Program Context

This eLearning professional learning (PL) program will be implemented each spring term as a service for middle grade level science teachers. The program utilizes five expert science content instructors in areas of meteorology, climate, geology, astronomy, and biology to facilitate and develop online content. Teachers may select one of the five online science content courses the program has available.

The virtual environment for this program is designed for virtual classroom collaborating, and has a blended format, synchronous and asynchronous communication tools and face to face instructions. Collaboration includes two face-to-face labs and electronic messaging, such as email, discussion boards, and Webinars. The PL content instruction is structured to strengthen classroom instruction of middle school science objectives. The time frame of one class is equal to a semester term. The subject area reflects a high need, as indicated by the Georgia's Criterion-Referenced Competency Tests (CRCT), 2009 middle school science scores (see Appendix B). The subject content is aligned to the Georgia Performance Standard (GPS). The overall purpose of the program is to increase student achievement in middle school 6th grade level science (meteorology, climate, geology, astronomy and biology).

Funding for participating teachers is not currently available. Efforts to acquire stipends for participants are making progress, as school administrators consider possible funding options.

Theory of Change

The goal of the program is to increase science content knowledge of middle school science educators currently teaching middle school science. In addition to increasing content knowledge, the program will provide enhanced science teaching practices utilizing Web-based

tools for teachers to use in their middle school classrooms. By extending the reach of content expertise of the science center to the middle school community via PL eLearning, the overall goal is to increase student learning in science content.

Learning approaches using Information and Communication Technologies (ICT) provides many opportunities for constructivist teaching (Oliver, 2002). The ICT settings can enable learning to be related to context and practices unlike the conventional lesson planning approaches (ibid,). Bodies of researches indicated that constructivism theory is a suitable philosophy for online learning environments, ensuring the "learning among learners" (Koohang, 2009). Education based on cognitive theory and implemented using online tools will allow prior learning experiences to scaffold the learning experience further (ibid,).

To ensure a strong foundation this online professional learning (PL) model is guided by the NCSD Standards (see Table 1).

Table 1

NCSD Standards	
1. Learning Communities	A hybrid learning environment (face-to-face workshops and online collaborations) a focus on middle school science content. The program will provide 2 to 4 PLUs for collaboration and participation online over a period of a one semester term.
2. Leadership	Content instructors will complete the required platform course online and develop online modules according to their area of expertise.
3. Resources	Grant money has not been approved for participants (middle school teachers) as of yet, but this is considered a possible option. Teachers will be able to participate online at their convenience. Content facilitators will integrate online responsibilities as a part of the regular schedule.
4. Data Driven	Science CRTC assessment scores for 6^{th} - 8^{th} grade levels and subject benchmarks (standards) support model informing for the purpose of increased learning in science by all students (below and above assessed standards)
5. Evaluation	In order to determine the anticipated increase in science content knowledge: Participants/Teacher will participate is pre-survey and post-survey

	assessments. The instruments, a pre-test-survey for planning evaluation, and the post-test-survey for summary evaluation is used. See Appendix D. Observation of classroom practices and student learning during the school term. These observations by the content instructor will serve as summative qualitative input, employing a Likert-type scale. See Observation Survey-list Appendix E. Data for Formative evaluation will include online participation experiences (qualitative), online content assessed knowledge gains (quantitative). Student learning will be assessed by comparing previous CRCT scores to post program CRCT scores.
6. Research Based	Research indicates content learning achievement is similar to face-to-face learning, and research indicates increased learning of content is more likely from on-going programs.
7. Design	Two face-to-face lab/workshops and online content design, this semester school term program, requires follow up observations of practices in the classroom
8. Learning	Content and the virtual environment provide collaborative learning to enhance science knowledge and promote enhanced skills/practices for the classroom. Online constructivist and content andragogy practices mirror classroom methods and expectations (engaging science content).
9. Collaboration	Facilitators and participants will engage in the learning of content process, collaborating with utilizing online Web tools.
10. Equity	Differentiated module assignments allow for classroom practice needs (assisting teachers to meet the diverse needs of their students)
11. Quality Teaching	eLearning instructional methods, appropriate to science content, will utilize web applications that facilitate participatory information sharing, interoperability, and online assessments.
12. Family Involvement	Provide web based tools intended for student uses, real world applications will be widely integrated over the course of the class, to be shared and useful for the lives of students outside of school.

This online PL model reflects an andragogical approach theorized by (Knowles, 1980) in his four basic assumptions about learners:

1. Learners' self-concept moves from dependency to independency.

2. Learners accumulate a reservoir of experiences that can be used to build learning.
3. Learners' readiness to learn is increasingly associated with the tasks and social roles.
4. Learners' time and curricular perspectives change "from postponed to immediacy of application and from subject-centered to performance-centered.

Knowles' approach along with the theory of online learning prescribed by Nichols (2003) is employed here for several reasons, foremost for the basic belief that "technology is pedagogically neutral." Online learning is a term that describes education that occurs through participation through the use of the Web. In the education community eLearning is a more adequate descriptive term that defines Web participation and use of technological tools that are Web-based or Web 2.0 tools. E-Learning may or may not be combined with face-to-face instruction (ibid,)

Logic Model

The logic model (see Appendix A) is based on the Evaluability Assessment Rubric as proposed by Killion (2008).

Users and Purpose of the Evaluation

The primary audience for this evaluation is the DeKalb County Board of Education and local school administrators. The overall purpose of this evaluation is to indicate the effectiveness of PL for science content using an eLearning environment. This examination of data will be used to determine changes in participants' content knowledge as a result of program participation. Depending on the degree of the program's effectiveness, as determined by evidence and data interpretation, the evaluation results will assist administrators in making the decision to support, continue, or expand the PL program. Negative results will support program

cancellation. The evaluation results will be reported to administrators and education board members.

Throughout the program process assessments of online practices will serve as formative analyses. These assessments will be conducted using the online interface management system. The results for this ongoing examination of data will inform the implementation process. Any needed program adjustments will be addressed by program organizers. Such adjustments will be made to ensure program objectives are being addressed throughout the program implementation and are appropriate for the purpose of serving the learning needs of all participants.

Evaluation Questions

1. What are pretest scores for teachers?
2. What are posttest scores for teachers
3. Has content knowledge of teachers increased after participating is the program?
4. To what extent are teachers accessing specific instructional web content within the PL program?
5. Has science achievement of students of participating teachers shown an increase that is reflected by the Georgia Criterion-Referenced Competency Tests (CRCT)?

Level of Impact

The level of impact for the summative program goal, to increase teacher content knowledge, is addressed by level 4 "Assessing application of learning" (Killion, 2008) This is an indicator of student learning (level 5, Assessing student learning) and the results from pretesting and post testing will be reported to administrators and the board of education. A second summative goal is addressed at level 5 "Assessing student learning" to determine student impact and teacher classroom practice changes, and will be utilized by program shareholders.

The planning and formative program assessments will occur during the face-to-face introduction of the online collaborative learning experience, addressing the content objectives to increase teacher knowledge, and skills regarding science content and classroom practices.

Evaluation Framework

Three methods will be employed by this proposed evaluation in order to determine program effectiveness as indicated by Guskey's five levels of evaluation, participant reactions, participant learning, organization support and change, use of new knowledge and skills, and student learning outcomes (Guskey, 2008). The first method is formative and quantitative. Using a pretest, called a survey, teachers will provide data by completing the survey during the online program introduction in a face-to-face lab. The survey will be administered by the content instructors. The survey will provide a formative assessment, and the results will be used to address any planning adjustments needed to begin facilitation of the online content/course.

The extent that teachers access specific instructional web resources during the programs implementation will be logged by the interface management program. This method will provide a statistical assessment of pedagogical content practices on Web tools aligned to the professional development objectives. The Web interface management statistics will serve to indicate strengths, such as (1) use of online science content resources, (2) use of specific content instructions that reflect science concepts, techniques, and tools.

Repeating the first method, the pretest survey becomes the posttest in the summative assessment of teachers' learned content knowledge. The posttest-survey will be administered by the content instructors on the last day of the class during the second and final face-to-face lab requirement. The pretest and posttest surveys together will provide a summative data and serve

as evidence to the effectiveness of the program. The third evaluation method is summative and quantitative, and will address increases in student achievement as assessed by the Georgia Criterion-Referenced Competency Tests (CRCT) science content scores. CRCT science content scores of previous instructional years will be compared to the CRCT scores of the post program instructional year. This third method along with the qualitative observation survey data will form a triangulation in the assessment that to serve as strong evidence of the program's merit.

Data Collection Procedures

The use of three methods to collect data will provide the benefits of a triangulation collection process. The first instrument is a pretest-survey and will be administered in the first face-to-face class, during the introduction of the eLearning term. The pretest-survey will be administered by a content instructor serving as an online facilitator. School administrators will be responsible for collecting and organizing of the data. As a formative application, the criteria assessment will initially be used to specifically identify content knowledge of participants, as described by science curriculum and the Georgia Performance Standards (GPS) for science. This formative data will be used to inform the program and permit facilitators to address content needs.

The pretest-survey will also serve as the posttest-survey, and will again be administered to participants by facilitators. At this time, in the second face-to-face class at the end of the online term, the survey will serve as the summative assessment. This posttest-survey data will be evaluated by program administrators to establish the impact of the program. The survey (see Appendix C) assesses content specific criteria in a multiple choice format.

With the use of a second tool, online content resources will statistically assess participants' usage of online content and resources. This formative assessment by the Web interface management program will inform the implementation process. This data will be evaluated by program administrators, and their analysis will establish patterns indicated by the online practices of participants during program implementation. This Web interface managed data will be available to the content online facilitators.

A third instrument and the forth method to collect data will compare students' Criterion-Referenced Competency Test (CRCT) scores. The student CRCT science content scores will be compared prior and post to the professional development (PD) online program. The standardized collection of data using all three instruments will provide specific and credible reflections of content knowledge (and instructional practices) using a technology component (eLearning).

Data Analysis

The aggregated data will be analyzed using two formative methods and two summative methods. The pretest-survey will be used to inform the implementation process and serve as the baseline measure for science content knowledge. The pretest and posttest (survey) scores will assess and indicate changes in science content knowledge. All quantitative data (scores) will be analyzed using the Statistical Package for the Social Sciences (SPSS).

In order to control the effects of the covariates and increase statistical power, all survey item responses will be converted to dichotomous scores (1=correct, 0=incorrect) and used as quantitative data. This converted data will be employed in an analysis of covariance (ANCOVA). This analysis will determine significant differences in means to measure a probability value of $p < 0.05$. One hundred survey items assess content knowledge (see

Appendix C). This process of measuring content knowledge before and after the PD program will provide results linked to program impact.

Monitoring and query functions will examine aspects of data that reflect the properties of online functions by participants. For example, a participant is actively accessing program resources in modules associated with areas that are in need of strengthening, or after completing modules and moving forward without additional use of online content once completed. A formative method, this process of measuring content experiences during the PD program will provide results linked to changes in practices and program impact.

In examining the Criterion Referenced Competency Test (CRCT) scores, student data will be compared from previous years to students' scores after the PD program. A quantitative analysis using the independent-samples *t* test will compare the means of the students' CRCT scores. The CRCT scores reflect students' achievement by students of participating teachers, prior to and after the PD Program. This will be conducted because group randomization is not possible, however a comparison of CRCT scores may indicate changes in science content knowledge and indicate a link to the PD program. According to the Georgia Department of Education, The CRCT is designed to measure acquire the skills and knowledge as described in the Georgia Performance Standards (GPS). Findings are used to diagnose individual student strengths and weaknesses as related to the instruction of the GPS.

Data Interpretation

Findings from this evaluation will serve to inform stakeholders of program impact. The value of the program will be dependent on changes indicating effectiveness of the program.

Summative evidence that specifically indicate increases in content knowledge of the participating teachers and their students will provide support for program expansion.

Dissemination

The findings of this evaluation will be provided to the lead administrator, the director of the center. The report may be useful to justify program funding in the possible pursuit of grant monies for the expansion of the program. Due to the sensitive natural of the collected data reflected in this evaluation, the report will be formally presented to the director. The presentation of these evaluation results will provide an opportunity to discuss worth and merit of the program as interpreted by the director, given the statistically significant changes presented. In addition to the presentation for the director, the director , school board member and office of superintendants will be provided with a report document that outlays the program's framework, evaluation methodology, such as data collection procedures, test scores, test questions, and statistical analysis, along with the evaluation findings and recommendations. This 5 to 8 page report will document in text, numerical data and graphical diagrams.

Budget

Due to the internal nature of this evaluation, the evaluation funding, along with the program implementation cost, will be absorbed into the center's operational budget. This is possible because the center's mission and instructional responsibilities include providing PL to the county it serves.

Evaluation of the Evaluation

Due to the appropriate methodology of the evaluation process and the quantitative analysis of the collected data, evaluation findings can serve as evidence of a credible nature. Changes in content knowledge can be linked to the implemented program. Such findings can be

interpreted by stakeholders. Strong evidence will permit informed decisions and policy that can directly impact student achievement.

Conclusion

This online PL program is a new addition to the list of services the center offers to the county and the wider science community. The program has the potential to serve its largest audience ever, but its implementation is not without its challenges. Should the findings of the evaluation enable a strong claim of effectiveness; the momentum of the program's growth will accelerate and the program will be a success.

Appendix A – Program Logic Model

Input	**Activities**	**Initial Outcome**	**Intermediate Outcome**	**Intended Results**
Content Instructors	eLearning content & facilitation of a virtual learning community			
Middle school science teachers	Online participation/collaboration & 2 Face-2-Face labs Follow-up Observation	Introduction to eLearning and the Virtual Interface	Experiences with collaborative eLearning in science content	Participants gain content knowledge and impact student learning

Indicators			
Summative: Teacher pre- and post-test (surveys measuring content knowledge and gains)	Summative: Comparison of CRCT Student scores Prior and post PD program	Planning and Formative: Teacher pre-test (only)	Formative: Online content on-going assessments monitored by the Web Interface Manager

Appendix B – CRCT Scores

Number of students tested	Grade level	Exceeded	Met	Did not meet expectations
6,840	6th grade	9.0%	45.9%	45.0%
6,854	7th grade	18.9%	40.9%	40.3%
6,962	8th grade	7.5%	39.7%	52.8%

County CRCT (The Georgia Criterion-Referenced Competency Tests) science scores

Appendix C – GPS Benchmark Assessment (1 – 5)

Survey (1), Meteorology

1. In abundance (volume) in the atmosphere, this gas comprises 78% of the Earth's atmosphere.
   a. Oxygen c. Carbon Dioxide
   b. Water vapor d. Nitrogen

2. What process produces clouds?
   a. condensation
   b. evaporation
   c. warming
   d. radiation

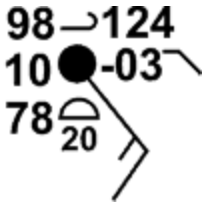
3. Use the weather station (here below) and identify the temperature value.

   a. 98°F

   b. 124°F

   c. 78°C

   d. 78°F



4. Which of the following is a <u>true</u> statement:
   a. Cloud droplets freeze once temperature drops below 0 ° C.
   b. Water vapor has a gray tint
   c. Water vapor is a liquid
   d. Super cool cloud droplets are below 0 ° C.

5. "Weather" is different from "climate" and is defined as:
   a. An element of the jet stream
   b. A certain condition at a certain time and place

c. The result of a populated area
d. Documented information

6. The Spring, Summer, Winter, and Fall season are a direct result of what phenomenon?
   a. The Milky Way
   b. Orbit of the moon
   c. The 23.5 ° tilt of the Earth from vertical
   d. The jet stream

7. What causes differences in air pressure over the Earth?
   a. Warm air rises at the equator, and cold air sinks at the poles
   b. Warm air sinks at the equator, and cold air rises at the poles
   c. Warm air rise at the equator, and cold air rises at the poles
   d. Cold air rises at the equator, and warm air sinks at the poles

8. What air mass type forms over Canada?
   a. mP
   b. mT
   c. cP
   d. cT

9. What is the value of the average seal level pressure reading?
   a. 1000 mb
   b. 2000 mb
   c. 1013 mb
   d. 2013 mb

10. What instrument is used to measure pressure?

    a. thermometer
    b. barometer
    c. hygrometer
    d. clinometer

11. Clouds with some vertical development and located in the upper levels of the atmosphere, with a lumpy appearance and are made of ice crystals. When viewed from the surface, each cloud element is about the size of a thumbnail.
    a. Haze c. Cumulonimbus
    b. Fair weather clouds d. Cirrocumulus

12. What is the boundary between two air masses commonly known as?

a. A line
b. A front
c. A millibar
d. A low

13. With an increase in altitude, air pressure:
    a. Decreases at an increasing rate
    b. Decreases at a constant rate
    c. Increases at a constant rate
    d. Decreases at a decreasing rate

14. What instrument is used to measure wind speed?
    a. anemometer
    b. thermometer
    c. compass
    d. geiger counter

15. An isobar is a line of equal _____.
    a. Pressure c. Temperature
    b. Density d. Dewpoint

16. Hot air rises because:
    a. It is full of pollution
    b. It has nowhere else to go
    c. It is less dense that cold air
    d. It is more dense that cold air

17. What happens when air temperature is approaching the (or same as) the dew point temperature?
    a. Relative humidity is increasing
    b. Evaporation increases
    c. Winds shift indirection
    d. Winds are calm

18. A saturated air parcel with a temperature of 10 ° C has a saturation mixing ratio of 7 grams per kilogram; A second air parcel with a temperature of 20 ° C has a saturation mixing ratio of 14 grams per kilogram; From this information, what is the" most likely" saturation mixing ratio of a parcel of air at 30 ° C? (Hint: warmer air holds exponentially more water vapor; the temperature/saturation mixing ratio relationship is not linear.)
    a. 17.5 grams per kilogram
    b. 19.0 grams per kilogram

c. 21.0 grams per kilogram
d. 26.5 grams per kilogramEth

19. Which of the following is not conducive to lake effect snow?
    a. Continental polar air advecting over warm Great Lake waters
    b. Strong vertical directional and speed shear with positive LI's
    c. Orographic lifting and frictional convergence
    d. Large temperature difference between lake and overriding cP air

20. Which of the following is a diabatic process, as compared to an adiabatic process?
    a. Convection
    b. Orographic lifting
    c. Radiational heating or cooling
    d. Rising air due to PBL convergence Their

21. Lines that separate areas of high and low pressure on a weather map are:
    a. Lattitude
    b. Longitude
    c. Isobars
    d. degrees

22. Lightning can travel from cloud to cloud.
    a. True
    b. False

23. What kind of weather is mostly associated with a high pressure system?
    a. Dry, stable conditions with little cloud
    b. Hot, humid days with high winds
    c. Rainy conditions
    d. A rapid increase in temperature

24. A head of a cold-front the air is
    a. Colder
    b. Warmer

25. Behind a cold-front the air is
    a. Colder
    b. Warmer

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