P1.72 PHYSICAL SCIENCE 3223: INTRODUCTION TO ATMOSPHERIC SCIENCE

Brian M. Cudnik*
Prairie View A&M University, Prairie View, Texas

1. INTRODUCTION

Since the AMS Diversity Project workshop in May 2002, we have offered the *Online Weather Studies (OWS)* course as an independent study course and as a component to the current Earth Sciences course (PHSC 4013). Several science education majors enjoyed material from *OWS*, presented by Brian Cudnik, within the Earth Science course taught by Dr. Cleo Bentley. Our focus was on weather that affects the Southeast Texas region as well as tools and methods for weather data collection and forecasting. Challenges included: significant activity involving the upgrading of the physics laboratories and department, establishing the four-track Physics major program, submitting a number of education proposals (several of which the use of *OWS* will be especially important), and changes in faculty personnel (one retired, another has started in Fall 2003). The Coordinating Board granted approval in the spring of 2003 to offer the *OWS* Course in its entirety at Prairie View A&M University. A technicality prevented the course from being offered in the Fall of 2003, but will be offered in the spring of 2004.

2. BACKGROUND

2.1 *PVAMU and the Physics Department*

Prairie View A&M University, part of the Texas A&M system of universities, is a Historically Black College / University (HBCU), a land grant institution founded in 1876. The main campus is located some forty miles west northwest of Houston and about one mile north of US Highway 290. The Department of Physics, situated on the third floor of the New Science Building, is in the process of upgrading its program with the introduction of a four-track program within the physics major. Three new specialized laboratories were established in the past year: the Computational Physics Laboratory, the Physics Learning Center, and the Science Education Center.

2.2 *Previous Offerings of Online Weather Studies at PVAMU and Challenges Faces so Far*

Since the AMS Diversity Project workshop, we have offered the course *Online Weather Studies* (OWS) both as an independent study and as a unit within the current Earth Sciences course (PHSC 4013).

* Corresponding author address: Brian M. Cudnik, Dept. of Physics, Prairie View A&M University, Prairie View, TX 77446; e-mail: mailto:Brian_Cudnik@pvamu.edu

The students who took the course, mainly education majors enjoyed the material from *OWS* presented by Brian Cudnik, within the Earth Science course taught by Dr. Cleo Bentley. Our focus was on the weather and climate of the Southeast Texas region as well as tools and methods for weather data collection and forecasting. No one has yet taken the independent study version of this course at PVAMU as of this writing.

Individual exercises and small groups of exercises from *OWS* have been modified and utilized to serve as exercises for the Pre College Institute for juniors and seniors in high school preparing to attend college and held in June of each year. The material has also been used recently as a laboratory exercise on weather forecasting within the existing Physical Science Survey laboratory (PHSC 1121).

The main challenge has been the lack of meteorological knowledge among the faculty and staff with the exception of Brian Cudnik and a geophysicist, Dr. Aluka. Another challenge has been lack of time due to a number of measures we are involved in with regards to upgrading the physics laboratories and department, to include the new four-track program, a number of education proposals (for many of which the use of Online Weather Studies will be especially important), and changes in faculty (one retired in the Spring of 2003, another hired in the Fall of 2003).

3. A NEW COURSE IN THE PHYSICS DEPARTMENT

3.1 *Approval to Offer the New Course*

We were approved by the Texas Higher Education Coordinating Board to offer *Online Weather Studies* as a stand-alone course (with the course designation PHSC 3223, entitled *Introduction to Atmospheric Science*) starting Spring 2004. This course offering is part of a larger plan to implement four tracks within the Physics Major, a plan that took effect during the summer of 2003. Along with the new course itself, we will once again offer part of this course within the existing Earth Sciences course as well as an independent study.

3.2 *The Purpose and Content of the Course*

OWS will be offered following the general outline of the textbook *Online Weather Studies.* Couched within each week's meteorological study topics will be the critical thinking / diversity component for that week, enabling students to have an added dimension to their studies while teaching them to "think outside the box".

Each student has his or her own worldview, as a result of their upbringing, personal characteristics and behavior patters, temperament, and lifetime experiences including education, events, and environment. Very often, one's worldview is shaped in the image of one's own culture, to the neglect of other cultures. The Diversity component will not only give the student a toolbox of critical thinking skills, but will introduce them to perspectives different from their own, to give them an appreciation of the bigger world they do not typically experience in everyday life, apart from the media.

Students likely to take this course are science education majors and science majors. The course is a 3000 level course, so it will be somewhat more involved than what it would be at the freshman introductory level. However, the course will still be geared toward those who have had little meteorology or science exposure. Table 1 outlines the proposed structure of the course, as it will be taught, and it includes both the weather and the critical thinking topics.

Table 1. Tentative Outline of PHSC 3223.

Wk.	Ch.	Weather Topic	Critical Thinking Topic
1	A	Weather Analysis, Forecasting	None
2	B	Atmospheric Optics	None
3	1	Monitoring Weather	Introduction to Critical Thinking
4	2	Atmosphere: Origin, Composition, & Structure	Interpretation & Inquisitiveness
5	3	Solar & Terrestrial Radiation	Analysis & Systematic
6	4	Heat, Temperature, & Atmospheric Circulation	Explanation & Reasoning with Confidence
7	5	Air Pressure	Testing Models & Objectivity
8	6	Humidity, Saturation, & Stability / Mid Term Exam	Formulating Significant Questions & Perseverance
9	7	Clouds, Precipitation, & Weather Radar	Transfer Insights into New Contexts & Reasoning with Confidence
10	8	Wind & Weather	Transfer Insights into New Contexts & Insightfulness
11	9	The Atmosphere's Planetary Circulation	Explanation & Truth Seeking
12	10	Air Masses, Fronts, Cyclones, & Anticyclones	Evaluating Theories & Open-mindedness
13	11	Thunderstorms & Tornadoes	Interpretation & Truth Seeking
14	12	Hurricanes	Developing Criteria for Evaluation & Judicious
15	C	Climate, & Climate Change / Review for Final Examinations	None
16	--	Final Exam	None

3.3 *The Facilities Used in the Instruction*

Two of the new specialized laboratories within the Physics Department will serve the delivery of this course quite well. The Physics Learning center has nine desktop computers set up with Web access, which the students can use anytime. Also, the Science Education Laboratory has resources to aid in the teaching and learning of *OWS*, including DVD's and hands-on equipment. Images of these facilities are shown below.

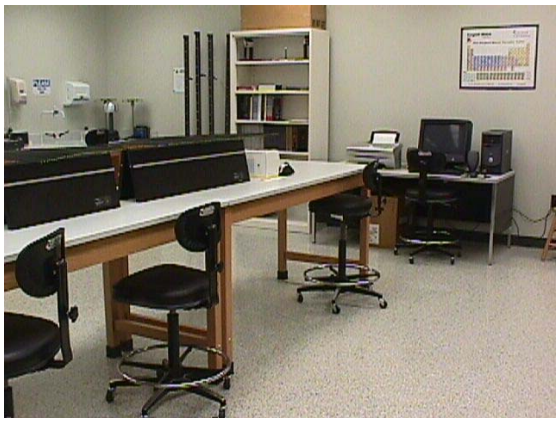
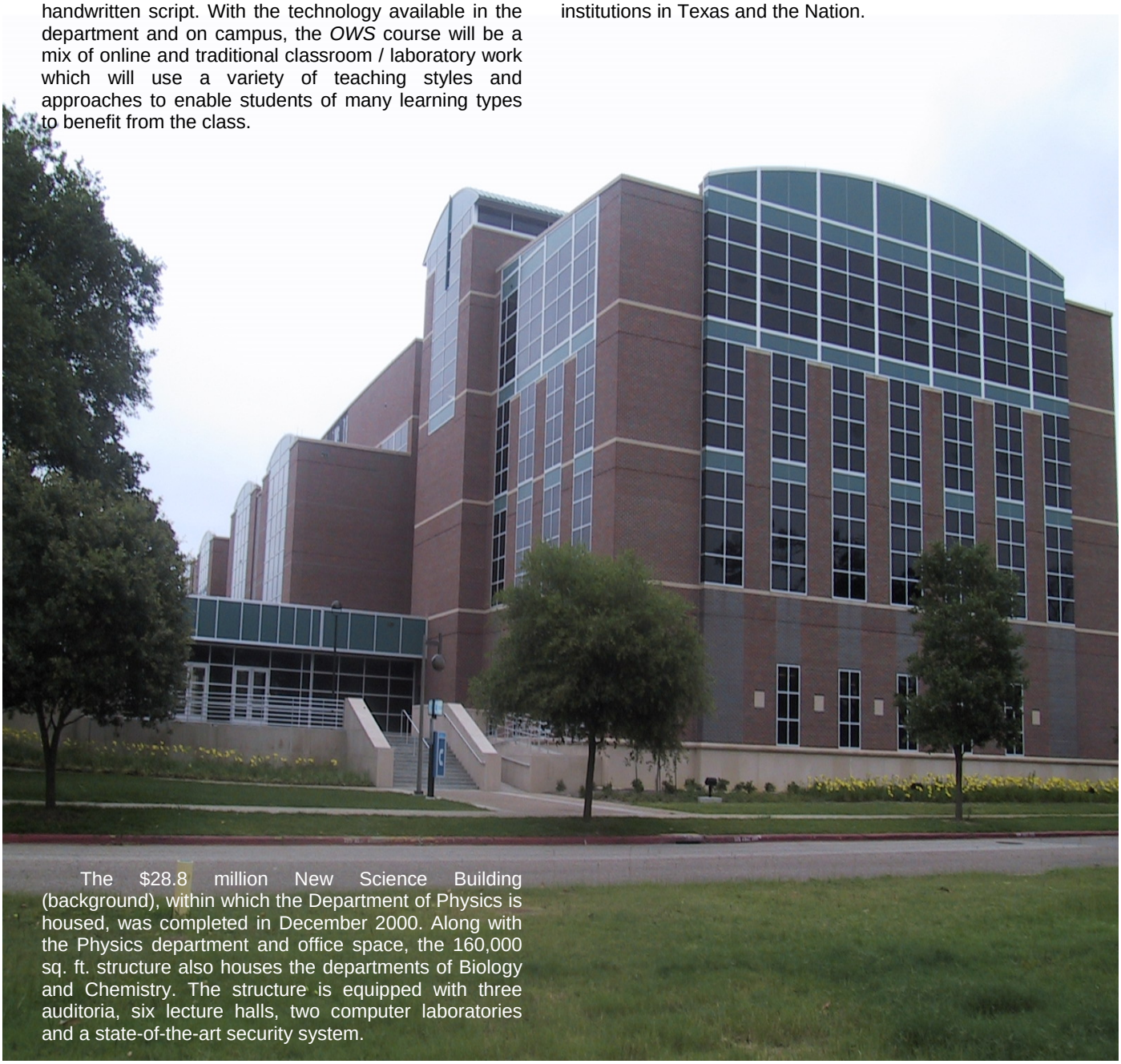


Figure 1. Two views of the Science Education Laboratory

Figure 2. A bank of computers in the Physics Learning Center

One of the principle elements of the *OWS* presentation will be the use of a variety of technologies. Online demonstrations and weather briefings will be made using a Smart Board (pictured below), a device that enables an instructor to interact with the computer desktop or an Internet browser in a manner that allows the entire class to see. Not only can the instructor control the computer's desktop from the board, but also he or she can write on the board as they present a topic, much like an on-camera meteorologist writes arrows, pointers, and circles on the weather map he or she is describing. These notes written during a given class period using a Smart Board can be saved and published online at a secure site for later student access, either as an image or converted to a standard text font from handwritten script. With the technology available in the department and on campus, the *OWS* course will be a mix of online and traditional classroom / laboratory work which will use a variety of teaching styles and approaches to enable students of many learning types to benefit from the class.

Supporting PVAMU is the IT department, which provides the students, faculty, and staff with resources that are reliable and secure enabling them to achieve excellence in their work. Also, PVAMU has a complete telecommunications infrastructure that links most University buildings and carries fiber, coaxial, and voice cables encased in conduits and concrete. The entire campus has access to the World Wide Web (Internet II), Electronic Mail, and the Student Information System (SIS), as well as access to video conferencing through the campus-wide Video Distribution Network. Several Trans Texas Video Network (TTVN) receiving sites are located around the campus as well. These TTVN sites enable various departments to connect with other institutions in Texas and the Nation.



The $28.8 million New Science Building (background), within which the Department of Physics is housed, was completed in December 2000. Along with the Physics department and office space, the 160,000 sq. ft. structure also houses the departments of Biology and Chemistry. The structure is equipped with three auditoria, six lecture halls, two computer laboratories and a state-of-the-art security system.

One important use of TTVN is the Texas Electronic Coalition of Physics, operating out of Texas A&M University, Kingsville, and connecting to over a half-dozen campuses Texas-wide. This network enables these small Physics departments to increase their productivity by offering classes to all participating member institutions. At least two of the campuses, TAMU-K and PVAMU offer *OWS*, and with the TECP capability, look to enable a wider range of students to take this course.

In addition, several proposals written to the National Science Foundation and several organizations make use of the *OWS* as part of their projects. The *OWS* has a multi-fold purpose of integrating technology and several physical sciences into a comprehensive study of the phenomenon of meteorology. The proposals make use of these facts to integrate *OWS* into their projects.

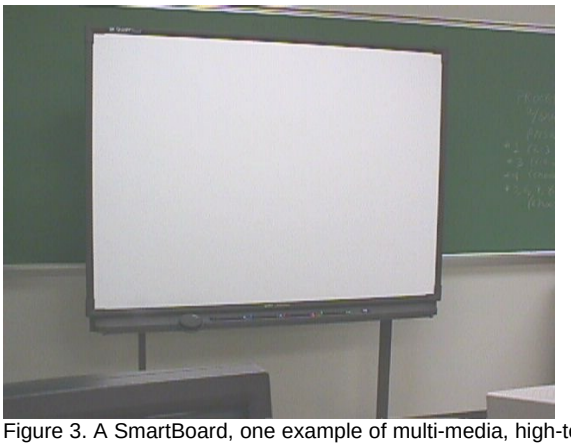


Figure 3. A SmartBoard, one example of multi-media, high-tech equipment used in instruction

One example of such a proposal is the National Science Foundation's Course, Curriculum, and Laboratory Improvement. Our proposal seeks to improve the enrollment in Science, Technology, Engineering, and Mathematics (STEM) through innovative approaches, to include the use of *OWS*. As of this writing, the proposal was still under consideration for funding by NSF.

4. CONCLUSIONS

In conclusion, the Department of Physics at Prairie View A&M University is in the process of improving its course offering, facilities, and technology in an effort to provide students an environment conducive for learning. The course is offered in a variety of forms to enable students the flexibility of either taking the entire course or just part of the course, depending on their educational needs. One section of OWS, entitled PHSC 3223, An Introduction to Atmospheric Science, utilizes state-of-the art technology to present the course in a manner conducive for learning. Facilities are available to enable students to participate in the online portion of the course within the department, as well as perform some of the laboratory exercises associated with the course. The critical thinking component of the course is included to equip students with the skills they need to effectively take science courses and do science in the real world. In addition, this component introduces students to ways of thinking and cultures that are different from their own, while maintaining the scientific focus of the course.