

Western AR Coop and the University of the Ozarks: Math and Science through Technology (MAST)

Math and Science through Technology (MAST) is a collaborative effort between the Western Arkansas Education Service Cooperative (WAESC) and the University of the Ozarks (U/O) to promote the use of research to improve both teaching practices and learning. The schools of the Arkansas River Valley have shown progress in achieving the goal of NCLB, however, there remains work to be done. The Common Core State Standards (CCSS), as well as newly adopted rules for teacher licensure, has created a need to restructure and shift instructional focus, especially during the middle school years. These shifts will require an increase in content knowledge, changes in pedagogy, and a closer focus on the interdisciplinary approach to education. Many of our teachers are unprepared to teach at the middle level especially with the depth these new standards prescribe. We are greatly concerned about learning progressions in mathematics as students advance from number recognition and simple math functions into ratio and proportional reasoning. Even though there are fewer standards in the new CCSS, these standards must be taught at a deeper level of knowledge. MAST will afford teachers an opportunity to develop a meaningful approach to total student instruction based on content integration which will include science, literacy and technology in addition to mathematics.

The MAST partnership is a collaborative of thirteen public and one private middle school, the University of the Ozarks, Janet Huckabee River Valley Nature Center (JHRVNC), and Western Arkansas Education Cooperative. Each school provided two math and two science participants from their mid-level faculty, with emphasis placed on the 5th-7th grade teacher.

MAST began in November of 2013 with an organizational meeting at Western Arkansas Education Service Co-op in Branch, Arkansas. Forty-three teachers and six staff members attended the meeting. The initial meeting included registration, an informational program, initial teacher testing using the Diagnostic Teacher Assessment in Mathematics and Science, and three hours of professional development in technology.

Meeting again in the spring, MAST participants collaborated in the creation of a student centered STEM competition for participating school. The competition was held at Waldron, Arkansas on May 2, 2014. Over 2,500 students participated in the competition which was a part of the "Big Idea" and student based learning envisioned as a major goal of MAST.

During the spring of 2014, MAST staff visited and evaluated each teacher using the Reformed Teacher Observation Protocol (RTOP). Base-line data were established with subsequent evaluation occurring during each year of the MAST grant.

Major teacher content and pedagogy was delivered to participants during a two-week long seminar held from July 7-18, 2014. The University of the Ozarks played host to a week of the summer institute on their campus and provided teachers for course instruction.

MAST focused on an integrated approach to STEM education. The MAST curriculum provided hands-on, student centered instruction in which students utilized math, science, and literacy skills to solve real world problems. Specifically, MAST :

- Provided instruction over multiple grades at increasing levels of understanding and depth;
- Had broad importance across multiple sciences, math, and engineering disciplines;

- Related to the interests and experiences of students;
- Connected to real world concerns that require a strong foundation of STEM knowledge.

Week one consisted of specific content instruction in mathematics, technology, and science. Teachers were offered choices of concurrent classes with topics ranging from data collection and evaluation to electrical circuits.

Week two was held at the Janet Huckabee River Valley Nature Center (JHRVNC). Week two was devoted to an integrated approach to instruction. Instruction included robotics, visiting an electrical generating plant and lock and dam, study of the speed, momentum and vectors of projectiles, to measuring heights of trees using triangulation. Additionally, teacher groups were required to develop and present a lesson using the Picture Perfect Literacy/Science program developed by the National Science Teachers Association (NSTA). Picture Perfect is a nationally acclaimed and recognized program which assists teachers into integrating the literacy component required by Common Core State Standards into the content classroom.

Additionally, teachers were introduced to several new programs and teaching methods that will be visited in more depth each subsequent year of the grant. These included Thinkfinity, Gizmo, Google Earth, I-Pad Apps, PENDA, Moddle, Edmodo, and others.

JHRVNC also provided staff and instruction in using the facility as an outdoor classroom for the region. Teachers were provided information and materials for conducting lessons on the use of compass, geocasting, animal and bird identification, and water resources. They were also encouraged to attend free training in Project Wild, Learning Tree, Forest of the World, and Places We Live. All of these are national outdoor programs that assist teachers in providing an integrated literacy, science, and math approach to instruction. Several of the teachers have arranged to work closely with the center during the 2014-15 school year.

Assessment of the MAST program will consist of three specific measurements. These are (1) increase in content knowledge of teachers, (2) measurement of teacher effectiveness through RTOP evaluation, and (3) increase in student achievement as measured by Arkansas benchmark scores in math and science.