Climate Change Narrative Game Education

DRL-1316782

Allan Feldman*, Glenn Smith*, Yiping Lou*, Ping Wang##, University of South Florida, Tampa, Florida, *: College of Education, ##: School of Geosciences
Paul Siegel, Stony Brook University, Stony Brook, New York

Climate Change Narrative Game Education (CHANGE) was recently funded by NSF (DRL-1316782). CHANGE's goal is to help high school students learn complex GCC science by making it personally relevant and understandable. CHANGE is creating a prototype curriculum that will be integrated into elective Marine Sciences high school courses, and test its efficacy.

CHANGE Principles

CHANGE uses:
(a) scientifically *realistic text narratives* about future Florida residents (text stories with local Florida characters, 50-100 years in the future based on GCC),
(b) a *local, place-based approach* grounded in west-central Florida Gulf Coast scientific data,
(c) a focus on *the built environment*,
(d) simulations & games *based on scientific data* to help students learn principles of GCC so students can experience and try to cope with potential long term effect of GCC via role-play and science-based simulation, and
(e) a *web-based "intermedia" eBook narrative* where sections of narrative text alternate with simulations/computer games.

Impact on high school climate change education

(a) The use of a *future narratives* approach, relating to local issues, and the focus on the *built environment* will help students attach a "human face" and a sense of immediacy to hitherto abstract issues of global warming.
(b) The *gaming space* taps into high school students' love of computer games by providing a highly engaging approach to climate change education.
(c) The *collaborative* nature of the game taps into adolescents' peer-based identities to help actively engage them in climate change science.
d) Accurate *science visualizations* based on real *data* provide an easy and accurate way to understand complex and authentic scientific phenomena.
(e) *Integration of the narrative and gaming system into the Marine Science course* provides accessible talking points to directly segue from stories students identify with into hard science content.
(f) The *use of text narratives along with computer games* provides an economical way to extend the system.
(g) The model, with its focus on local, place-based issues can be *easily and economically propagated to other locales around the country*, by substituting in local settings, issues, and data.

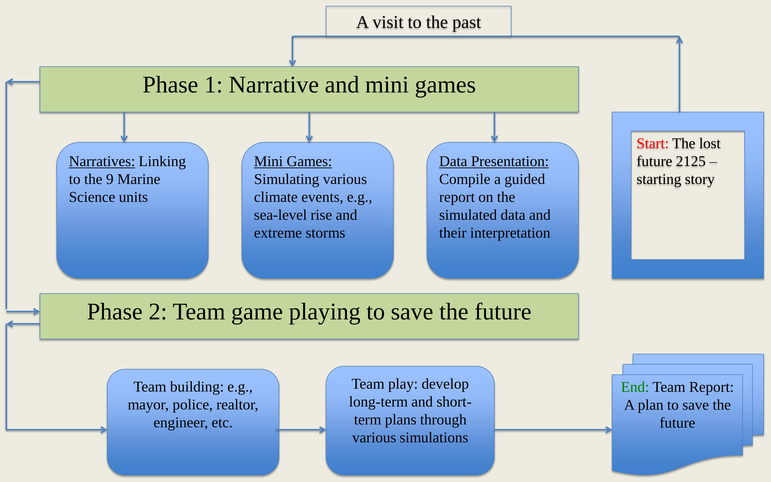
CHANGE will be integrated into the FL Marine Sciences course

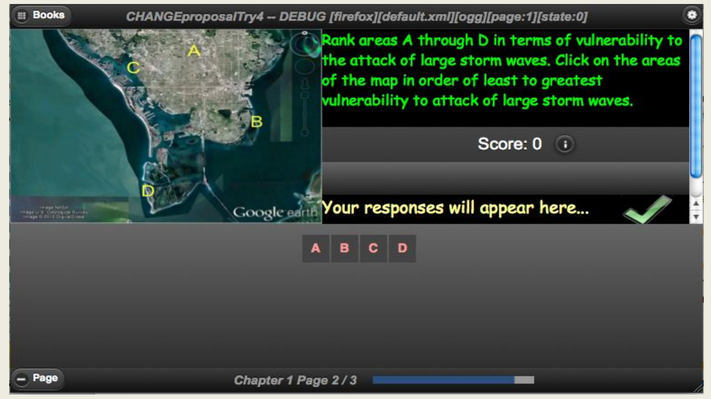
Marine Science Unit	Climate Literacy Principle[1]	NGSSS Standards[2]	AAAS Benchmark[3]
Aquariums	2	SC.912.E.7.2 SC.912.L.17.10	5F/M2b
History and technology	5	SC912.N.1.7 SC912.N.2.4 SC.912.N.3.1 SC.912.N.4.1	4B/M10 4B/M11
Chemistry	2	SC.912.E.7.1 SC.912.E.7.4 SC.912.L.18.12	4C/M7 4B/M7
Physics	1	SC.912.P.10.2 SC.912.E.7.9 SC.912.E.7.6	4B/H6
Geology	4	SC.912.E.6.3	4B/M9 4B/M12 4B/M14
Ecology	3	SC.912.L.17.10 SC.912.L.17.2	4C/M7 5D/H12
Populations	7	SC.912.L.15.13	5F/M2b
Environment	7	SC.912.L.17.4	4C/M7
Human impact	7	SC.912.L.17.8	4C/M7 5D/H3

1 Climate Literacy: "The Essential Principles of Climate Sciences"
2 Florida Next Generation Science Sunshine State Standards
3 AAAS Benchmarks

CHANGE Learning Objectives:

1. Demonstrate a fundamental and working understanding of climate change and climate change science especially as it relates to the built environment. Understand a list of prioritized key factors influencing global climate and their relationship.
2. Demonstrate a fundamental and working understanding of the interrelation among the natural environment, built environment, social aspects in the context of climate change in coastal regions. Develop a list of interactive factors on how a specific environment, e.g., a coastal barrier island, functions.
3. Effectively communicate about climate change and climate change science.
4. Engage in informed and responsible decision making related to climate change at local scale in the context of the entire globe as a whole.





CHANGE Research Hypotheses:

Hypothesis 1: A *framing narrative* approach to climate change education will help high school students understand climate change science in a more coherent way.
Hypothesis 2: A *local, place-based* educational approach will make climate change science more relevant and accessible for high school students.
Hypothesis 3: A *local, place-based* educational approach, focusing on the ***built environment***, will make learning climate change science more relevant and accessible to high school students.
Hypothesis 4: An *intermedia text narrative, gaming and simulation space*, concluding with *role-play* and *students writing endings to the story*, will stimulate and engage students to apply the newly acquired knowledge (and pre-existing knowledge) in problem solving, and will boost continuing engagement in science, potential desire for science career paths, and result in more content learned.

CHANGE Research Questions:

How do (H1) *framing narratives*, (H2) *a local, place-based approach*, (H3) *a focus on the built environment* and (H4) *an intermedia text narrative, gaming and simulation space*, affect students' learning and teachers' instruction of climate change science?" More specifically, we ask how does CHANGE affect:
- students' learning of climate change science?
- students' interest in climate change science? and
- teachers' instruction of climate change science?

Data Sources

Research Question	Computer data logs & student work (throughout year)	Student year end exams & unit tests	Student science & climate attitudes surveys (pre- and post)	Classroom observations (4 times in a sample of 5 classes)	Teacher surveys (end year)	Teacher interviews (mid and end year)
1. Student learning	X	X		X		X
2. Student attitudes	X		X	X		X
3. Instruction				X	X	X

Contact: afeldman@usf.edu