Developing A Project Based Learning Progression in A Serious Educational Game Design and Development Project

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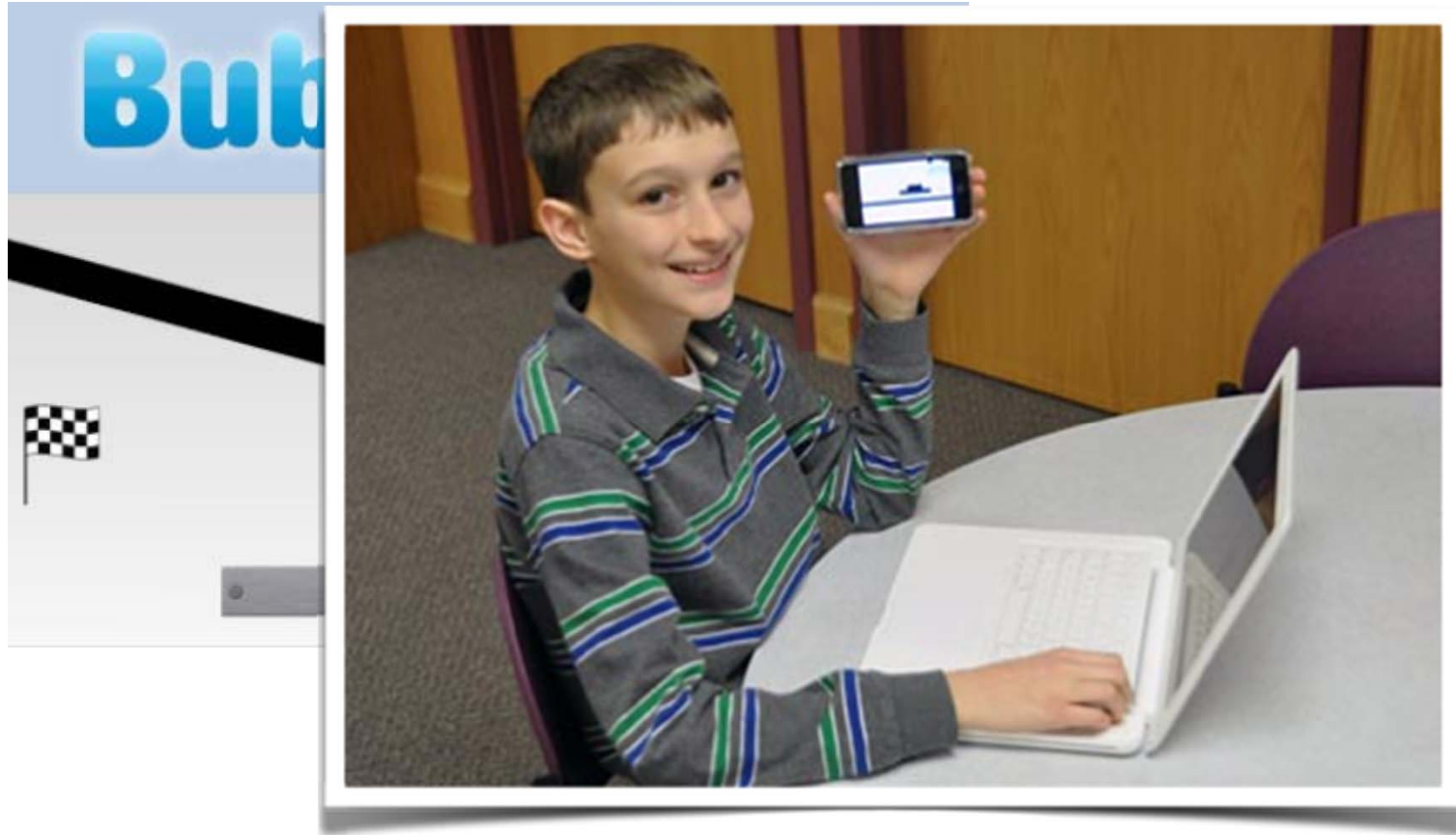GEORGE MASON UNIVERSITY

Think. Learn. **Succeed.**

NSF

A NEW ERA IN EDUCATION
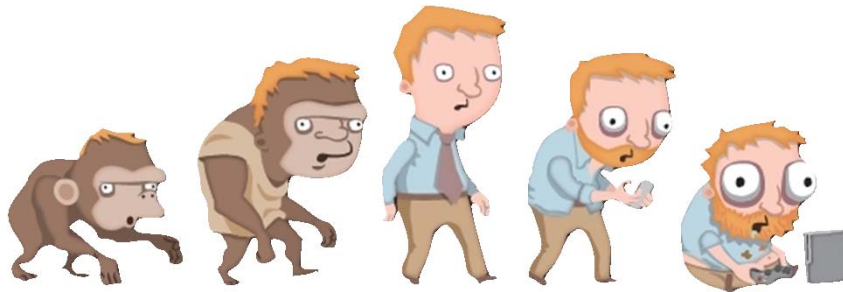
- $15.4 Billion on Sales in 2015

- 155 Million Americans play video games

- Estimate suggest ~3.38 billion hours are spent engaged in video games per year

Today's Games

Educational Gamers

- Crave creativity

- Crave assessment and feedback

- Learn through failure

- Take on different perspectives

- Are reflective
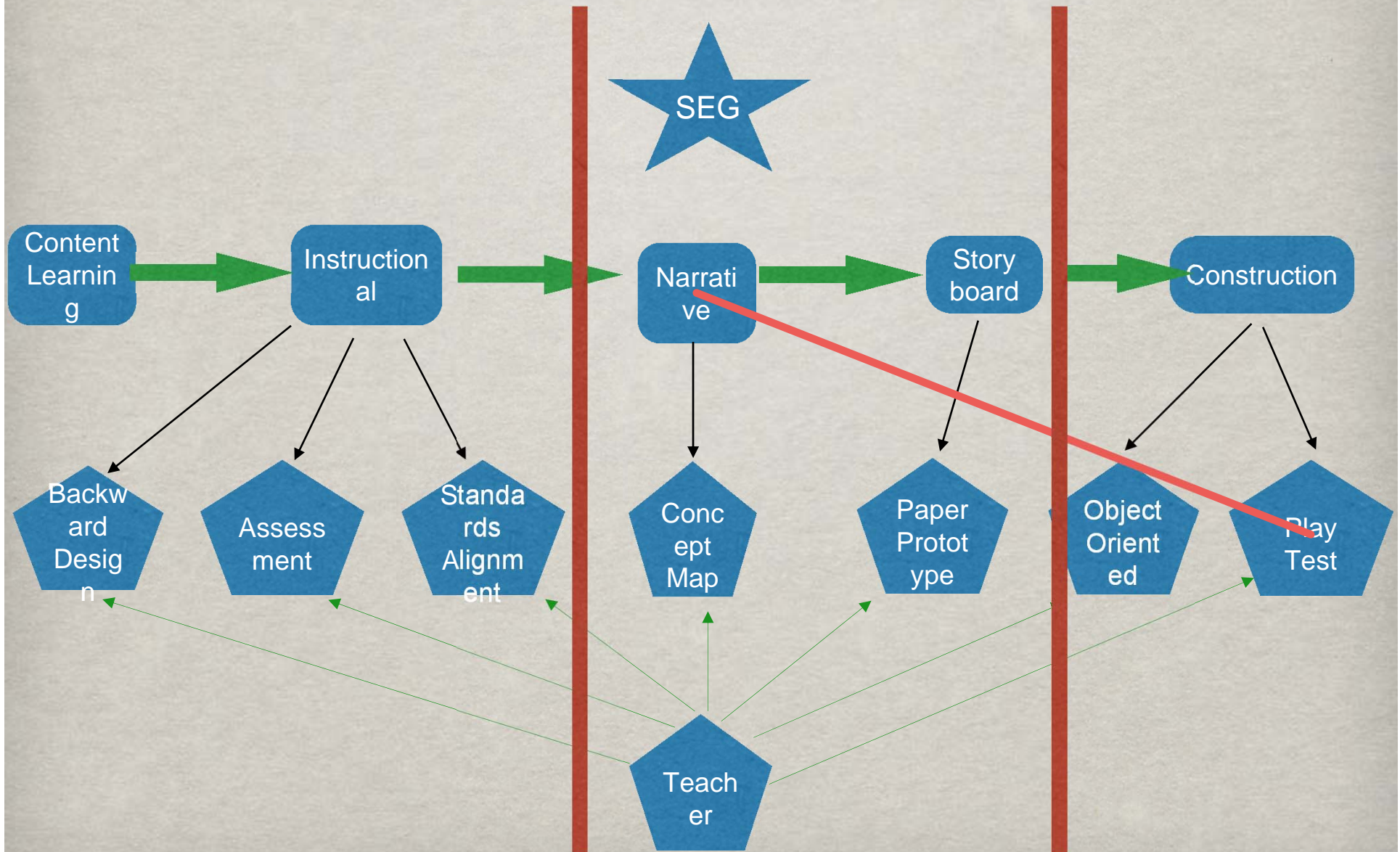
Our Research Focus

- Blur the lines between learning & Entertainment

- Learn by doing

- Student as teacher

- Learn through failure

- Take different perspectives

- Cross-disciplinary

STEM UP

- Follow up to HI FIVES & GRADUATE

- Student designers

- HID middle school

- Extension classes

- Building theory on Self-Regulation

SEG Design Mechanics

Methods

- 15 middle school HID students in STEM UP (NSF REAL)

- 1-on-1 interview w/each student

- LP about renewable energy

- Audio & Videotaped during planning and SEG creation

Initial Interviews

Themes	Example statements about renewable energy	Frequency
Good for Earth	Umm, it's probably good for the earth (1).	1
Renewable	That it could be reused over and over again (2).	5
	It won't go away or disappear (2).	1
	Ah… you could use it for a little bit, but if you use too much it will run out (6).	3
Examples of Renewable Energy Sources	I think umm, windmills (1).	2
	Solar power, wind power (7).	5
	Even water power (7).	2
Examples of Energy Sources	Trees (6).	1
	Ah, gas (6).	3
	Umm… electricity... (8).	2
	Like a battery charger takes the energy out of the old battery, stores that energy, renews that energy, and then puts different energy back into that battery while other ones getting renewed (10).	1

Game Planning

Themes	Example statements about science content in students' game
Solar Energy	What type of energy is stored energy?" So they would have to choose potential, kinetic, solar, or wind (9).
	What is the purpose of wind energy? and then my choices are: For energy to power… electronics, power solar panels, help trees grow. Those are my choices. These are the hints like… the electric companies make this (10).
Wind Energy	How many blades are on a wind turbine? Ah… the answer is 3. Cause there's 3 blades on a…(10)
	How is wind energy better than electricity? A: cost size, B: will never run out. And C: both A and B. Actually… it costs more for wind energy than it does for electricity so the correct answer would be B. It never runs out cause the wind caused it and you can't change the wind (10).
No change (sustained learning)	Well, I kind of knew most about the science in here but it was kind of review for me. Like I knew it, but I forgot about it. (8).
	Yeah and I just remembered from before, so it's a little fresher (14).
	I would say that I learned a little bit more about solar energy then what I had when I first started, but other than that… (4)

More on Planning

Themes	Example statements about science content in students' game
New content (student alludes to having learned something specific)	Actually, I learned that you can use wind turbines, because I didn't know that, that they were called wind turbines. And I also learned a little bit about solar panels, about how they would work I think (9). I learned about wind energy and how it's renewable (3). And why they put windmills (3). It works like that, in a place where there is wind and not many birds (3).
Knowledge application (student alludes to having been able to use content knowledge in the game)	Like I would ask "is turbines used for wind or solar energy?" and then they would have to think of like wind, so then they would just answer, their answer would be wind (9). It gives you like solar energy is renewable and, um, how it doesn't harm the Environment. Because it helped people know that solar energy is better and helped change people's mind about solar energy instead of oil, and stuff like that (2). To, um, help people learn about wind farms (6). Like, how is wind energy good for the environment? It cleans the world, it's dirty for the world, it pollutes the world, or gives off smoke (6). And you have to come over here and if you answer this question like, "what kind of solar power it is?" So I said…I think it was [the answer] passive heating, and if it is you would win the game (12). You, like…the windmills you can only have them in a place with no birds. And you have to have like a lot of wind in order to make electricity… (3)

Conclusions

- Previous projects support learning pre to post SEG design/development

- Original hypothesis was that each step in the SEG model was a step in a learning progression

- Data suggests Content & Instructional are one node/step

- Narrative/Storyboard-Concept Map are a second node/step

- Construction is the final step of the PBLP

A Global Model

In teaching others we teach ourselves.
I cannot teach anybody anything, I can only make them
think

We don't stop playing because we grow old. We grow old
because we stop playing.

Where all think alike no-one thinks much

He who dares to teach must never cease to learn.

It is the supreme art of the teacher to awaken joy in
our reative expression and knowledge

Schools should be a mirror of a future society

Our progress as a nation can be no swifter than our
progress in education. The human mind is our
fundamental resource.

The task of the modern educator is not to cut down
jungles, but to irrigate deserts

Any Questions ?
Free Your mind

Only Children ask the Big Questions because they don't know
enough not to.