# Promoting Student Success in Science

Pulling together relevant frameworks to create inclusive learning environments

Thelma Akyea, Toronto District School Board
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## Discussion Overview

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  - Culturally Relevant and Responsive Pedagogy
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## About the Speaker

- Thelma Akyea is a Math, Science, Design, and Technology teacher at Carleton Village Public School in the Toronto, Canada. She has a Master in Education with a specific focus on Urban Education. Her research interests include developing and implementing inclusive ways to address the science and technology curriculum. Thelma uses innovative teaching and learning strategies, which value indigenous ways of knowing, to engage inner-city youth in science with remarkable results.

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## Introduction

- As educators, we can agree that a passion for science is developed during the formative years (Hanson, 2009; Murphy & Beggs, 2005) and that it is important for elementary teachers to facilitate rich learning experiences that encourage all students to pursue science beyond high school.

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## Problem

- Future scientists of diverse backgrounds are marginalized and racialized by the alienating components of science education.
  - One such component is the language used in science.

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## Goals (I)

- To identify relevant frameworks:
  - Inclusive Education;
  - Culturally Relevant and Responsive Pedagogy; and
  - Black Canadian Feminist Thought.
- To mobilize frameworks
  - Produce a functional model that can be used in practice.

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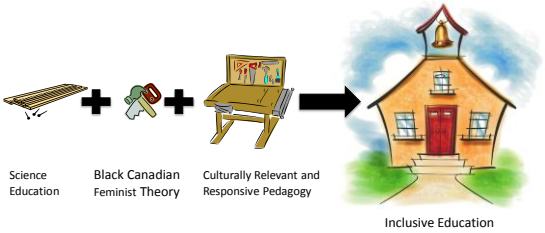
## Guiding Questions

- How do I engage marginalized and racialized students in order to promote academic success and sustain the love of science?
  - How do I disrupt the notion that the only legitimate method of science study has a Eurocentric starting point?
  - How do I use a dynamic understanding of student culture to change the lens through which science is viewed?

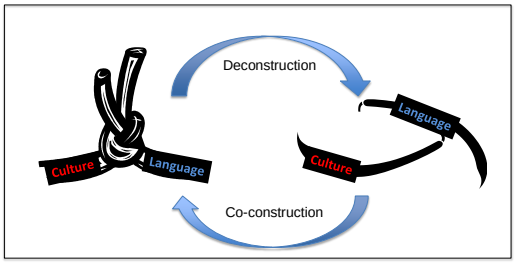


## Goals (II)





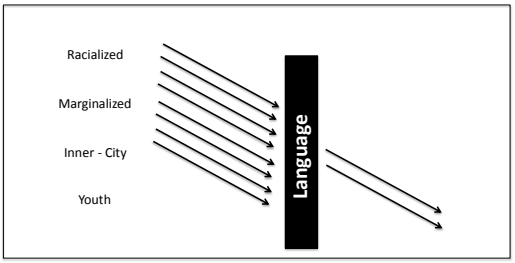

## Historical Context




**Culture and language are inextricably linked.**



## Affected Groups




**Many disenfranchised youth suffer the negative effects held in place by language barriers.**



## Inclusive Education

- The purposeful integration of:
  - School and classroom practices;
  - Curriculum; and
  - Cultures and experiences of marginalized groups.



## Culturally Relevant and Responsive Pedagogy

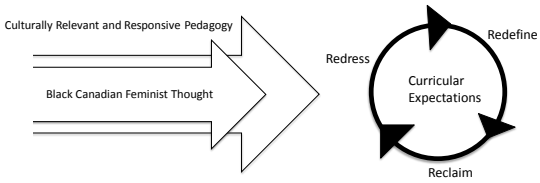
- Gloria Ladson-Billings (1996) explains that there are three principles of Culturally Relevant and Responsive Pedagogy :
  - High expectations;
  - Cultural competence; and
  - Critical consciousness.

## Black Canadian Feminist Thought

- The principles are:
  - Revolutionary vision;
  - Resistance;
  - Mutual stretching;
  - Collectivism;
  - Community mothering;
  - Self determination;
  - Spirituality; and
  - Self reliance.



## Mobilizing Inclusive Framework in Science Education



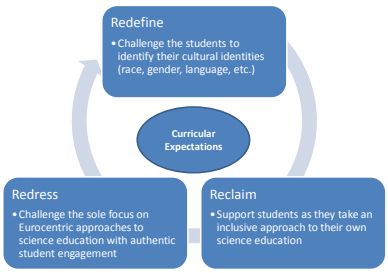



## Inclusive Science In Action

- Science Unit: Understanding Cells
  - The limiting factor that hindered student understanding in this area was the derivation of the term "cell" and the historical context from which it arose.
  - Inclusive programing was enacted
    - BCFT: Understand how my teaching practice was implicated in perpetuating limitations
    - CRRP: Enforced high expectations, cultural connections, and critical analysis of the inclusive learning tasks

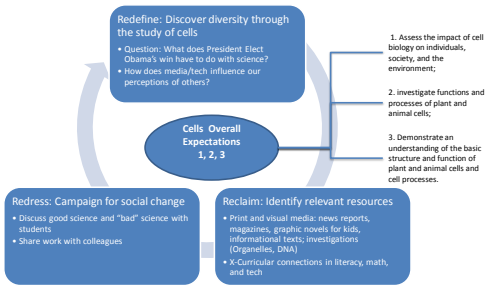


## Enacting the Process (I)






## Enacting the Process (II)





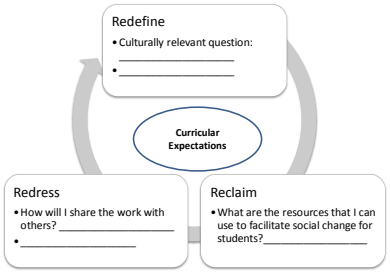

## An Inclusive Lesson in Science

- Science Inquiry
  - How does President-Elect Obama's Win relate to science?
    - An open question that
      - Allows students to identify with the subject matter
      - Sets the stage for Understanding Life Systems
      - Provides the opportunity for a seamless transition into further study of the Math, Science, and Technology through the lens of indigenous cultures (eg. Inventors of African descent, the Invention Convention, etc)

# An Inclusive Lesson in Science



# An Inclusive Lesson in Science






# An Inclusive Lesson in Science

- Culminating Task: Active Research
  - This area of study led to the development of additional, student generated questions
    - What are the contributions made by scientists of diverse backgrounds?
    - Why don't we know about these scientists?
    - How can we become more informed?



# An Inclusive Lesson in Science

- Cross Curricular Connections
  - Inventor's projects
    - Students replicated inventions developed by people of diverse backgrounds
    - Addressed expectations in Math (geometry and spatial sense, number sense and numeration, and algebra geometry) and Design and Technology