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STEM: CHARTING THE WEATHER

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STEM: Charting the Weather

Synopsis

Thirty teachers participated in a professional development course that integrated science, mathematics, literacy, and technology for elementary/middle level teachers. Using one of the lessons pertaining to weather, the speaker will share a fourth grade teacher's implementation of the project with his students as well as several of the students' power point presentations.

STEM: Charting the Weather

STEM Core Team 1

At the state level, though science is not tested, math and reading scores of Arkansas students were flat for the last four years and lagged behind national average (NAEP, 2011). "Proficient" level on the national test was reached by less than a third of Arkansas test-takers. At the local level, Arkansas Comprehensive Testing, Assessment and Accountability Program (ACTAAP) consist of the Arkansas Benchmark Exams in science for Grades 5 and 7 and the End-of-the-Course biology exam for Grade 10. There are no state science test scores data available for grades 3 and 4. Since the 5th grade science tests measure the content knowledge accumulated over K-4, 5th grade science scores on ACTAAP and SAT 10 (Table 1) were considered.

(Insert Table 2 about here)

The state's scores on national exams, the science scores and the AYP status of the schools are unacceptable, and there is need for immediate action. A needs assessment survey was given to 3rd-5th grade teachers in selected school districts in October 2011. Twenty five 3-5 grade teachers responded to the survey. 68% of these teachers expressed special interest in science curriculum materials that integrate the existing math and literacy; 60% requested 3-4 specific topics to be connected common core curriculum; and 50% wanted an integration of technology. When asked for the topics 68% selected properties and changes of matter, 48% selected living systems and force and motion. The test score data and the results of the survey from the two partner school districts (School District A and School District B) provided several compelling reasons for establishing STEM Core TEAM program.

The goal of this project was to increase the level of content knowledge and skills in STEM areas by integrating science, technology, engineering and mathematics with literacy programs.

The objectives were:

1. Increase teachers' content knowledge in STEM areas by at least 15%;
2. Facilitate teachers' development of 5-E lesson plans that target Common Core standards through the integration of literacy with science, technology, engineering and math instruction;
3. Ensure inclusion within lesson plans of connectivity between lesson content and STEM careers; and
4. Develop a repository of successful 3rd-5th grade STEM lesson plans.

STEM Core Team II

STEM Core Team II is a continuation of the 2011-2012 project. 25 elementary school teacher participants went through a rigorous, highly effective 60 hours of professional development program. Data from the project evaluation and needs assessment show that 100% of the participants agreed or strongly agreed that the program was very effective and the hands-on activities were useful. They will be using them in their classroom and would like to have the training for one more year. A needs assessment survey was given to all the participants school districts SCT in 2012. 31 teachers responded to the survey. 94% of the teachers expressed an interest in the existing math and literacy programs. The test score data and the results of the survey from the two partner school districts provided several compelling reasons for continuing STEM Core TEAM II program.

The University of Central Arkansas and two high-need LEA school districts (District A and District C) will partner to continue the STEM Core Team II. Table 2 shows the demographics and the poverty level for District A and District C which are our high

need LEAs. The poverty level of the District A is 24.3% and that of District C is 33.9%. Though most of the teachers have bachelor's degrees in elementary education, they do not have a degree or training in Science Education.

(Insert Table 2 about here)

The goal of this project is to increase the level of content knowledge and skills in STEM areas by integrating science, technology, engineering and mathematics with literacy programs.

The objectives are:

1. Increase teachers' content knowledge in STEM areas by at least 10%;
2. Facilitate teachers' development of lesson plans that target Common Core and Next Generation Science Standards through the integration of literacy with science, technology, engineering and math instruction; and
3. Develop a repository of successful 3rd-5th grade STEM lesson plans.

Faculty

Dr. U. Garimella, director of the STEM Institute at UCA met with UCA faculty to design the syllabus and course materials. Dr. Andrew Mason from Physics, Mr. Jerry Mimms from Biology, and Dr. Carolyn Pinchback from Mathematics agreed to work together to develop the lessons and provide trainings.

Week of 29 July to 2 August 2014

Each faculty member was responsible for presenting concepts in his or her area. Dr. Pinchback used literacy by integrating mathematics, science, and technology. Below is a brief synopsis of her week's work. Additionally, there is an example of a response or any example by several participants.

Monday, 29 July 2013

- Survey
- Overview for Charting the Temperature
- Check the temperature

Tuesday, 30 July 2013

- Record temperature
- Each group researched an area (hydrologist, meteorologist, botanist, and geologist). In the report/presentation, the groups included a definition, what do they thought their students would like to know about this field, the salary of this person, identify a person in this field, etc. Included is an example of one group's research about a meteorologist.

Meteorologist

- What is the job description?
One who reports and forecasts weather conditions
- What types of jobs may this scientist do?
Climatologist, storm chasers, TV/Radio weather forecaster, NOAA, military, Education, consulting Meteorology Businesses
- Who is a person in this field? (Give a brief biography of that person)
Gabriel Fahrenheit- born May 16, 1686- Died September 1736. German Engineer and Physicist- Made altimeters, thermometers, barometers, known for the Fahrenheit thermometer that used Mercury.
- How much does this scientist make?
Little Rock Meteorologist (TV) \$135,392
- What is an interesting fact that appealed to you about this branch of science?
53% of TV meteorologists are women. American military seeded clouds during Vietnam War in an attempt to flood the Ho Chi Minh trail; the first mathematical forecast was a 6

hour forecast and took over 6 weeks to calculate (1920- the frequency of cricket chirps tells the temperature # of chirps in 15 seconds + 37 = temperature in Fahrenheit

- What else would you like to share etc.?

Wednesday, 31 July 2013

- Check the temperature
- Journals
One group reported on an article by Roberge, Martin C. and Linda L. Cooper. (April 2010). Map Scale, Proportion, and Google Earth. *Mathematics Teaching in the Middle School*, Volume 15, Number 8, 448-457. The format is included also.

Presentation

1. Title of the article
2. Summary of the article- using known landmarks photographed from an aerial view- like a football field- students use ratios to find the scale of the map
3. Explain your like or dislike
Like- it can be simplified for younger kids as an introduction to scale
4. Implementation in the classroom
Measurement using different materials (photo is two times as big as this block)
5. Common Core State Standards/Next generation science practices
Science (all) Math (all) Lit- 4,5

Thursday, 1 August 2013

- Check your city's temperature
- Children's literature books

One group's report on Tish Rabe's *Oh Say Can You Say What's The Weather Today?* Is given below.

In your presentation, include the following:

- *Title of book
- *Author
- *Next generation science practices/ Common Core State Standard
- Summary of book- Planning and carrying out investigations; signs in nature tell you about weather
- *Likes or dislikes- Very child friendly; great ideas of things to do with class!
- *Implementation in your classroom

Book and Author	Activity	Math	Science	Literacy
<i>Oh Say Can You Say What's the Weather Today?</i> By: Tish Rabe	Make a cloud in a bottle. Create a rain gauge. Create an anemometer. Demonstrate tornado with water in a bottle.	Chart temp. rainfall chart air pressure	Track storms cloud formation water cycle predictions (weather)	Vocabulary Folklore predictions (what will happen next in the story)

Friday, 2 August 2013

- Sharing your favorite lesson
- Discussing the Charting the Temperature

Classroom visit

One of the requirements of the grant was to observe the teachers. Dr. Pinchback made two visits to Mr. Hope's fourth grade class. During one visit, she observed his class working in groups to research the regions of Arkansas and the weather in that region. Using the Internet, the students looked at the past three months of rainfall, high and low temps, and the average temperature. Each group worked to create a Power Point for the presentation to the class. When the presentations were completed, he had the students compare and contrast their region with other regions in Arkansas.

Dr. Pinchback was very impressed with Mr. Hope's lesson. He incorporated mathematics, science, technology, and literature. The students were familiar with Fahrenheit and Celsius scales, they discussed the climate regions, seasons, and the like. They were quite comfortable using the laptops for their power point presentations. In researching their region, they read about the Earth's atmosphere, solar energy, layers of the atmosphere, etc.

According to Mr. Hope, his students loved talking about weather in general. It is something that is easily observable every day and the students love trying to predict the weather. The students also love using the computers any time they can. The students enjoy making their PowerPoint different than others. With the research students noticed that just in our state we have a big difference in land types and that affects the different weather conditions around the state. My impression was that the students learned a great deal about the regions in Arkansas at the same time they were learning weather patterns and how land effects weather conditions. Incorporating technology in the class is always good because kids are practicing skills that they will use in the real world.

For future use, he wrote, "we will track weather in these regions as we go. And what I mean is this project stems from our weather calendar. We keep a weather calendar for a month on the

weather conditions in our city: highs, lows, rainfall, and pressure & humidity. Next time I will do the same for all regions so when we come to our presentations there will be more information at hand."

In responding to the question, "Were there any ideas that you received from the training that influenced you for this lesson?" He stated, "Absolutely. In our STEM Summer II session we talked about the regions of AR and there similarities and differences. This prompted me to add this to our weather unit. We learned of the regions and their features while researching their weather patterns in my class."

Additionally, Dr. Pinchback asked him if any student's or group's work appealed to him and why. He responded, "There were several groups that had appealing work. The presentations were simply outlining the highs, lows, and rainfall for each region, but a few groups went as far as to say what the average for each month was in their region."

One of his favorite power point presentations is as follows.

Weather in three U.S cities

By : Luke, Taylin, and Zuriel

Weather in Las Vegas

Sep. avg. 94 high 71 low rain 0.25 in.

Oct. avg. 81 high 59 low rain 0.27 in.

Nov. avg. 67 high 47 low rain 0.36 in.

Weather in Miami

Sept.avg.87 high 78 low rain 7.88in.

Oct.avg.84 high 75 low rain 4.47in.

Nov.avg.79 high 70 low rain 2.74in.

Weather in Chicago

Sept. Avg. 75 high 58 low rain 3.03in.

Oct. Avg.63 high 58 low rain 3.24in.

Nov.avg.49 high 35 low rain 3.42in.

Summery

The lows range from 58 to 78 and the highs range from 75 to 94 in September. The lows range from 46 to 75 and the highs range from 63 to 84 in October. The lows range from 35 to 70 and the highs range from 49 to 79 in November. The rain ranges from 0.25 to 7.88 in. in three months.

References

Articles

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Table#1
 Partner School District's Science Benchmark and SAT 10
 Scores

School District A Science	BB	B	P	A	SAT 10	Poverty	FRL
5th Grade	20.8	37.8	33.2	8.1	47	31.84%	66%
Demographics	White	Black	Hispanic	Asian	Native Am	others	
	32.32	58.93	6.93	1.37	0.31	0.07	
School District B Science							
5th Grade	20.5	60.7	17.9	0.9	62	25.54%	50.1%
Demographic	White	Black	Hispanic	Asian	Native Am.	Others	
	90.45	6.86	3.31	0.28	0.51	0.17	

BB=Below basic, B=Basic,
 P=Proficient, A=Advanced

Table #2
 Partner School District's Science Benchmark and SAT 10
 Scores

District A Science	BB	B	P	A	Poverty	FRL
5th Grade	12	36	32	11	24.3%	70.1%
Demographics	White	Black	Hispanic	Asian	Native Am	others
	33.6	58.8	6.60	0.90	0.10	0.07
District C Science						
5th Grade	12	37	43	9	33.9%	52.7%
Demographic	White	Black	Hispanic	Asian	Native Am.	Others
	90.45	6.86	3.31	0.28	0.51	0.17

BB=Below basic, B=Basic, P=Proficient, =Advanced

