Supporting Students' Science Content Knowledge through Project-Based Inquiry (PBI) Global

Who We Are & Why We Are Here

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New Literacies Collaborative #newlit

NC STATE UNIVERSITY
College of Education
Friday Institute for Educational Innovation

NSF

Overview

- Who We Are & Why We Are Here
- Why inquiry?
- What is PBI Global?
- National Science Foundation (NSF) DRK 12 Exploratory Grant Overview
- Q&A
- Wrap Up & Thank You

Why Inquiry?

Why Inquiry?


The World is Changing.
Schools Need to Prepare Students To Be:
Globally Competent
STEM & STEAM Knowledgeable
Creative Problem Solvers & Critical Thinkers
Effective Communicators & Collaborators

Why Inquiry?

Inquiry as a learner-centered pedagogy.

- Learner-centered pedagogies are aimed at
  - learning needs
  - interests
  - aspirations
  - cultural backgrounds of students

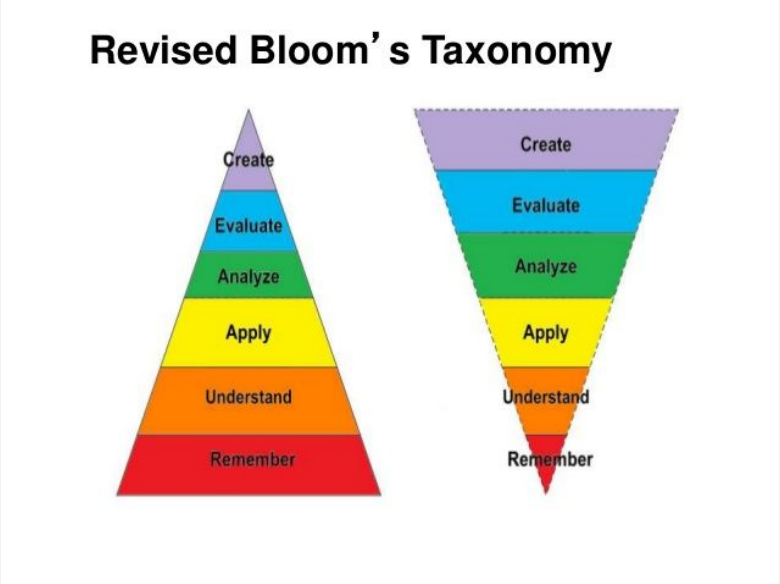
- Through technology and ongoing discussion and dialogue, students are engaged in and with
  - collaboration
  - creation
  - inquiry

- Teachers facilitate learning rather than being the sole source of information.

Why Inquiry?

Inquiry-based pedagogies emphasize...

- Motivation and Engagement
  - Choice
  - Purposeful/Authentic Learning
- Building Background Knowledge and Skills
- Collaboration
  - Literacy as Social Practice
- Teacher Scaffolds/Guidance
- Differentiation
- Iterative Design
- Knowledge Creation



Adapted from Anderson & Krathwohl (2001) and Spires et al. 2008

Why Inquiry?

- Student activity through inquiry closely reflects scientists' research processes (Barrow, 2006; Kesselman, 2003), and has been seen to positively impact science content knowledge (Harris & Rooks, 2010)

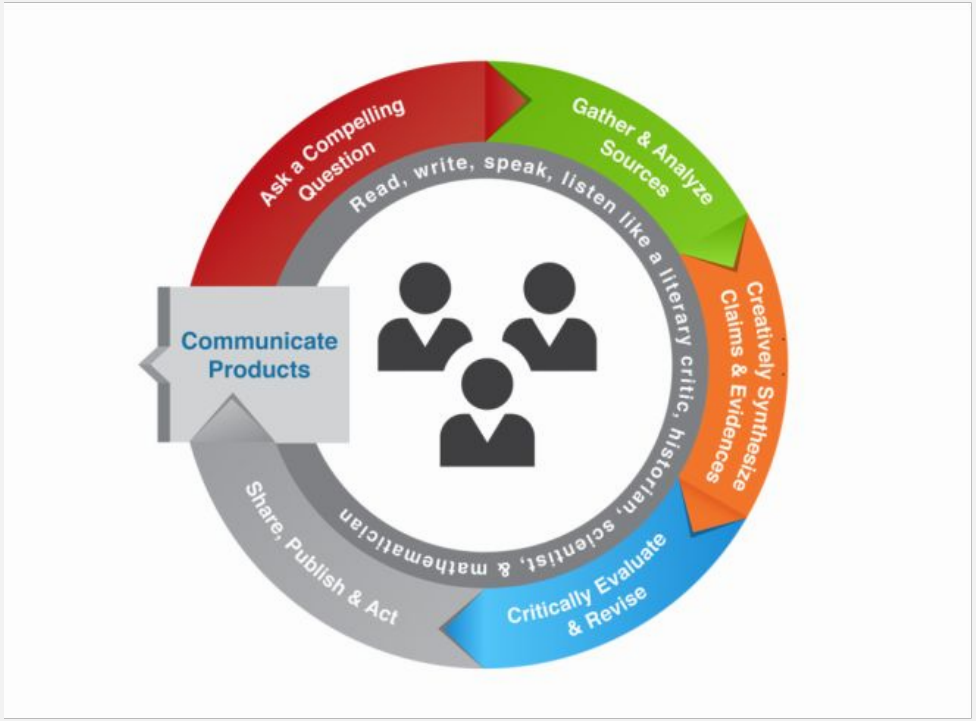
- Focus on student questioning and exploration of new knowledge for the purpose of integration with prior knowledge and skills

- Teachers support students through providing instructional scaffolds

What is PBI Global?

What is PBI Global?

Process: Project-Based Inquiry (PBI) Global



Build Background Knowledge:

- Common Read

What is PBI Global?

Content: UN Sustainable Development Goals

What is PBI Global?

PBI Global Design Features

What is Project-Based Inquiry (PBI) Global?

Person Early College for Innovation and Leadership (PECIL)
&
Wake STEM Early College

Spring 2019

Every Drop Counts: Global Water and Sanitation Issues

PBI Global Phases	Multimodal Product(s)	Potential Instructional Scaffolds
Design a Compelling Question	Compelling Question	• Compelling Question Stems • Compelling Question Subtopic Suggestions • How Compelling Is Your Question? Chart • Compelling or Not Model Questions
Gather & Analyze Sources	Annotated Bibliography	• Annotated Bibliography Graphic Organizer • Source Credibility Lesson • MLA Citation Review
Creatively Synthesize Claims & Evidences	Claims Sheet Digital Product(s)	• Claims, Warrants, and Evidence Lesson • Evidence, Warrants, and Claims Graphic Organizer • Claims Sheet Template • UN SDG Infographic Analysis • Digital Tool Lesson(s)
Critically Evaluate & Revise	Feedback Form	• PBI Global Rubric • Peer Review • External Expert Evaluation(s) • Team Coach
Share, Publish, & Act	Showcase	• Presentation Script • Showcase Rehearsal

National Science Foundation (NSF) DRK12 Exploratory Grant Overview

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Project Overview

The two-year DRK-12 Exploratory project focuses on:

- Implementing interdisciplinary project-based inquiry in 9th grade classrooms
- Facilitating collaboration of teachers and students between two schools -- one rural and one urban -- in North Carolina, USA
- Developing science content knowledge and science and engineering practices through the topics of global water and sanitation issues
- Investigating factors influencing student motivation and engagement, and teacher attitudes toward inquiry-based pedagogies

Research Questions

1. How does interdisciplinary inquiry through the PBI Global process support student science content knowledge?

2. How can students' motivation and engagement be characterized after participating in the PBI Global process?

3. To what degree do teachers' attitudes toward inquiry-based pedagogies change as a result of PBI Global professional development?

Project Objectives

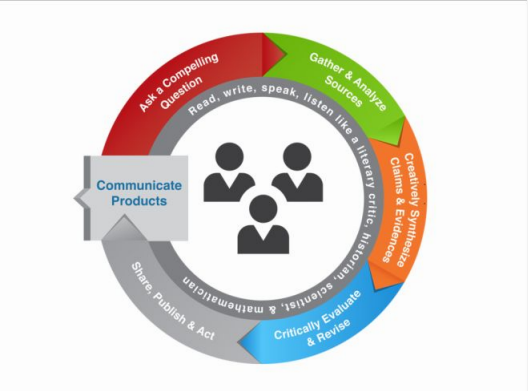
- Design and iteratively refine instructional materials for an interdisciplinary PBI Global initiative connected to UN Sustainable Development Goal 6, which is on the topic of ensuring access to clean water and sanitation
- Design and iteratively refine PBI Global professional development with teachers to support student learning through inquiry
- Implement a multi-week PBI Global resulting in student created print/digital products and action projects
- Assess student science content knowledge and factors that influence student engagement and motivation, and changes in teacher attitudes about inquiry-based teaching

Educator Professional Development

Four Days of PD to...

- Learn about the PBI Global process
- Work in cross-school collaborative teams to engage in a model PBI Global
- Discuss how to best support students throughout PBI Global with instructional scaffolds
- Plan cross-school inquiry and interdisciplinary instruction

Beginning with the End in Mind



PBI Global Products for Showcase

- Annotated Bibliography
- Claims Sheet
- Visuals - Infographic & Tri-fold
- Presentation Style - Advocacy Panel & Trade Show

PBI Global Action

- Walk for Water with Iron Giraffe Challenge

Data Collection

Students

- Science Content Test (questions from NAEP Question Tool and AAAS Science Assessment Item Bank)
- MUSIC Inventory Survey
- Focus Groups
- Student PBI Global Products

Teachers

- Inquiry Teachers Survey
- Focus Groups
- Instructional Fidelity Checks

Data Analysis

- Student content tests, MUSIC Inventory results, and the Inquiry: Science Teachers Surveys will be analyzed for differences before and after the project using t-tests and descriptive statistics
- A collective case study will be conducted to determine content knowledge and motivation changes as a result of the project
- Focus group transcripts and student final products will be coded using a thematic analysis process to identify common themes in science content knowledge
- Teacher focus group transcripts will be analyzed similarly to identify where teachers need additional support

Significance

- Address the need for STEM knowledge and skills in educational experiences that will be in high demand in all jobs

- Focus on UN Sustainable Development Goal 6 of availability and sustainable management of water and sanitation for all

- Examine scaffolds needed by students and professional development needed by teachers to adopt innovative models of instruction in new settings

Broader Impacts

- Prepare diverse students from populations underrepresented in STEM fields for college success
- Advance theory and practice of STEM education through developing improved inquiry-based learning materials and researching impacts on teachers and students
- Understand how inquiry-based learning can promote high levels of achievement and find broad application in science education
- Analyze scalability issues pertaining to the implementation of inquiry-based pedagogies in schools

Q&A

Learn More About PBI Global

- Check out www.pbi-global.com
- Read our PBI Global how-to article in the *Journal of Adolescent and Adult Literacy*, "Going Global with Project-Based Inquiry: Cosmopolitan Literacies in Practice"
- Connect with the New Literacies Collaborative on social media

 **New Literacies Collaborative**  **#newlit**

Scaling Up Project-Based Inquiry (PBI) Global: Educator Needs Assessment

Available Now at https://go.ncsu.edu/pbigneeds

Provide the New Literacies Collaborative with feedback on your global education needs!

New Literacies Teacher Leader Institute

July 2020

The Friday Institute for Educational Innovation

Raleigh, NC, USA

- Experience 3 days of FREE professional development
- Build capacity for Project-Based Inquiry (PBI) Global
- Collaborate with global educators

Stay Tuned For More Info Coming Spring 2020!

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Thank you!

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