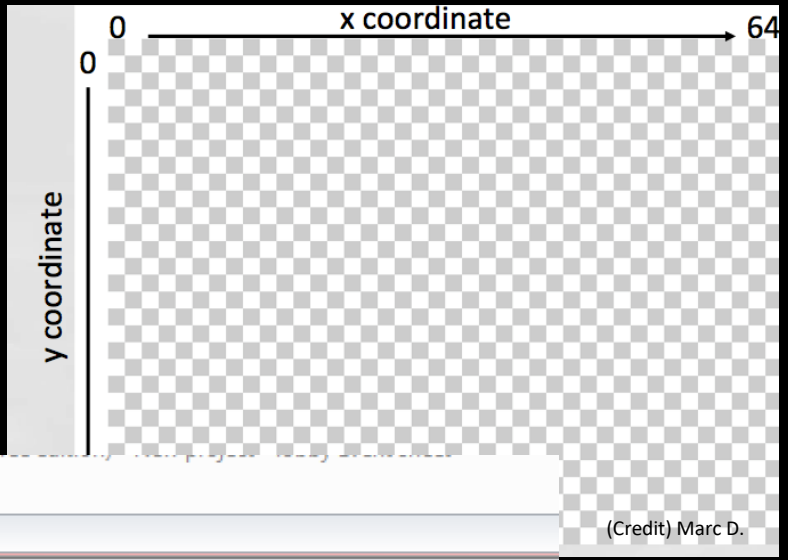


Metatuning Quadrant IV: Procedural Literacy



Metatuning Quadrant IV: Procedural Literacy (Animation)





(Credit) Marc D.

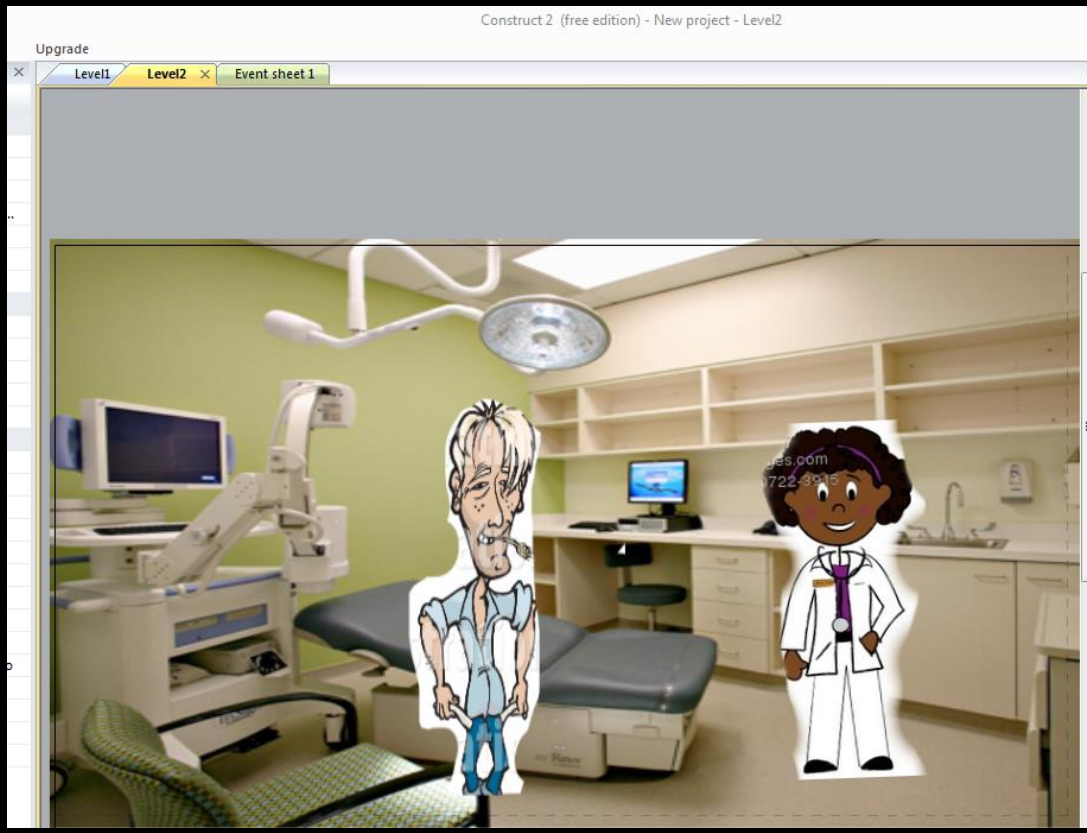
Upgrade

Level1 | lobby | level1 events | lobby Event sheet

1	Sprite14	Is visible	Text	Set text to *"How are you?"*
				Add action
2	System	On start of layout	paitient1	Set Bullet speed to *100*
			paitient1	Set Bullet angle of motion to *0* degrees
				Add action
3	paitient1	X > 470	paitient1	Set Bullet speed to *0*
				Add action
4	paitient1	X < 470	paitient1	Set Bullet speed to *100*
				Add action
5	paitient1	X > 470	Text	Set text to *"Can I see a doctor?"*
				Add action
6	Mouse	On **Left** button **Clicked** on **Sprite18**	System	Go to **Level1**
				Add action

Main Implications of Metatuning

Tes' personal (aspirations) and social (empathy) values–hence, the "sweet spots" of discovery learning—adaptively moved through iterative design processes, yielding a social-justice themed game about the injustices of health care. Metatuning Tes' tuning processes (documentation writing, game deconstruction activities, researching, debugging).



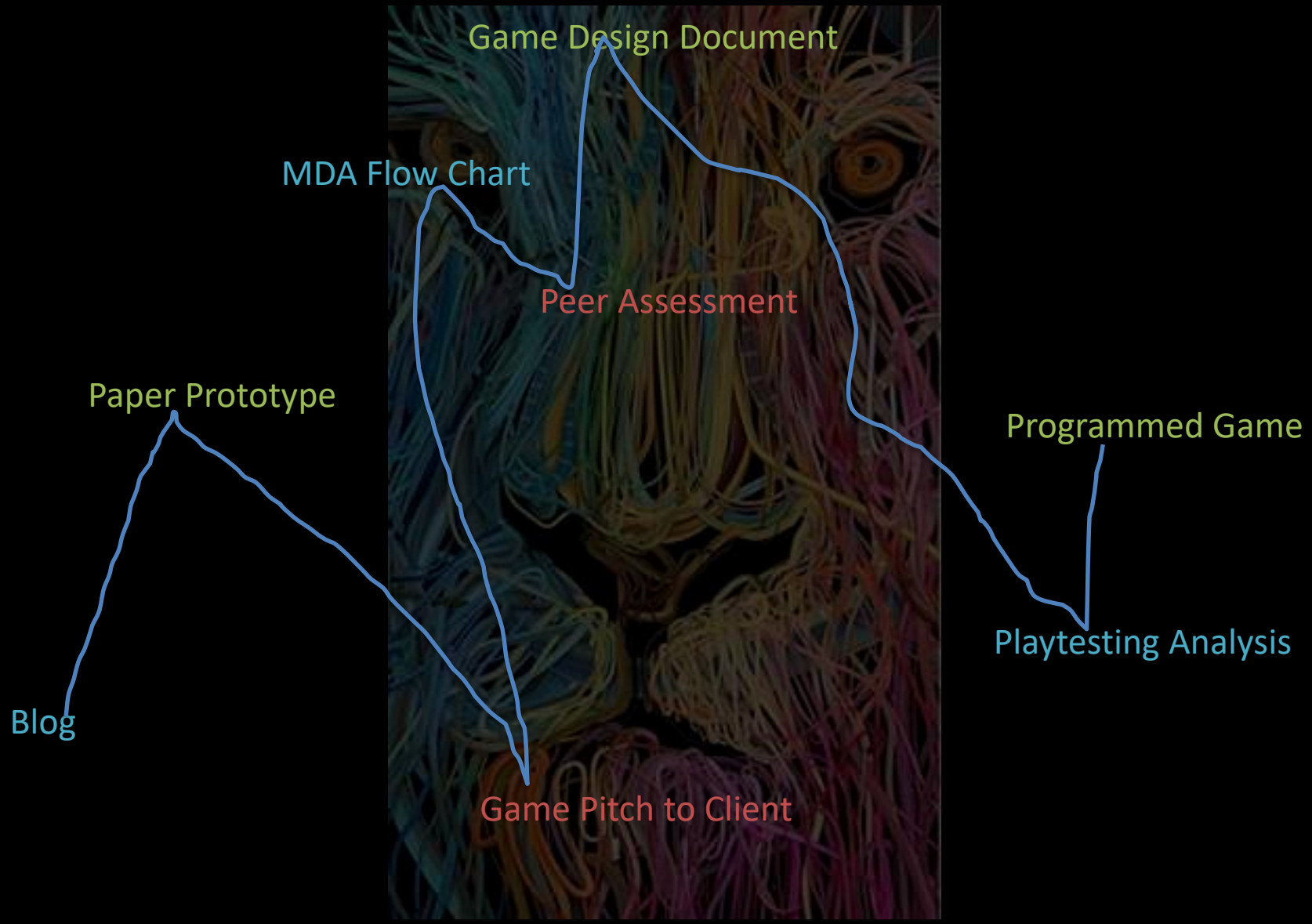
Metatuning Social Justice Through (Cultural) Systems Based Thinking:

Tes: Justice, ummm…equality, that's about it.
ME: Yea, that's good. So tell me how social values or issues inspire your game design for your game?
Tes: Well…I… uhh… put what I wanted to do when I grow up into a game…cuz I wanna be a Dr.
ME: Right…what were some values you put into your game when we switched to your Construct 2?
Tes: Equality.
ME: Alright. OK. And was it difficult to translate values like "equality" into your game?
Tes: Umm no like when you thought about it a little, then it becomes easier?
ME: And did it in a good way or bad way help change your creative direction in how you wanted to create your game?
Tes: In a good way.
ME: OK. How so?
LN 24 Tes: Hmmmm. It made me think about like the real world…about like… ummm, how people really react in society.

Thank You

Questions and Answers?

Metatuning Game Design *Writing* Genres



Future Research of Transdisciplinary Research and Pedagogy