How Might Web-Based Educational Games Support Student Success?

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B.C.'s New Curriculum

- Students will still learn the foundation skills in literacy and numeracy
- communication skills, creative and critical thinking, personal and social awareness at the core
- Students will use these competencies to problem solve, discuss issues, and make decisions
- The new curriculum will be fully implemented in the fall of 2016 for grades k-9 and grades 10-12 in fall of 2017

20th Century Teacher

- Taught the three R's
  - Reading Writing and Arithmetic
- Knowledge was key
  - Students listened and learned
  - Textbook supported
  - Written assignments
  - Pencil and paper activities
- Creativity was not the focus
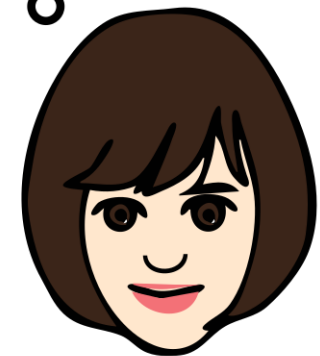
21ˢᵗ Century ~~Teacher~~ Leader

- The three R's are still important but…

- The four C's are now the focus
  - **Creativity**
  - **Critical thinking**
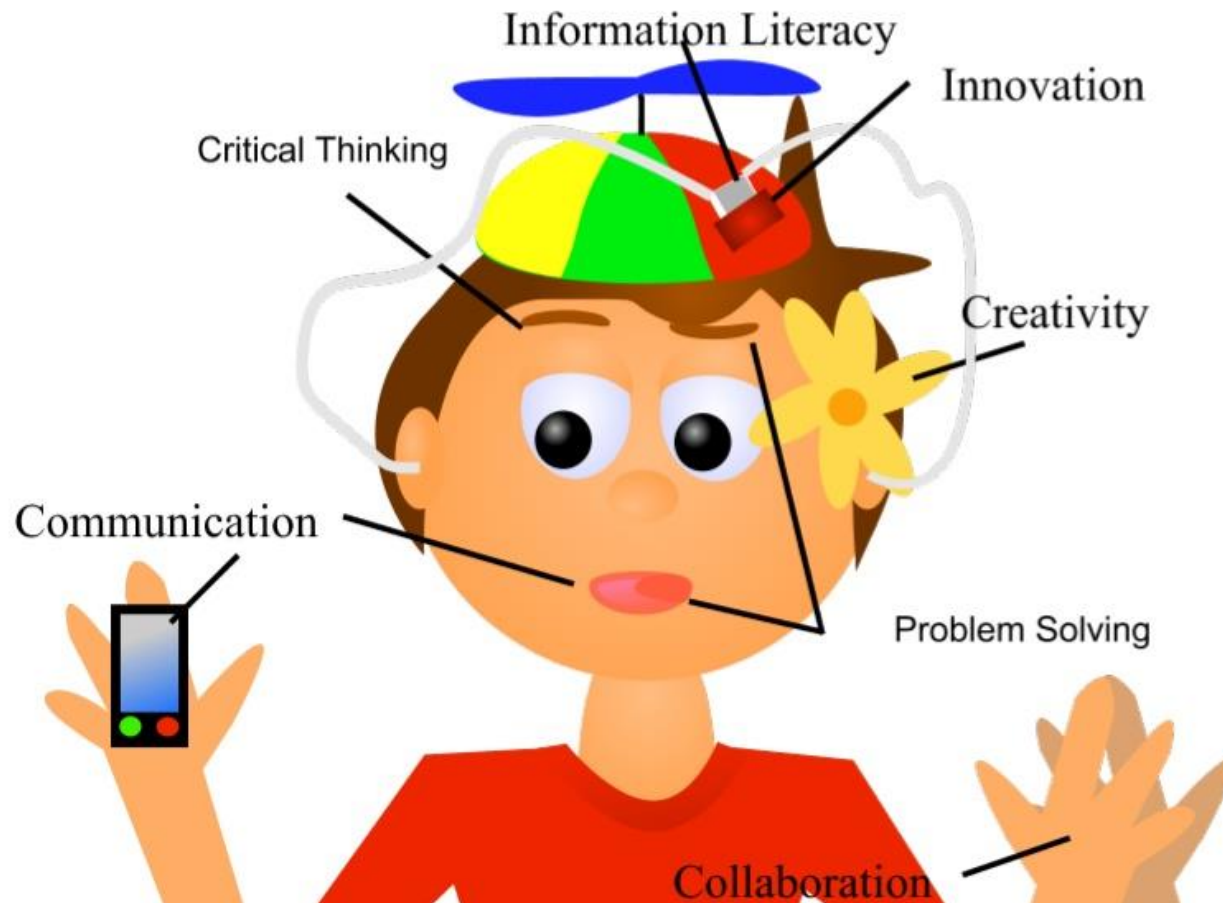 - **Communication**
  - **Collaboration**.
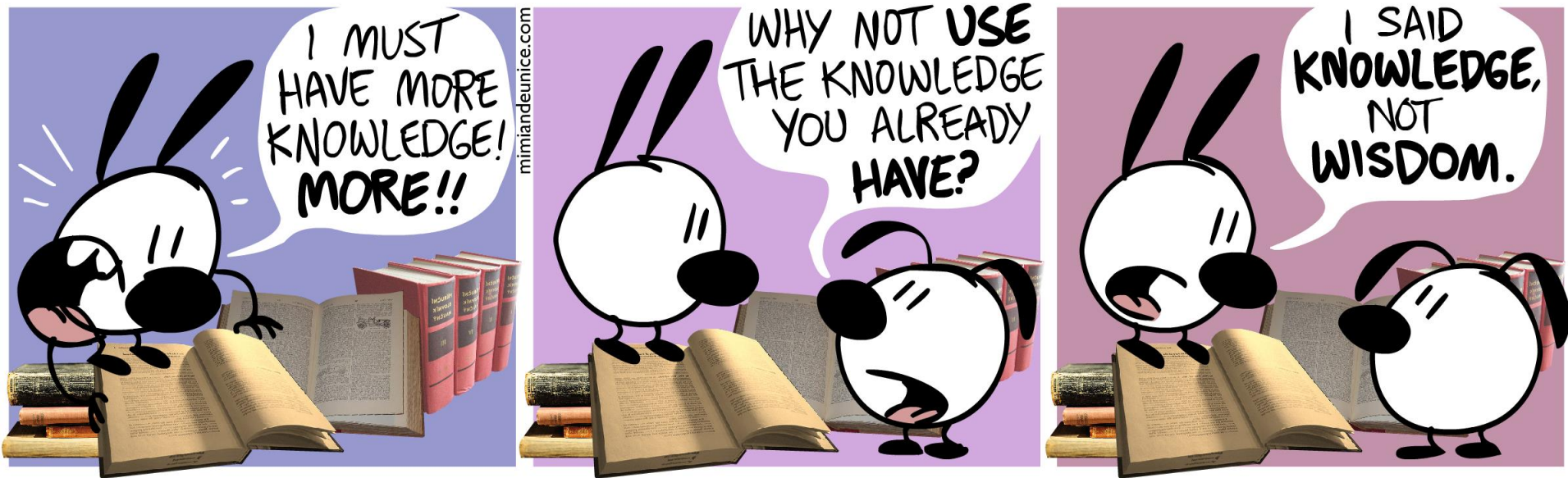
We need to have knowledge and use it too.

21st Century Learning is...
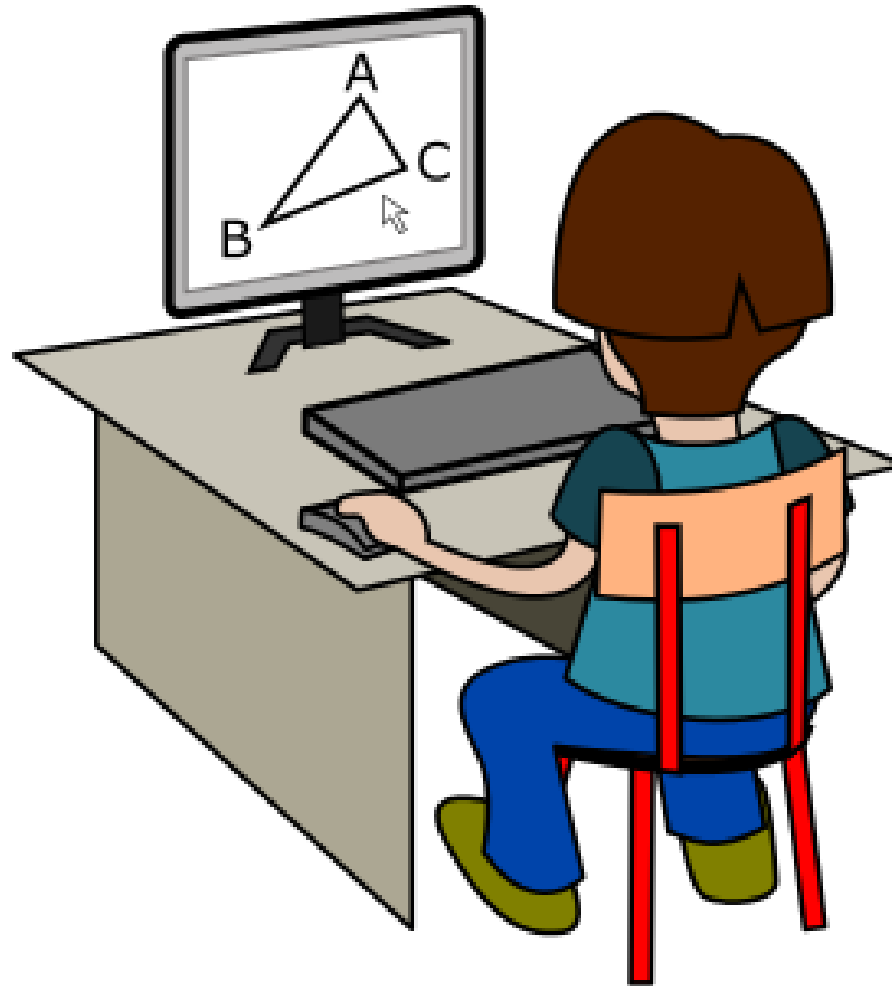A combination of the 3 R's and the 4 C's!

Information Literacy
Innovation
Critical Thinking
Creativity
Communication
Problem Solving
Collaboration

What support materials is available to teach the 3 R's and the 4 C's?

Might Web-Based Educational Games Support Student Success?

Institute of Play

- The 21st century requires learners to use that knowledge to think critically

- Educational games support this type of learning by allowing students to solve complex problems, being creative, use critical thinking skills and interact with others through technology (4C's)

Principals on Gaming: What Video Games Have to Teach Us About Learning and Literacy.

- James Paul Gee's learning principles as applied to video games
- The same learning principles also apply to classroom environments
- Gee outlines 13 principles that make video games effective for learning.

Principals on Gaming Summary

What does the research say?

- Richard Blunt from eLearn Magazine cites three studies using a video game

  - Economic, business, and management students

  - Some with video game some without

  - The results showed significantly higher scores for those who played the video game
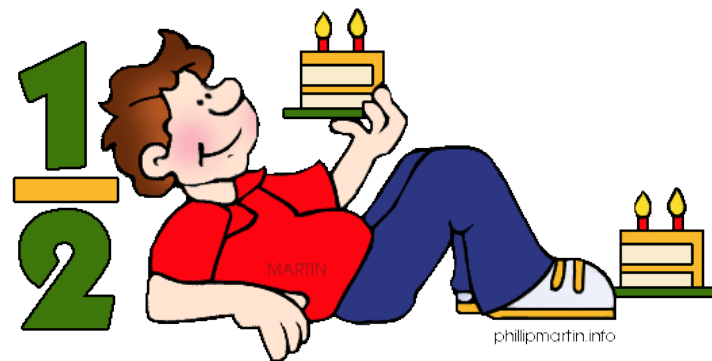
Mathematics Education

- Can rational-numbers based knowledge could be improved using two video games, Semideus and Wuzzit Trouble?
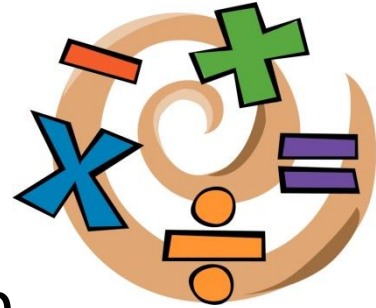
(*International Journal of Serious Games)*

- The study looked beyond simple recall of knowledge, to a broader conceptual understanding of rational numbers.

- The researchers concluded that the two video base games improved conceptual knowledge of rational numbers.

Effects on Basic Mathematical Skill

Educational Research and Reviews

- Study of 44 grade 5 students
  - 22 control group / 22 experimental group
- Groups were given the same instructions
  - Control group traditional classroom assignments
  - Experimental group played math computer games
- Both given pre and post-tests
- Results no significant academic differences

Social Studies: Game-Based Learning

Georgia State University study

- researchers investigated if using game-based learning increased academic achievement and motivation of grade 6 social studies students
- Compared game-base vs traditional learning
- Students were given pre and post-test, and a survey to determine motivational levels.
- The results showed game-based instructions had higher achievement levels.
- The motivation for learning was the same for both study groups.

Science Technology
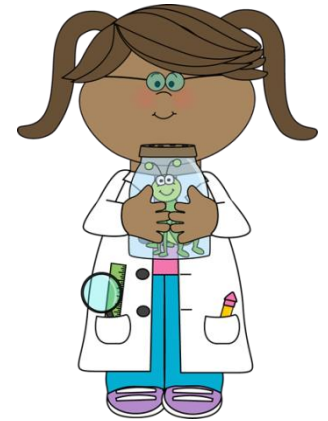
Science Magazine

- This journal reviews the data available for video games in science technology, engineering, and math (STEM) disciplines.

- Their research shows that well-designed digital games increase in learning levels between 7% and 40%.

- The researchers also found that the greatest effect was on poor learners.

- The journal also suggested that games with effective pedagogical practices yield positive learning benefits.

Game effects on 21st Century skills

Journal of Research on Technology in Education

- 21 undergrad students to see if 21st century skills are associated with digital games
- The undergrads used games instead of traditional teachings strategies in their classroom
- Classroom students felt motivated and felt an increase in 21st century skills

Can Educational Games be measured?
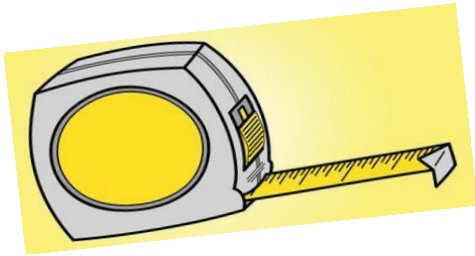
Researchgate publications

- Many variables and contexts by which education can be measured

- A number of variables that influence game choice

- Type of learner, prior knowledge, and what learning goals are tested.

- Their final conclusion was that a general statement on the effectiveness of educational games is virtually impossible.

Review and Meta-Analysis

SRI International

- This meta-analysis reviewed over 60,000 articles and reduced that to 68 studies
  - Not by favorable results, but by meeting standards
  - compare digital games to a non-digital comparison

- Results showed that digital games on average were more effective that non-game instructional conditions.

What do we know?

- The new B.C. curriculum will be fully implemented in the fall of 2016 for grades k-9 and 10-12 in fall of 2017
- The Institute of Play, Gee, and Kolk all demonstrate that creativity, critical thinking, communication, and collaboration (4 C's) are critical in 21st century learning
- Studies show educational games can increase academic achievements and motivation.
- But studies also show no change in academics or motivation
- Making a general statement on the effectiveness of educational games is virtually impossible
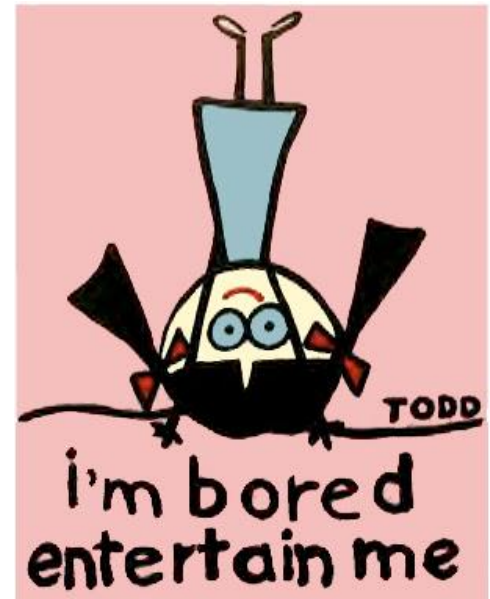
Implications for Teaching

At Best

- Web-based Educational games do a better job
  - teaching 21st century skills (4 C's)
  - teaching basic skills (3 R's)
  - motivating the learner
  - entertaining the learner

  than traditional methods
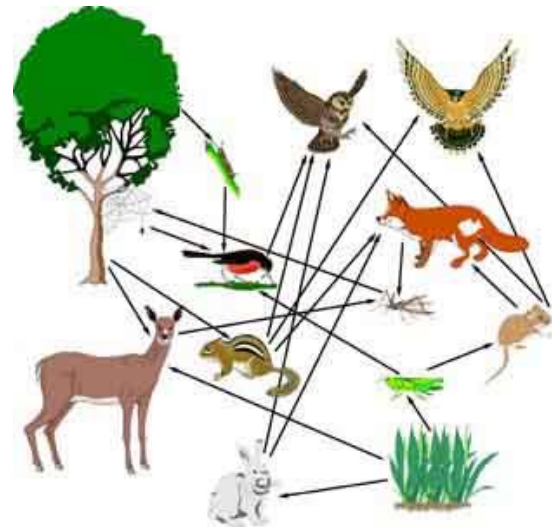
Implications for Teaching

At Worst

i'm bored entertain me

- Web-based Educational games

  do the same job

  and entertain the learner

What can these finding do for you?

Worst case scenario, students do not lose anything

- Students are entertained
  - Less behavioural problems
- Less marking
  - More time to prepare for teaching
- Use a station rotation model
  - Able to work with smaller groups of students
- Some programs track progress
  - Easier to provide feedback to parents

Personal Evaluation

- I agree with research based on personal experience
- Some web-base educational games do an excellent job of teaching skills (3 R's and 4 C's)
- Other games just entertain, but do not add or take away from learning
- Students enjoy playing the games
- Station rotation works (personal experience)
- Use web-based games as one of your tools for teaching
- Less marking, less behavioural problems, and more time to prepare for future lessons

Is it …

The Choice is Yours

References

- Clipart Microsoft Works 2010

- **Blunt, Richard. (2009, December*). Do Serious Games Work? Results from Three Studies. *eLearn Magazine.* Retrieved from http://elearnmag.acm.org/featured.cfm?aid=1661378**
- **British Columbia. Ministry of Education. BC'S New Curriculum: Core Competencies. (2015). Retrieved from https://curriculum.gov.bc.ca/competencies**
- **Clark, D. B., Tanner-Smith, E. E., and Killingsworth (2014). S. *Digital Games, Design, and Learning: A Systematic Review and Meta-Analysis*. Menlo Park, CA: SRI International. Retrieved from https://www.sri.com/sites/default/files/publications/digital-games-design-and-learning-executive_summary.pdf**
- **Gee, James Paul. (Nov. 13, 2013). Principals on Gaming: What Video Games Have to Teach Us About Learning and Literacy. [Video File]. Retrieved from https://www.youtube.com/watch?v=4aQAgAjTozk**
- **Institute of Play. Why Games and Learning? Retrieved from http://www.instituteofplay.org/about/context/why-games-learning/**
- **Kiili, K., Devlin, K., Perttula, T., Tuomi, P., Lindstedt, A. (2015). Using video games to combine learning and assessment in mathematics education. *International Journal of Serious Games, Vol. 2, Nr. 4*. Retrieved from http://profkeithdevlin.com/Papers/Kiili-Devlin_2015.pdf**

- Kolk, M. (2011, March 30). The 21st century classroom – where the 3 R's meet the 4 C's! Tech4Learning. [Web log post]. Retrieved from http://web.tech4learning.com/blog-0/bid/45149/The-21st-century-classroom-where-the-3-R-s-meet-the-4-C-s

- Magnacca, Shannon. (2013). *"Game-Based Learning in the Social Studies Classroom".* Instructional Technology Education Specialist Research Papers. Paper 7. Retrieved from http://digitalcommons.georgiasouthern.edu/edu-papers/7

- Mayo. M. J. (2009). "Video Games: A Route to Large-Scale STEM Education?" Science 323, no. 5910, 72–89. Retrieved from http://science.sciencemag.org/content/323/5910/79.full

- Sardone, N. & Delvin-Scherer, R. (2010). Teacher candidate responses to digital games: 21st century skills development. Journal of Research on Technology in Education, 42(4), 409-425. Retrieved from http://files.eric.ed.gov/fulltext/EJ895055.pdf

- Sayan, H. (2015). The effects of computer games on the achievement of basic

- mathematical skills. *Educational Research and Reviews,* Vol. 10(22), pp. 2846-2853. Retrieved from http://www.academicjournals.org/journal/ERR/article-abstract/D6BB1F456358

- Vandercruysse, S., Vandewaetere, M., & Clarebout, G. (2012). Game based learning: A review on the effectiveness of educational games. Retrieved from https://www.researchgate.net/publication/260360868_Game-Based_Learning_A_Review_on_the_Effectiveness_of_Educational_Games
  DOI: 10.4018/978-1-4666-0149-9.ch032