Utilizing the NASA Data-enhanced Investigations for Climate Change Education Resource for Elementary Pre-service Teachers in a Technology Integration Education Course

This project was supported through NASA ESTEEM (formerly NICE) grant #NNX11AM97A

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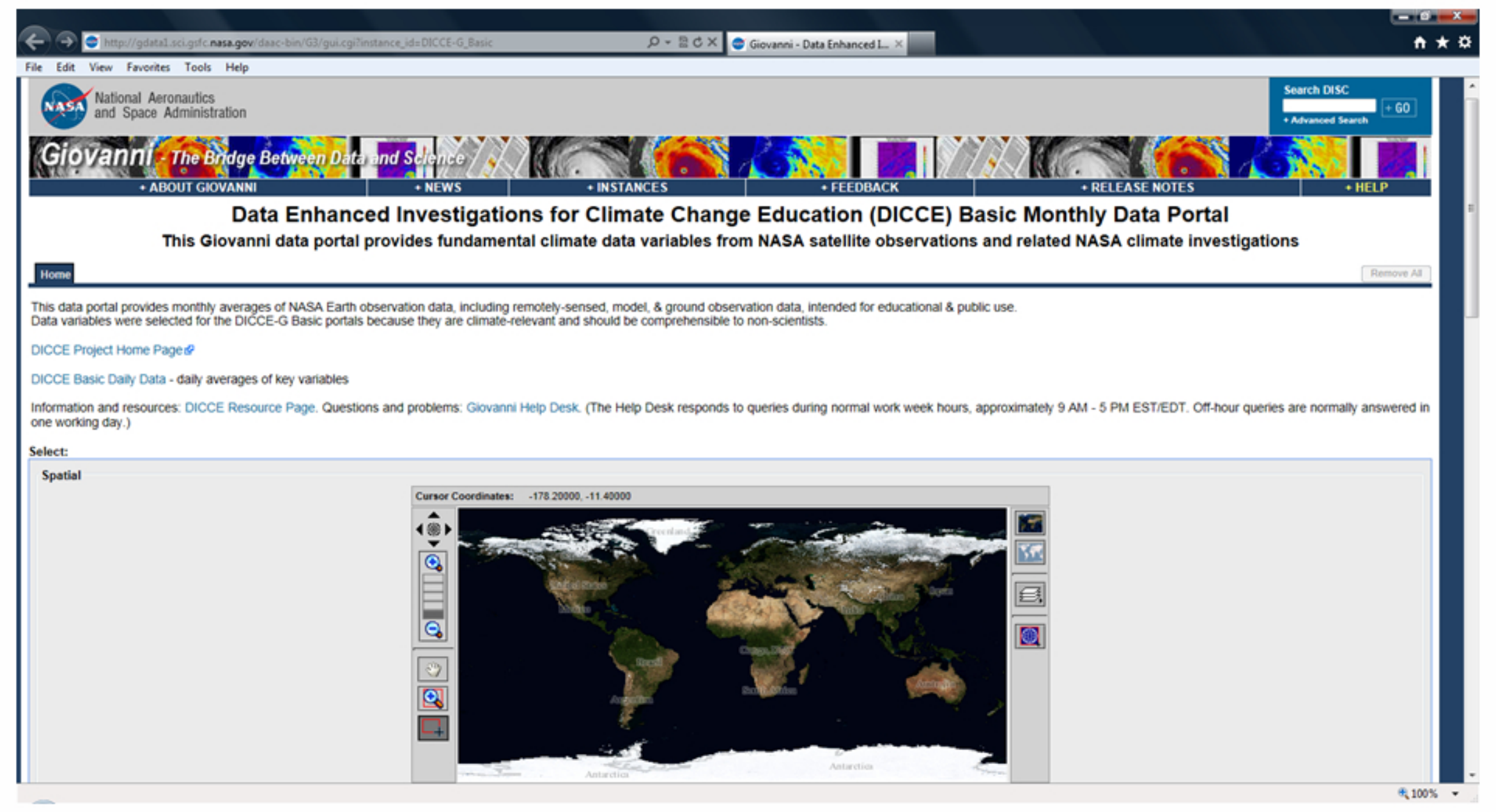
SYNOPSIS

The preservice teachers enrolled in the Elizabeth City State University EDUC 203 Introduction to Computer Instructional Technology course, primarily for technology integration learning have created climate change educational lessons based upon their use of the NASA Data-enhanced Investigations for Climate Change Education (DICCE). NASA climate education datasets and tools were introduced to faculty from Minority Serving Institutions through a grant from the NASA Innovations in Climate Education program.

These lessons were developed to study various ocean processes involving phytoplankton's chlorophyll production over time for specific geographic areas using the Giovanni NASA visualization software tool.

Sample of a phytoplankton specimen captured in a microscope and photographed using the iPhone 4G


National Aeronautics and Space Administration
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Giovanni The Bridge Between Data and Science
ABOUT GIOVANNI
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RELEASE NOTES
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Home
Remove All

Data Enhanced Investigations for Climate Change Education (DICCE) Basic Monthly Data Portal

This Giovanni data portal provides fundamental climate data variables from NASA satellite observations and related NASA climate investigations

This data portal provides monthly averages of NASA Earth observation data, including remotely-sensed, model, & ground observation data, intended for educational & public use. Data variables were selected for the DICCE-G Basic portals because they are climate-relevant and should be comprehensible to non-scientists.

DICCE Project Home Page

DICCE Basic Daily Data - daily averages of key variables

Information and resources: DICCE Resource Page. Questions and problems: Giovanni Help Desk. (The Help Desk responds to queries during normal work week hours, approximately 9 AM - 5 PM EST/EDT. Off-hour queries are normally answered in one working day.)

Select:

Spatial

Cursor Coordinates: -178.20000, -11.40000

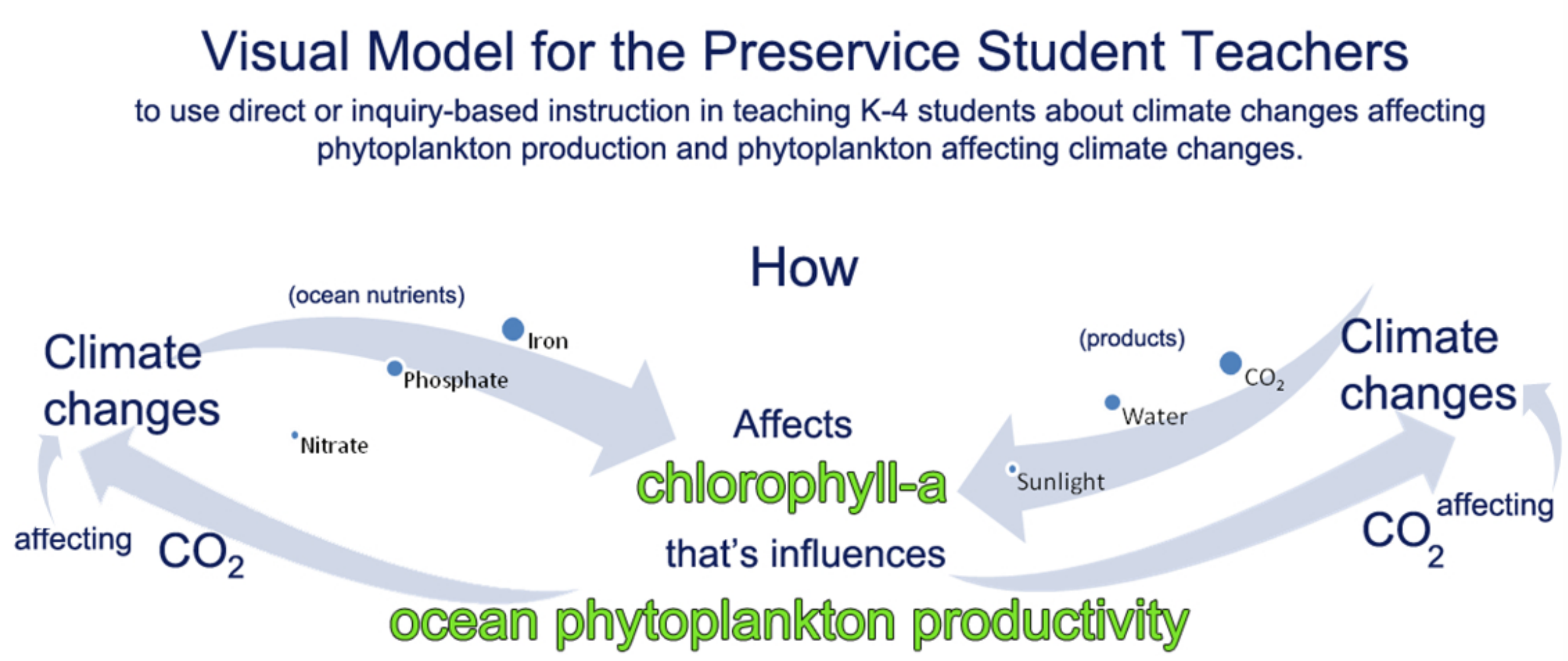
NASA GIOVANNI Visualization Tool

Using the NASA Giovanni visualization tool was essential in displaying the observational datasets that showed the levels of carbon dioxide, sunlight, nitrate, sea temperature, and chlorophyll influencing on oceanic phytoplankton production based from the effects of climate change.

RESEARCH

Elizabeth City State University joined with the University of New Hampshire under the NASA Innovations in Climate Education (NICE) Program to empower faculty of education programs at Minority Serving Institutions to better engage their preservice teachers in teaching and learning about global climate change from NASA Earth observation sets. The workshop provided the faculty with approachs to understanding climate change and its impacts on terrestrial and ocean ecosystems.

Now the preservice teachers of the EDUC 203 Introduction to Computer Instructional Technology course have utilized the technology integration planning (TIP) model (Roblyer & Doering, 2014) in developing lessons based on their content knowledge of climate change themes from experimenting with NASA Earth observation data sets acquired from GIOVANNI. The lessons support 21st century learning themes (Partnership for 21st Century Skills, 2014)



Visual Model for the Preservice Student Teachers

to use direct or inquiry-based instruction in teaching K-4 students about climate changes affecting phytoplankton production and phytoplankton affecting climate changes.

How
Climate changes
(ocean nutrients)
Iron
Phosphate
Nitrate
affecting
CO_2
Affects
chlorophyll-a
that's influences
ocean phytoplankton productivity
(products)
CO_2
Water
Sunlight
Climate changes
affecting
CO_2

METHODS

Technology Integration Planning Model (TIP)

STEP 1: Determine the relative advantage

STEP 2: Assess Tech-PACK

Developing the preservice student teachers' content knowledge of climate change education.

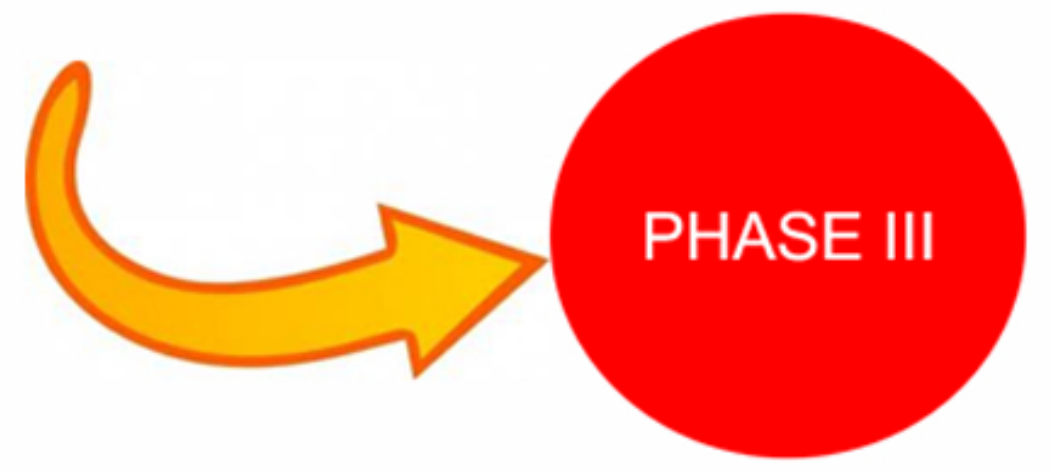
Developing the preservice student teachers' pedagogical knowledge to support climate change education and learning.

Developing the preservice student teachers' technological knowledge to deliver and integrate the appropriate technologies for teaching climate change lessons and activities preparation.

STEP 3: Decide on objectives, assessments
STEP 4: Design integration strategies
STEP 5: Prepre instructional environment

The preservice student teachers develop learning objectives supported by Common Core State Standards and the Next Generation Science Standards with proposed climate education lessons and assessements.

The preservices student teachers will identify what conditions to support technology integration strategies and associate apropriate technology tools and methods in preparing a classroom environment for learning.



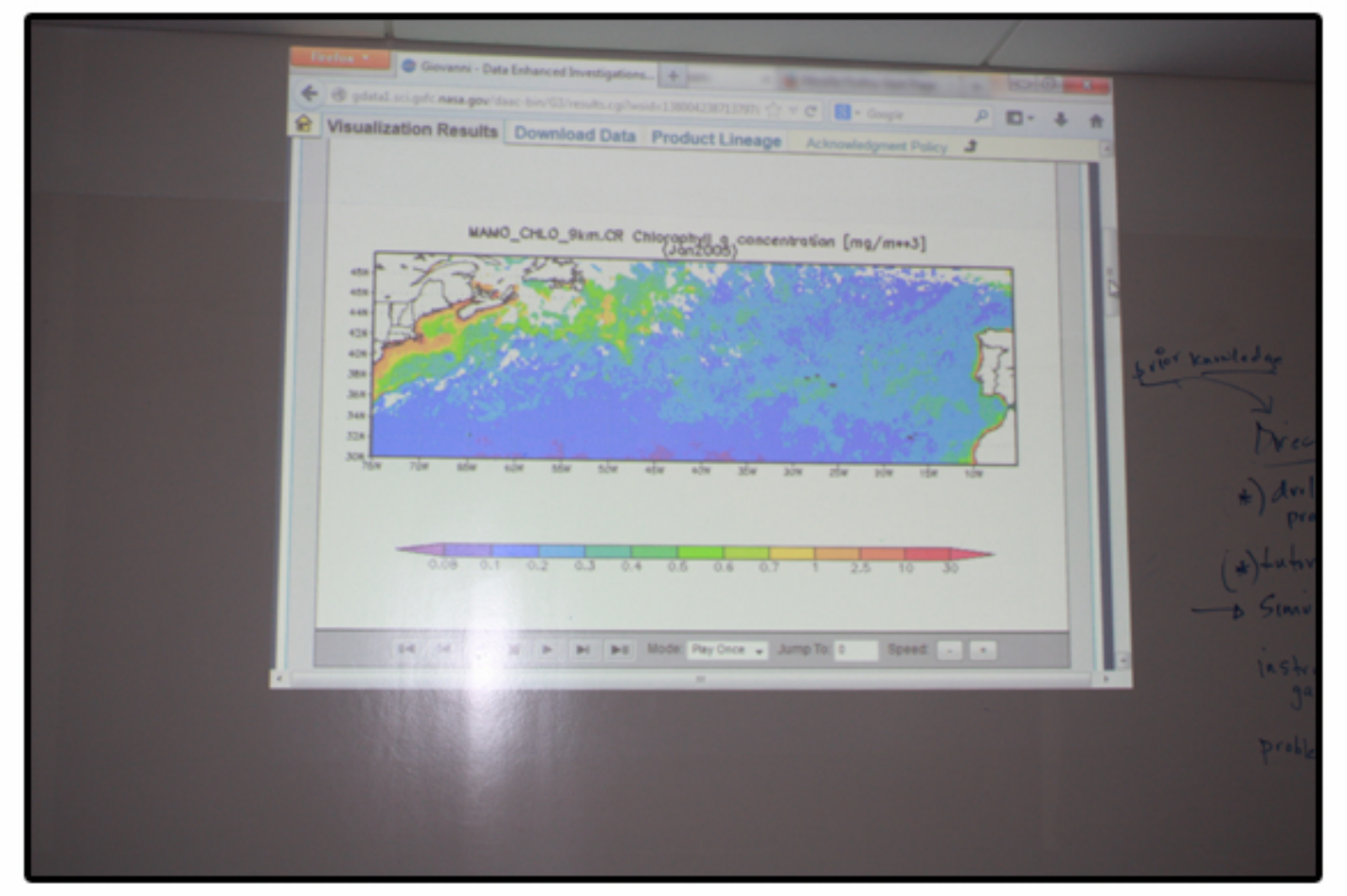
STEP 6. Analyze results

STEP 7. Make revisions

The preservice students will review possible outcome of successful climate education learning for target audience and determine any revisions and modifications to the developed lessons and technology integration strategies.

Utilizing the NASA Giovanni visualization tool

Dr. Howard presenting a climate change model in EDUC 203 class



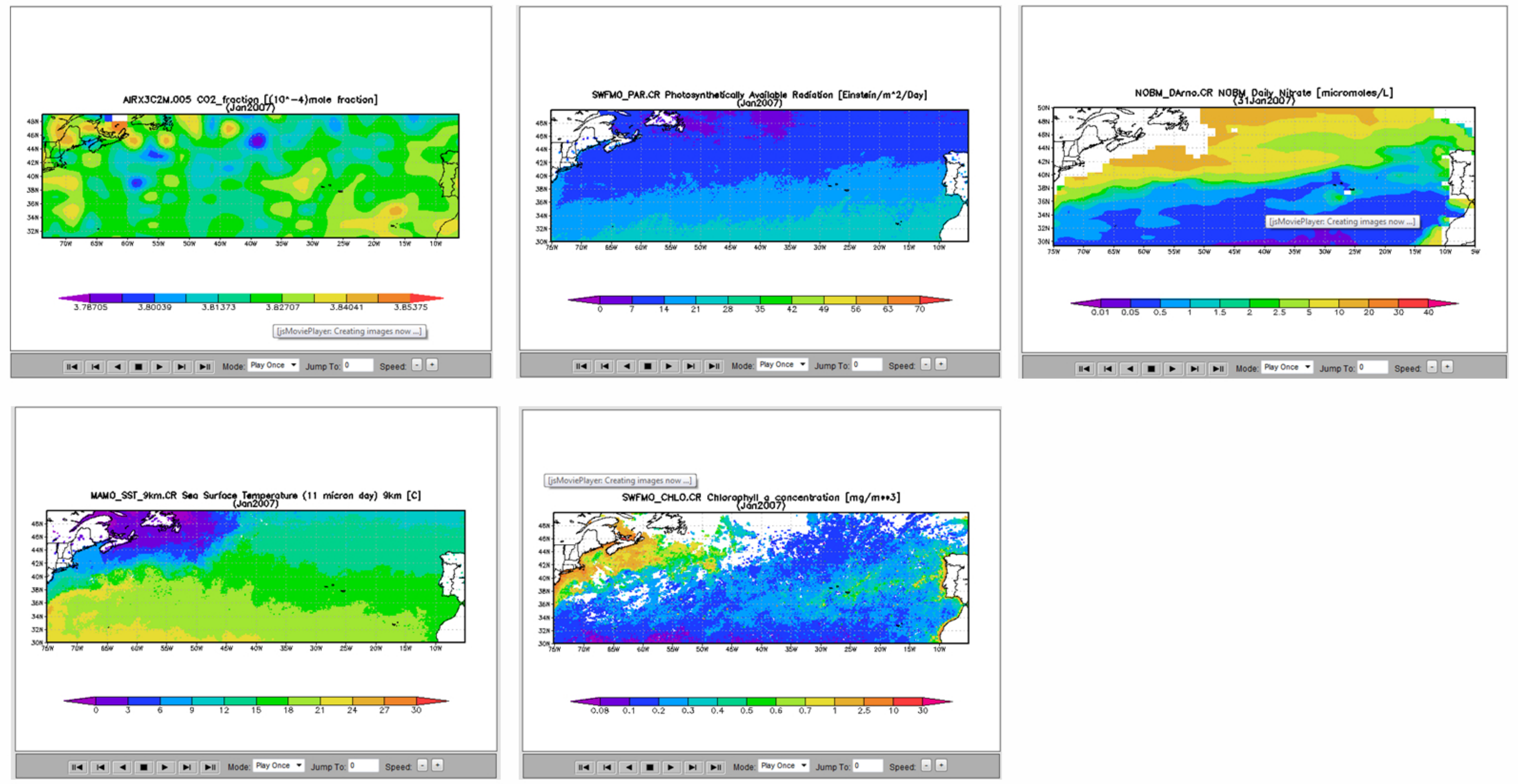
Chlorophyll concentration for Jan 2005 illustrated in the lecture.

RESULTS

- The development of climate change lessons based on a thematic unit of study
- Knowledge and skills of utilizing the NASA Giovanni software tool
- Analysis of observational data of an area in the North Atlantic region that is affected by climate change

Two primary challenges of technology integration

- Motivating pre-service teachers to be interested in climate education
- Next Generation Science Standards of climate education non-supportive in the Common Core State Standards


AIRX3C2M.005 CO2_fraction [(10^-4)mole fraction] (Jan2007)
3.78705 3.80039 3.81373 3.82707 3.84041 3.85375
SWFMO_PAR.CR Photosynthetically Available Radiation [Einstein/m^2/Day] (Jan2007)
0 7 14 21 28 35 42 49 56 63 70
NOBM_DArno.CR NOBM Daily Nitrate [micromoles/L] (31Jan2007)
0.01 0.05 0.5 1 1.5 2 2.5 5 10 20 30 40
MAMO_SST_9km.CR Sea Surface Temperature (11 micron day) 9km [C] (Jan2007)
0 3 6 9 12 15 18 21 24 27 30
SWFMO_CHLO.CR Chlorophyll a concentration [mg/m**3] (Jan2007)
0.08 0.1 0.2 0.3 0.4 0.5 0.6 0.7 1 2.5 10 30
[jsMoviePlayer: Creating images now ...]
Mode: Play Once
Jump To: 0
Speed:

DISCUSSION

- By establishing climate change as a social concern to promote a deeper and personal involvement for the learners (Ojala, 2012)
- Using inquiry and investigative research in exploring the Earth's systems caused by climate change (Ojala, 2012)
- Reflecting on the learners' opinions about climate change on a global scale (Ojala, 2012)
- Successful utilization of the Technology Integration Planning (TIP) model in the classroom

NIA CLIMATE CHANGE Resources
http://nia.ecsu.edu/nice/2013/fall2013lessons/

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Ojala, M. (2012). Regulating worry, promoting hope: How do children adolescents, and young adults cope with climate? International Journal of Environmental & Science Education, 7(4), 537-561. Retrieved from ERIC database.

Partnership in 21st Century Skills (2014). Retrieved from http://ww.p21.org

Roblyer, M.D. & Doering, A.H. (2013). *Integrating technology into teaching* (6th edition). Boston, MA: Pearson.