C3i (Critical, Creative and Collaborative inquiry) for the 21st Century

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“Would you tell me, please, which way I ought to go from here?”
“That depends a good deal on where you want to get to.”
“I don’t much care where —”
“Then it doesn’t matter which way you go.”
Lewis Carroll, Alice in Wonderland

Where do we want to go in education? This matters a great deal and should define what the classroom of the future looks like, feels like, and how it functions.

Our guiding questions:
1. What should be the goals for 21st century learning?
2. How can schools be re-designed to best achieve these goals?
3. What are the pitfalls and possibilities offered by digital technology in our pursuit of these goals?
Is it possible we may invest billions in technology only to replicate the kind of learning and progressive disengagement already creating a crisis in schools?

What should the classroom look like in 10 years?

Dare to dream! Imagine the classroom of the future
Using our **Senses** to help us think about learning in the future

What shape is learning?

What colour is learning?

What does learning sound like?

What does learning taste like?

What does learning smell like?

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**Shifting realities**

<table>
<thead>
<tr>
<th>20th Century</th>
<th>21st Century</th>
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<td>prepared students for the known</td>
<td>need to prepare students for the unknown</td>
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<tr>
<td>focused on technical skills that aligned to the workplace</td>
<td>need to focus on civic engagement, innovation, critical thinking</td>
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<tr>
<td>push-based model focused on compliance and replication</td>
<td>opportunity to move beyond to nurture curiosity and a questioning disposition</td>
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As much as technology offers exciting opportunities for learning it is also a dangerous chimera – enticing, expensive and quickly outdated so that vast amounts of education resources are drained in the never ending challenge to keep up with the latest technology – yet this creates two great dangers:

1) the true benefits of technology are not embraced creating an ever-widening gap between student lives in and outside of school and those who have the means and those who do not
2) schools are seduced by the allure of technology and fail to ground its use in ways that truly support critical, creative and collaborative learning causing greater declines in student engagement as students become overwhelmed by the vast ocean of information they encounter without the intellectual tools needed for them to be curious, discerning and entrepreneurial learners who can filter, select, use, create, re-create and contribute.
Cascading Curriculum Design
(recursive, collaborative, reflective)

Driven by Sustained Inquiry

Throughtbook: supporting innovation through “failing forward”

Learning to think, thinking to learn

Creativity - It's worth the time!
Just as genes are the building blocks of life, memes are the building blocks of ideas. Memes are mind shapers or the ideas which have passed from one generation to the next. Sometimes these powerful ideas are in fact mistakes – such as a belief that the world was flat – these are called “mismemes”.

1. Students must acquire content knowledge before they can engage in critical inquiry;

2. Building students' content knowledge requires the transmission of information from teacher/text/video and is a part of learning that does not involve critical thinking.
How can we teach to best sustain student attention?

How can we connect learning to the pleasure centre of the brain thereby helping students derive intrinsic satisfaction from learning?

Dopamine is the source of intrinsic satisfaction it contributes to pleasure, sustained attention, motivation and perseverance.

Major Dopamine boosters: *Success* at achieving *challenges*

Research suggests students need to experience *success at least 20% of time* to receive a dopamine boost. Attention is sustained as long as the challenge can be revised or changed. Thus, *launching the birds*, or inviting students to predict, speculate, or offer an initial idea/response to a problem is a crucial part of creating the conditions for sustained attention.

Rather than *proof of learning*...

“Assessment tasks”, "Summative Assessments", "Culminating Activities/task" – they all make the task a demonstration of learning and often an event that occurs at the end of the learning to provide evidence of success at achieving the desired outcomes.

make the task the "*driver for learning*"

Rather than being seen as proof that students have successfully learned, the task becomes the invitation for students to learn.

for which the teacher *choreographs the learning experiences*

Enabling students to become competent users of the intellectual tools called upon by the nature of the challenge.
Cascading Curriculum

Over-Arching Inquiry
Can understanding Newton’s laws of motion help us be better drivers?

Over-Arching Challenge
If Newton were your driving instructor... Prepare a set of 4 pieces of clearly and accurately explained advice of safe driving that apply Newton’s laws of motion and include illustrations for each piece of advice.

Focus Inquiry 1: Does gravity play an important role in driving?
- Defn: Develop a safe driving tip that takes gravity into consideration.

Focus Inquiry 2: Does inertia play an important role in driving?
- Defn: Develop a safe driving tip that takes inertia into consideration.

Focus Inquiry 3: Does force play an important role in driving?
- Defn: Develop a safe driving tip that takes force into consideration.

Focus Inquiry 4: Does action and reaction play an important role in driving?
- Defn: Develop a safe driving tip that takes action/reaction into consideration.

Lesson Challenges
- How did the launch of the car down a 10-story ramp help the first Wright flight?
- Explain why the car appears to crest up the hill.

Cascading Curriculum

Over-Arching Inquiry
How can we best use our understanding of animals to help them live healthy lives?

Over-Arching Challenge
Growth and change in Animals. Design a new enclosure for a particular animal to provide a healthy place for baby animals to grow and live in.

Focus Inquiry 1: How can we create a place for an animal to live that meets its physical needs?
- Defn: Create a sketch of the enclosure for your animal.

Focus Inquiry 2: What does your animal need to eat to stay healthy?
- Defn: Prepare a daily feeding guide for the animals to help make sure the animal stays healthy.

Focus Inquiry 3: What are the most important changes an animal goes through as it grows up?
- Defn: Create miniature models of what needs to be in the enclosure.

Focus Inquiry 4: What is important to know about proper care and handling of the animal by humans?
- Defn: Create a set of 4 illustrations with short written explanations that explain how and when the animal should be handled by people.

Lesson Challenges
- What are the most important changes an animal goes through as it grows up?
- What is important for an animal to have to grow up healthy?
- What are the most serious dangers to people when handling your animal?

Anticipatory Set: What are the most important roles for zookeepers? How do they help the animals to stay healthy?
Using Thought Journals to Create Safe Learning Environments

The primary purpose for a Thought Journal is to nurture and support innovation by allowing students to “fail forward” as they test ideas, deepen their understanding, and gather feedback on their ideas/designs.

A Thought Journal is intended to provide students with the opportunity to deepen their understanding of important concepts and ideas by building upon a “launch of the learning”. During the learning launch students respond to a provocative prompt by capturing an initial idea, prediction, conjecture or hypothesis in words, picture, diagrams, numbers or other forms of notation in their Thought Journal. As they inquire into the issue, and new understandings develop, they “fail forward” by constantly trying out new ideas, revising initial thoughts, extending their thinking and refining or re-focusing their response to the challenge. The Thought Journal allows educators to re-frame failure as a necessary part of learning that can act as a source of inspiration and an opportunity for further learning rather than something to be feared.
Spielberg Storyboards from Poltergeist

J.K. Rowling Early Draft of The Philosopher's Stone
Newton's early draft for "The Division of a Monochord"

Thoughts Journals are...

**Powerful for: assessment as learning** as students are continually reflecting forward as they apply new learning and their emergent understanding of concepts to help them refine their response to the challenge;

**Powerful for: assessment for learning** (allowing teachers to provide immediate and on-going feedback and guiding instructional decisions so as to be able to focus on the intellectual tools needed to improve student success);

**Powerful for: triangulation of assessment evidence** (contributing to the body of evidence teachers gather through observation and conversation allowing for a focus on the quality of thinking demonstrated - even in product falls short of the ideal).
Dare to dream! Imagine the classroom of the future

What should the classroom look like in 10 years?

How will the classroom nurture engaged thinkers?

How can technology be used to increase engagement?

Critical Thinkers

Engaged Thinkers

Innovators
When is someone thinking critically?

- A person is thinking critically only if she is attempting to **assess or judge** the merits of **possible options** in light of **relevant factors or criteria**.

- **Critical thinking is criterial thinking**— thinking in the face of criteria.

How does creativity relate to critical thinking?

"All who study creativity agree that for something to be creative, it is not enough for it to be novel: it must have value, or be appropriate to the cognitive demands of the situation."..."creative" refers to novel products of value, as in "The airplane was a creative invention."

from Creativity - Beyond the Myth of Genius, by Robert W. Weisberg.
Criteria for Creativity

something is *produced*

the "creation" is *novel*

the "creation" adds value, has significance or solves the problem it was intended to solve

Stimulating Creative Cognition through **BVSR**
(Blind Variation- Selective Retention)

BVSR in the field of creativity, hinges on the ability to generate a large number of novel ideas and the ability to eliminate the absurd and frivolous from the meaningful and appropriate. It involves two phases:
**Phase 1: Blind Variation** - the generation of many ideas

* law of BVSR states "*the greater the heterogeneity and volume of trials the greater chance of a productive innovation*
* flourishes under conditions of lower cognitive control known as "hypo-frontality"
* occurs when there is less filtering of ideas
* can be spontaneous or deliberative
* thrives in collaborative environments ("collective genius")

**Phase 2: Selective Retention**

* up-regulation of cognitive control is required to allow for the evaluation of options
* appears cognitive flexibility, the ability to up and down regulate cognitive control is a key to creative thought
Blind Variation is enhanced by:

* performing tasks in an unconventional order (by breaking the normal thought processes creativity)
* allowing for distractions from the task - taking a break and doing something unrelated lowers levels of cognitive control
* thinking of problems far away in space and/or time - e.g. "people in ... need some suggestions for..."

* paying attention to the visual properties (shape, size, colour, material make-up) - this encourages the brain to focus on often over-looked perceptual elements

Note: Blind Variation is inhibited by Brainstorming as it creates social stress that inhibits lower cognitive control which is optimal for the generation of novel ideas. Brainstorming is only helpful after you have come up with possible solutions on your own.
What are the implications of BVSR for schools if creativity and innovation are to be embraced as an integral part of 21st century learning?

Consider the implications for:

* classroom community - routines, expectations, modelling
* assessment and evaluation
* curriculum design
* instructional practice

Nurture a community of thinkers

Create opportunities for thinking through critical/creative challenges

Support rigor by teaching the intellectual tools needed for quality thinking
### Three Types of Questions

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<tr>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
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<tbody>
<tr>
<td>What are the ingredients in Bertie Bott’s Every Flavor Beans?</td>
<td>What is your favourite flavour of Bertie Bott’s Every Flavor Beans?</td>
<td>Should Bertie Bott’s Every Flavour Beans be sold in school cafeterias?</td>
</tr>
<tr>
<td>What are three activities on Salt Spring Island?</td>
<td>Would you like to move to Salt Spring Island?</td>
<td>Would your family’s needs be better met in Ottawa or Salt Spring Island?</td>
</tr>
<tr>
<td>Identify several natural disasters that impact on the environment?</td>
<td>Which natural disaster creates the most fear for you?</td>
<td>Which natural disaster poses the great threat to the Ontario’s economy?</td>
</tr>
<tr>
<td>List three types of exercise.</td>
<td>What is your favourite type of exercise?</td>
<td>Which sport would best meet the needs of someone with asthma – diving, soccer or tennis?</td>
</tr>
<tr>
<td>What did the Inuit use to make tools?</td>
<td>What geographic feature of Nunavut do you like the most?</td>
<td>Which natural resource – diamonds or fish – are most important to northern society?</td>
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### Come up with your own examples!

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<tr>
<td>What were the last three movies you have seen?</td>
<td>What is your favourite genre of movie?</td>
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What are three methods of harvesting trees used in Canada?

Which of the theories used to explain climate change is the most plausible?
Is Hamlet a sympathetic character in your eyes?

Prepare a list of holiday presents for your family.
**Designing Critical Challenges**

Critical challenges may take one of the following six forms:

- Critique the piece
- Judge the better or best
- Rework the piece
- Decode the puzzle
- Design to specs
- Perform to specs

How skilled were Egyptian artists?
Can you help out Lou Costello?

A. Uncover the conceptual error in Lou’s mathematical thinking

B. Design a learning activity that would help Lou in understanding this conceptual error by providing an alternative solution to the math problem being discussed.

- What kinds of prompts are these two
- critical challenges?

Develop a plausible explanation for John Lok’s entry in the ship’s log.

- John Lok, Voyage to Guinea, 1554, ship’s log:
  - The elephant is the biggest of all four-footed beasts.... Of all the beasts they are most gentle and tractable, and are of quick sense and sharpness of wit. They love rivers, and will often go into them up to the snout, wherewith they blow and snuff and play in the water. They have continual war against dragons, which desire their blood because it is very cold: and therefore the dragon lieth in wait as the elephant passeth by.
Dare to dream! Imagine the classroom of the future in 10 years.

- How will the classroom nurture engaged thinkers?
- How can technology be used to increase engagement?
- How will the classroom embrace “authentic learning”?
- How can technology be used to enhance opportunities for authentic learning?
Authentic Learning occurs when students:

• are invited to solve real problems connected to the world through the lens of one or more disciplines;
• work with evidence found beyond the classroom or school;
• are invited to share their learning and solution/product in other than traditional pen and paper assessments.
Dare to dream! Imagine the classroom of the future

What should the classroom look like in 10 years?

- How will the classroom nurture engaged thinkers?
- How will the classroom embrace "authentic learning"?
- How will the classroom help to nurture entrepreneurial learners?

- How can technology be used to increase engagement?
- How can technology be used to enhance opportunities for authentic learning?
- How can technology be used to enhance entrepreneurial learning?
Entrepreneurial Learners

Technology acts as a curiosity amplifier

Possess a questioning disposition

Doing the subject - not just learning about it

Learn through failing forward

Collaborative Communities

Collective Genius

Social Media as a Learning Tool

Establishing expectations and routines

Cloud-based Apps