

Education Seminar # 1: Lesson Planning, NOS, & Journal Article Publication

Speaker: Dr. Andrea Burrows, GK-12 and RET Grant Coordinator, University of Cincinnati

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Times: 9:00 - 11:30 AM

Venue: University of Cincinnati, Old Chem. 615A

Prepared by:

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The first Educational seminar for the 2011 RET participants was presented by Dr. Andrea Burrows, Grant Coordinator for both the NSF Graduates K-12 (GK-12) and the Research Experience for Teachers (RET) at the University of Cincinnati. Dr. Burrows received her B.S. in Science Education/Biology from the University of Central Florida (UCF), M.S. in Science Education from Florida State University (FSU), and Ed.D. in Curriculum and Instruction from the University of Cincinnati (UC). Since 2007, Dr. Burrows has held the NSF GK-12 and RET grant coordinator position at UC. In August 2011, she will join as Assistant Professor of Secondary Science Education at the University of Wyoming. In addition to teaching courses at UC, Dr. Burrows has taught at Northern Kentucky University (NKU) since 2006. Prior to these university experiences, she worked as a middle and high school science teacher for 12 years in Florida and Virginia. Her research explores partnerships between teachers and scientists.

The purpose of this session was to provide the RET participants with information relating to some of the deliverables that must be completed by the end of the summer program. This session was important to answer some questions about the expectations for teacher participants and also to provide a framework for the teachers to work in so that the lessons and journal articles that are prepared in the correct format and are true to the Nature of Science. Some photos of the session are presented below.



Dr. Burrows Conducting the Lesson Planning Seminar

Each teacher participant must create, submit, and implement an original lesson plan. The lesson each teacher creates will likely be more like a unit plan instead of a single lesson plan. So the submitted lesson plan will in actuality be only a portion of the lesson taught in the classroom. One of the key

things to remember in creating this lesson is that it does not have to mimic the research conducted this summer, as some of the facilities and resources will not be possible to replicate in the classroom. However, the lesson plan does need to be based in what accomplished or learned during the 6 week research period.

A lesson plan template has been created and published that RET teachers should adhere to as they create their own unique lesson plans. All items in the lesson plan template will be covered as the lesson plan is fully developed, however, the highlighted items are perhaps the most important aspects that need to be addressed. Instead of typing directly into the template, RET teachers should create their lesson plan in an outline format on a new page following the template, taking care to include all associated letters and numbers and to provide information relating to all the highlighted areas in the previous page. It is encouraged to keep the heading information the same from the template page to the actual lesson page created by each teacher. This will allow for the differences that will no doubt be present as 12 different teachers create their own unique lesson plans centered on the research that was accomplished over the 6 week program.

Some important specific things to take care to include on the lesson plan are the Application, Career potentials, and Societal impact (ACS) for this lesson. An example that is specific to the Water Quality project would be as follows.

- A - Create a small device to test water quality for contaminants following a natural disaster. (Describe how to apply the research in a different way, to something in the future, or to another area aside from Engineering)
- C - Engineers, waste water treatment facility employees, scientific researchers. (Describe some potential jobs associated with your lesson or research area)
- S - Providing clean water for people in developing countries or supplying water to improve the lives of those in rural or socioeconomically disadvantaged areas. (Describe how this research or lesson affects people)

The duration of time also needs to be included in the lesson plan, including the number of class days and amount of time per day. Another important part of the lesson plan is the Standards section. It is vital to include at least two of the STEM (Science, Technology, Engineering, and Math) content standards in each lesson plan, as one of the goals of this program is to create cross curricular connections. The objectives for the lesson must be measurable, and should be constructed using Bloom's Taxonomy, with focus on the higher levels of questioning. The misconceptions may be fleshed out using any number of online resources for optimum accuracy. The materials section should include all physical items and any other technology or classroom resources needed to complete the lesson as intended. The instructional strategies need to be planned to a level of great detail, with the teacher knowing exactly what they wish to accomplish in the lesson for maximum interactive and hands-on experiences for students. An active, student led lesson plan will ensure that the teacher scores well on the RTOP evaluation by the UC assessment representative. The learner participation should be specific about what the teacher is expecting the students to do before, during and after the lesson.

From the assessment perspective for the lessons, it is important to determine how students will be assessed. Will there be a verbal or written assessment? Will students create a poster or give a presentation? The teacher should develop between three and five essential questions relating to the lesson, that should be more than simple knowledge based questions. It is possible to use these questions and others on the Pre and Post tests surrounding the lesson. These Pre and Post tests are very important, and should consist of approximately ten questions (including the devised essential questions) and may include multiple choice, true / false, matching, or others. A reflection must be submitted by the teacher following the lesson. This reflection should cover topics relating to the success (or lack thereof) of the lesson, and suggestions for changes or revisions before future iterations of the lesson. It is important to make sure that the objective, activity, and assessment are all aligned.

Dr. Burrows then asked the RET participants to spend time brainstorming how the teachers can connect their research to their classroom. Time was spent working on the teachers' lesson plan ideas individually. Then the research partners were encouraged to discuss their ideas with each other.

The next topic discussed during this workshop was the nature of science (NOS) and how the NOS connect to the lesson plans the teachers develop. Dr. Burrows asked the teachers to take some time to answer the questions: *"What is the nature of science and how do you think you will use it?"* After the discussions, ideas were shared about what the NOS means. The discussion included that science is a particular way of understanding the natural world. Science is a different kind of knowledge and way of thinking. Science is logical, linear, but at the same time, inventive. Scientists must be flexible to change when new ideas are discovered or presented. Science has longevity and durability, because science is tested, accepted (not necessarily proven), and then withstands until a better idea comes along. Science does not necessarily explain everything, but it can predict. Science is a way to revisit a problem and make something better. The teachers were also provided with resources about the NOS from the following resources, so teachers can use NOS principles in their lessons.

Some useful websites for reference were give, which included:

- <http://www.project2061.org/publications/sfaa/online/chap1.htm?txtRef=&txtURIId=%2Ftools%2Fsfaaol%2Fchap1.htm>
- <http://evolution.berkeley.edu/evosite/nature/index.shtml>
- http://www.teacherlink.org/content/science/class_examples/Bflypages/nos.htm
- <http://www.nsta.org/about/positions/natureofscience.aspx>

The final deliverable discussed during the seminar was the journal article. Teachers were instructed to look at guidelines for their journal of interest (such as NSTA). The journals usually require 2000 words per article. The journal article should share what was done and how it was done. Journal articles are not feel good articles. Teachers must write as if writing to another teacher who you will have no contact with the lesson except for the article. The reviewers will want to know why they should take this to other teachers and how students and teachers benefit from the lesson/article. Dr. Burrows also discussed that the journal article will be revised after the lesson is completed so that it represents best practices for the lesson.

In conclusion, this educational seminar provided the RET participants with information regarding deliverables required for the program. Dr. Burrows instructed and answered questions relating to both the lesson plan and the journal article. Dr. Burrows also included discussions on the NOS and how it relates to the lesson plan and journal article. After this seminar, teachers are equipped to begin writing the lesson plan and the journal article.