1.1 WEATHER INVESTIGATORS OF NORTHEAST – LOUISIANA (WIN-LA!)

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1. INTRODUCTION

A one week summer camp "Weather Investigators of Northeast-Louisiana (WIN-LA!)" was sponsored by the University of Louisiana at Monroe (ULM) during July 2003. The residential camp focused on the study and analysis of weather as an integrator of math and science using select SkyMath materials and ideas as a basis for activities (www.unidata.ucar.edu/staff/blynds/Skymath.html). These were related directly to the Louisiana K-8 Mathematics Proficiency Core, particularly the benchmarks for Data and Reasoning.

The summer camp was funded by the state's LA GEAR-UP program (as part of the larger federal program) and targeted to the "at-risk" 7th graders. The intent was to help younger students (1) learn about the atmosphere and weather, (2) integrate the math and science needed for meteorology content, (3) provide content and skills for academic achievement as related to the Louisiana Math Proficiency Core, (4) promote skills development, critical thinking and problem solving through camp activities, (5) offer exposure to the college-setting, careers exploration, and (6) illustrate the professional community and strengthen the tie of the atmospheric science program at ULM to the broader community of the public, educators, and professionals of northern Louisiana.

2. PREPARATIONS FOR WIN-LA!

Staffing for the project included the Project Director, a school teacher, and two undergraduate student majors in atmospheric science. All staff was provided basic project materials (plan of work, ULM guidelines, similar) prior to project performance. While each served in a variety of roles, all provided for direct mentoring and counseling for the participating 7th graders.

Participant applications were sought through a variety of mailings, phone calls, media releases, emails, and facsimile transmissions. The majority of these were completed through the Delta RSI Office at ULM with the exception of media releases, emails, and some facsimiles completed via the ULM Public Affairs Office, and the Department of Geosciences.

An application brochure with program information was distributed to all GEARUP school systems (except high school or lower elementary) during the first week of May based on mailing information provided by Delta RSI. Three sets were mailed to each school system addressed as "Science/Math Coordinator", "Guidance Counselor", and "Principal" with names added when known. The same information was also sent by facsimile to the schools during the third week of May.

Additional contacts were made with teachers and administrators to "get the word out" by Delta RSI and other resources at ULM (e.g., Teaching and Learning Resource Center) during the fourth week of May. During these weeks and the first three weeks of June, calls were made to schools by the PD and others to request applicants. Emails and facsimiles were again sent based on information supplied at the LA GEARUP orientation meeting in Baton Rouge.

All applicants provided a copy of school transcripts, letter of recommendation, one page typed essay, a "commitment and follow-up" statement, and information regarding insurance, emergency contacts, and dietary or physical restrictions. The applicants were then mailed information relevant to their participation including a "Permission and Consent" form for their attendance as well as follow-up activities for the ensuing school year.

3. WIN-LA! SUMMER CAMP ACTIVITIES

On the first day (Sunday), project staff greeted all participants during the check-in process at the Slater Hall Dormitory at ULM. Participants were provided a ULM folder of materials that included a nametag (for identification at meals and to learn one another's names), a ULM sticker, a copy of their signed consent form, the ULM organizations directory sheet, notes on notebook entries, the 'to bring' listing, a campus map, and a pen. In addition, two presentations were provided – one on the "WIN-

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LA!" program for the student and guardian – the other for the participant's teacher/school district upon return in the fall.

After getting settled in their rooms, the participants were given a walking tour of campus (and 'goody-bag', ULM Recruiting and Admissions) to familiarize them with the campus. Afterwards, a meeting was held to review basic rules, safety, and regulations of their stay and their participation in the weather camp activities. The ACES Student Form, supplied by the LA GEARUP Program Office, was distributed for completion by all participants. General introductions were made prior to a dinner cook-out.

On the second day (Monday) participants were given a tour of the facilities of the Department of Geosciences in Hanna Hall following their first journal entry. Entries were made in participants' notebooks each day in the morning, prior to lunch, and at the end of the day's activities. The journals were intended as personal reflections as well as a log of activity, learning, and later assessment. In addition, all completed a pre-test on their knowledge of weather. This test was given again on the last day for direct comparison. Other activities for participants included use of the ULM Activities Center for physical recreation and the Student Union Building.

Group, or Team, assignments were made for focusing of activities. These included Mississippi River commerce, police/fire/hospital, and scouting camp operations. Activity Monday morning centered on the nature of weather (including a short portion of video), making observations, considering qualitative versus quantitative measures, and the need for instrumentation. During the afternoon, the HOBO sensor was demonstrated using a laptop computer and associated software. In addition, a tour and discussion of library resources was provided so that participants would not only see a university level facility, but also be able to access materials later in the week.

During the remainder of Monday afternoon (and Tuesday through Thursday afternoons), a ULM Mathematics faculty worked with participants to teach simple data analysis. This included aspects of plotting and graphing (time series and scatter plots), summarizing (mean, median, other statistical measures), and other methods of data analysis. Participants were provided handouts as well as opportunity to work with Excel spreadsheets (which they constructed) to learn and master these skills.

On Thursday they were able to recreate these and perform other functions with TI-73 Explorer Graphing Calculators. These skills were helpful when the participant groups (teams) analyzed the data they collected on campus (on Tuesday). Other principles (e.g., time lag or response of instrument, error identification, related) were also illustrated through the application of these techniques. Evening activities included assessment of thunderstorm activity of the day in the Gulf States using the computer laboratory in the dormitory. This was supervised by the undergraduate meteorology majors.

Activities on Tuesday considered the variation and response of temperature and sunlight. Graphs of time series were useful to illustrate these (e.g., LSU Ag-weather website) and provided background on how variations occur in time and space. Participant groups then planned and completed a deployment of HOBO sensors on campus. Each group placed two sensors at each of three locations for data collection. The remainder of the morning was used to discuss thunderstorms and severe weather and included a video. All sensors were retrieved after lunch for data download.

The afternoon also included a visit to the ULM Career Services Center for career exploration activities. Mathematical and statistical analyses also considered conversion factors and the use of scatter plot relationships. In addition, ULM undergraduate meteorology majors from another research project (COMET Partners Project - see acknowledgements) provided a weather map discussion and forecast including a visit to the rooftop to observe cloud development. A visit by TV-8 also provided the participants with a chance to describe their weather camp experiences to that time.

On the fourth day (Wednesday) participants were given an assessment test (1. A unit is defined as…) and a "homework" assignment. The assignment focused on integration of knowledge, skills, and critical thinking to solve three problems. This was followed by a lengthy discussion of thunderstorm attributes and severe weather (including storm chasing). This included physical explanations and video of direct encounters with storms. In addition, a visit by both TV-10 and the News-Star Newspaper allowed participants and staff an opportunity to discuss their knowledge and skills gained thus far.

On Thursday participants rotated between the computer laboratory (Hanna Hall), the meeting room (plan/discuss presentation and strategy), and the ULM library. This provided time to analyze their collected data and to consider the context of their

focus group. Another assessment test was provided (1. Write a fraction…) and during the afternoon the TI-73 Explorer Graphing Calculators were introduced and used. Following the day's activities, weather camp tee-shirts were distributed, a cookout was held (inside due to rain) and followed by a gathering in the dormitory for an "awards" ceremony (staff to participants) and for games provided by the ULM Office of Student Affairs.

On Friday final preparations led to presentations by each participant group including a question and answer period. This was attended by weather camp staff as well as additional meteorology majors and provided a professional flavor to the proceedings. Brief discussion of their performance afterwards focused on the nature of a college-level education, the expectations and requirements, and the importance of career exploration.

A post-test was then provided on weather knowledge (and the same as Monday's) and followed by program assessment. Participants were reminded of follow-up activities planned for the ensuing school year and certificates of completion distributed during final journal entries. Notebooks were collected for analysis and all participants and staff completed their check-out from the dormitory and left campus by Noon.

Staff was consulted throughout activities and during "off-times" to ensure personal needs were being met and that participants were benefiting from their weather camp experience. Pictures were taken during the entire course of the program and on the final day participants said farewells and signed one-another's shirts.

4. ASSESSMENT: WIN-LA!

The assessment for this project was based on tools to assess participant performance, abilities, knowledge or skills gained, and their program evaluation. Each of these were completed through the use of one page question sets and distributed during the course of the weather camp. These included two mathematics-based question sets (for general assessment of participant background ability), a pre- and post- weather test (for program assessment), an essay or word problems sheet (for integration and synthesis), and a program assessment sheet (programmatic). From the responses, although not used to assess performance, it was clear that participants had significant spelling and grammatical errors.

For the two mathematics-based question sets (i.e., "1. A unit is defined as…" and "1. Write a fraction…") were derived from the LA Core Proficiency Standards for the 5-7th grade levels and based in part on their relation to project activities in mathematics and weather. These question sheets were given Wednesday and Thursday of the weather camp in order to include impacts of the weather camp activities completed by participants. The intent was to establish participants' level of knowledge and their ability to work with mathematical concepts.

While the individual maturity-level of the participants played a role in some of the responses, most responses provided a clear depiction. These are ultimately useful in assessing participants' ability to learn and understand new material and to relate mathematical concepts to a scientific investigation. From these two question sets it was clear that less than half of the participants understood the concepts of dimensions, conversion factors, dependent and independent variables, variability, and the definitions or uses of percentages and averages.

Although these were not directly presented to the participants during the weather camp activities, they do serve (to some extent) as markers of their ability in the underlying principles of science and math. In addition, less than half were able to express numbers in decimal or powers of ten format, negative number sequences, the definition of a square root, how to define or calculate volume, and unable to correctly identify the larger of units (i.e., degrees Fahrenheit versus degrees Celsius and Meter vs. Yard). Based on these results, it is more readily clarified what the participants did and did not learn and integrate in their weather materials.

The pre- and post- weather test was designed to consider the basic aspects of atmospheric science in terms of definitions, observation, analysis, and application. The intent was to determine improvements in this knowledge and their ability to link this information conceptually and apply it to new situations. As weather and climate are often portions of K-8 science education programs, it was expected that the participants would show some working knowledge prior to the program. The essay (or word problems) sheet of questions was given (as a 'homework' assignment) in order to assess their ability to apply knowledge and use critical thinking skills. Questions were focused on: #1 – scenario, dilemma, justification, and reasoning; #2 – scenario, planning, options or alternatives, and ramifications; #3 – quantitative analysis based on set rules with no obvious context (or situation).

In their responses, the participants showed a greater precision and integration of concepts (e.g., atmospheric composition and weather causation) as well as the ability to conceptualize and relate information. In most cases the level of improvement was minor, but significant in that it represented improved (or more robust) knowledge and use. The last two questions, although biased (i.e., participants were involved in related activities on the day of the test), provided immediate feedback on principles being used during the weather camp program. Their responses to the essay sheet questions indicated an ability to recognize 'unspoken' hazards and the urgency of an issue (#1), the nature of planning (#2) although under-estimating ramifications of choices, and inability to solve a purely quantitative analysis.

The program assessment sheet was distributed at the end of all project activities. Questions were designed to evaluate the participants' opinion of the camp, their abilities in math and science, their use of technology, other factors, and the ULM facilities. A scale of 1 through 5 was used (strongly disagree to strongly agree) to assess their opinions. Open answer questions focused on what participants felt to be the "best and worst" aspects of the camp and what their plans for school and career were.

The average score of responses for all numeric questions ranged from 4.0 to 4.7 indicating general to strong agreement on camp goals being achieved. The lower scores were associated with math comfort, ULM comfort, and extra-curricular activities. Although the lowest score (4.0) concerned their learning of "new things" during the project, it still indicated that participants agreed they had learned new things.

The higher scores were for developmental skills (e.g., spreadsheets – 4.7 average score), the use of technology (instrumentation sensors and calculators), staff assistance, and ULM facilities. Free response questions indicated that best items of the weather camp included technology and severe weather whereas worst items focused on journal entries and class-time. Participant responses to their school and career plans were predominantly positive although somewhat ambitious considering their current skills and abilities. They appeared to be more motivated to achieve these than previously expressed.

Aside from these assessment tools, journal entries of the participants and staff were also reviewed to determine other elements, aspects, and anecdotal evidence of project success. The entries, to be returned with notebooks to the participants during follow-up activities, were examined with regard to content, growth, and satisfaction (or feelings of the time).

Journal entries of the participants reflected content acquisition based on comments about facilities (geosciences museum), tornadoes, balloons to illustrate the atmosphere and weather balloons, cloud and storm formation, wind and other instrumentation, as well as definitions of the mean, median, mode, and range of data. In terms of growth comments focused on computer use and skills (e.g., spreadsheets, graphing, charts), calculators, and refined use of these. Other growth mentioned included principles behind a rain gauge ruler (the 10:1 scale), miles per hour as distance over time, comparing reality (rooftop cloud observations) to instrument observation, and "how not to waste time" at work.

Satisfaction (or "feelings") of participants could be characterized as positive, or positive and negative. Comments included amazement at the types of sensors and how they related back to the human senses, having fun with graphing and the instruments, and enjoying cookout and activity center time. A few expressed a desire for more computer time, were nervous prior to their presentation, and would have liked to continue longer (or come back again). Some results were equivocal (e.g., videos – one indicated boring, another liked the movies).

Journal entries of the staff were reviewed for consistency and with regard to their formative assessments and interactions with the participants. Staff comments were primarily with regard to the difficulties expected for the given age group (e.g., attention span, behavior, personalities and maturity). Their entries indicated computer lab work (e.g., spreadsheets) and field work (e.g., HOBO sensors) were particularly helpful.

Staff felt that some aspects of the experience may have been somewhat overwhelming (e.g., journal entries, some of the statistics) and one thought the final day presentations questioning of participants unfair. It is noted that this questioning was performed merely to recreate the college environment in which participants might find themselves in several years. Additionally, the journal entries were necessary for assessment tracking and therefore a requirement for this project.

While participant teams also generated graphs and other materials in their analyses, these were not archived for review. Impact and dissemination assessment will not be possible until follow-up activities with LA GEARUP school districts are completed.

5. FOLLOW-UP PLANS: WIN-LA!

Longitudinal and time-based assessments will be made during the school year through follow-up visits to both the schools of the participants and to those identified by the LA GEARUP program. In this manner the project may have impact beyond the summer camp time-frame and serve other at-risk 7th graders in the state. Visits were scheduled to take place in November and February 2003-2004. It is hoped these will encourage the school to implement weather-based activities in its math and science curriculum.

Other means of assessment include the observed and/or documented use of graphing calculators in the schools, establishment of weather observations and tracking by the participants, integration of weather with math and science (and across other subjects in the school's curriculum), and cooperation with and support from undergraduate Meteorology Majors working in the ULM Climate Research Center. These provide comprehensive and complementary support to the participants and their schools for lasting impact.

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