Charles J. Eick, Mary Lou Ewald, Velma B. Richardson, Karen Anderson

Building a Leadership Network Supporting Science Education Reform in Rural East Alabama

The authors argue that leadership networks when comprised of regional stakeholders including university faculty, school system administrators, and teacher leaders can begin to work together towards common reform goals.

Many of us who are in science teacher education in rural and impoverished areas lament the lack of resources and support available for practicing a higher quality of science instruction in our regional schools (Harmon, Henderson, & Royster, 2003). While National Standards (National Research Council, 1996) call for teaching science through inquiry, most of our regional teachers do not have the hands-on resources or professional support needed to do so. What we teach and model in our science teacher education programs often gets 'washed out' upon entering our regional schools. Without support for inquiry, our science teachers are reliant on methods where content is disseminated through lectures and textbooks, including textbooks that can be more than five years old! To add insult to injury, these traditional approaches to teaching science are most detrimental to diverse populations of students who are steadily increasing in our schools (Lynch, 2000). Teaching through inquiry where students work together to seek scientific understanding through evidence meets the needs of all learners. This problem has not gone unnoticed, as many state and federal funding agencies have targeted underserved populations of students through various grant opportunities. However, over the years, these well-meaning efforts bring limited and temporary relief to the few schools that participate in them. Despite all the talk of what is needed for systemic reform, university faculty often continue to apply for science outreach grants in a 'hit-or-miss' fashion based on what opportunities are available. If successful, they will later gather together partners to discuss implementation to meet the grantor's requirements, and not the real long-term needs of science education reform (Hall & Hord, 2006). Yet, even with the best of intentions, grant-based reform is elusive as big state and federal dollars for systemic reform in rural areas are limited. How can real change in science education begin to happen in such a harsh environment? How can we capitalize on the human resources and existing infrastructures in our large rural regions to make a real difference?

Without support for inquiry, our science teachers are reliant on methods where content is disseminated through lectures and textbooks, including textbooks that can be more than five years old!

Initiating Systemic Reform Efforts

Professional development experts in science education agree that meaningful and lasting reform requires three basic elements: (1) collaboration of all stakeholders, (2) ongoing professional development using research-based strategies that work, and (3) the availability of resources and materials for teaching science through inquiry (Loucks-Horsley, 2003). If reform is to occur in our regional schools and be sustainable, then these elements must be present. Our first step was to *develop a network of stakeholder support* as the vehicle for implementing a common vision of reform that we could all strongly share (Lasley, Matczynski, & Williams, 1992). Our initial stakeholders included higher educa-

tion faculty and administrators from education and science, K-12 teachers and administrators (including superintendents, principals, and curriculum coordinators). We needed to initiate meetings with all parties in order to reach consensus on shared expectations for reform. Many collaborative reform efforts fail because of diverse expectations for the collaboration and its work (Spector, Strong, & King, 1996). Networking and meeting to begin and support reform are low cost and vital to any successful long-term effort. Our first big decision was to discern who was best suited to initiate or broker this process.

Many collaborative reform efforts fail because of diverse expectations for the collaboration and its work.

In rural East Alabama the two major universities, Auburn University and Tuskegee University, were best suited to initiate the building of the stakeholder network needed for systemic reform efforts in science education. Both land-grant institutions had historically garnered grants for science outreach programs in K-12 schools. Each had key leaders in science and education who spent much of their time working in outreach. Those of us in the College of Education at Auburn University initiated the conversation with the science faculty of the two institutions to create a new collaborative organization that could become both leadership and clearinghouse for reform efforts. Leadership was needed to develop and direct a common vision of science education reform and help implement reform efforts in the region's school districts. We were keenly aware that successful partnerships treated all stakeholders with an equal voice but still required designated leaders who were responsible for making reform happen (Dallmer, 2004). Such a collaborative organization could both chart and direct professional development initiatives to meet our commonly held goals for reform. The decision to model this organization on similar successful efforts in math education in our region led to the name of TEAM-Science: Transforming East AlabaMa Science.[1] However, none of this would be possible without having the regional school systems as a partner in this process. How TEAM-Science was formed as a network of science education stakeholders and its early initiatives as a vehicle for 'doable' reform are discussed.

Phase I: Building the Collaborative Network of Leaders

To begin to develop the network of stakeholders, we began meeting with regional superintendents and district curriculum coordinators. We shared our intent to collaborate with all 15 regional school systems to help build the infrastructure needed to meet the goals of reform for our region. These initial goals included developing a network of science teacher leaders from each school district, initiating common professional development for these teachers, and working together to apply for systemic grant funding that met these goals. Application of the concept of *teacher leadership* empowered early teacher reformers

Leadership was needed to develop and direct a common vision of science education reform and help implement reform efforts in the region's school districts.

to take leadership roles in changing science teaching in their districts. Our next goals were to garner support of regional school principals to develop school-based teacher practitioners (K-12) with the needed professional development to begin the process of reform at every school. Our approach to effective reform was always viewed as 'top-down' and 'bottom-up'. Without both administrative and teacher support any systemic reform would be doomed to failure (Loucks-Horsley et al., 2003). Our ultimate goal was the improvement of student motivation and achievement in science, reflected in the required '**No Child Left Behind'** legislation.

Forming the infrastructure for a meaningful higher education and K-12 partnership does require a limited amount of initial funding. Most of the fifteen rural school districts in our region operate on very limited resources, even foregoing textbook adoption cycles in order to use these funds for more immediate infrastructure needs. Local corporate partners could provide the initial needed funds, particularly if a relationship already exists. In these early networking efforts of TEAM-Science, the universities provided the limited funding needed for these meetings and the secretarial support to disseminate information. Auburn University's Regional Inservice Cen-

[1] The TEAM-Science initiative was seeded through internal university funding from Auburn University's Outreach Office and the Colleges of Education and Sciences and Mathematics.

ter was already set up as a vehicle for coordinating general teacher professional development and regional contacts. Most universities or regions have a similar organization already in place. School district leaders were more than happy to work with us in these efforts for the benefit of their teachers and students. Each district provided us with a list of possible teacher leaders at each grade level who could begin the grass-roots efforts for TEAM-Science.

Forming the infrastructure for a meaningful higher education and K-12 partnership does require a limited amount of initial funding.

Phase II: Using the Network to Tackle Immediate Needs

Once teacher leaders were identified, the first agreed upon effort in professional development was to collectively operationalize the greater mission and goals of TEAM-Science. Mission and goal statements were crafted (See Figure 1). The first leadership project for teachers from the fifteen districts was an immediate need to create curriculum guides which met the state's new course of study. The development of curriculum guides (or frameworks) for planning and teaching was foundational for reform efforts and doable without external funding. The alignment of the state's new course of study standards with national standards and the new high stakes assessments would be the bedrock upon which inquiry-based reform efforts would start. This same approach in developing a "standards-based curriculum of the highest quality" (Brady, 2002, p. 38) was also an important step to improving student achievement in other similar reform efforts. Aligning 'what was taught' in science at each grade level could

Figure 1. Transforming East AlabaMa-Science Mission, Beliefs, and Goals

Mission Statement

The mission of TEAM-Science is to transform science education in the East Alabama region so that all students are empowered through scientific literacy to contribute responsibly to society.

Our Beliefs

- We believe that science facilitates students' ability to think critically as they analyze and synthesize data in order to solve problems using a scientific approach.
- We believe that inquiry-based teaching is the best approach to developing scientifically literate students.
- We believe that students must take challenging, high quality science courses in order to meet their post-secondary education goals.
- We believe that curriculum alignment and high quality curriculum resources are essential for successful learning of science.
- We believe that science teachers must be supported through ongoing professional development and resources in order to successfully teach through inquiry.
- We believe science educators, school system administrators, scientists, elected officials, and the community should work together for the enhancement of science education.

Our Goals

- Students will successfully communicate scientific understanding and solutions to scientific problems in written and oral form.
- Teachers will enter the profession with the content knowledge and abilities to implement instructional strategies and high quality curricula that support inquiry-based education.
- Students will be prepared to enroll in advanced level high school science classes. Teachers in East Alabama will have access to a curriculum aligned with state and national standards, accountability testing, and the appropriate text resources to support it.
- Teachers and science education stakeholders will participate and benefit from professional development that is ongoing and embedded in classroom practice.
- Higher education, local school systems, state education agencies, business partners and parents will work together to build collaborations that systemically support science education in East Alabama.

have a substantial impact on science achievement scores similar to mathematics (Schmidt, Houang, & Cogan, 2002). It also would form the basis on which professional development on 'how to teach' through inquiry would occur.

One of the most important parts of educational collaborations that works is the professional personal relationships and trust that are developed through working together towards a common vision of reform.

Working over the course of one summer, teacher leaders crafted curriculum guides that would align what was taught in science at each grade level and across grade levels. Within these curricular frameworks other initiatives flowed including the evaluation and selection of appropriate textbooks supporting the frameworks; textbooks that were often the only purchased resource for teachers (See TEAM-Science web site: http://teamscience.auburn.edu). Guided discussion and reflection on effective teaching approaches and what was most important for student learning became a routine part of this process.

Phase III: Linking the Network to State Initiatives

The initial TEAM-Science leadership, composed of higher education professors, district superintendents, district curriculum coordinators, and select teachers, soon began working on sustainability efforts for the collective vision of reform. Private and public grant funding opportunities that met our long-term goals were discussed and sought. One opportunity in particular was the state's initiative to fund local centers that would provide kit-based inquiry science resources (STC™ and STC-MS™) and ongoing professional development for teachers in grades K-8. This initiative was already funded in many regions of the state with early successful results in improving student test scores in science (Alabama Math, Science, and Technology Initiative (AMSTI), 2006). Toward this endeavor, we used our collaborative network of stakeholders to disseminate information about this program and how we could collectively work to obtain it for our region.

In an effort to better position ourselves for such funding we began a summer professional development effort with the middle grades science teachers in our region on how to use these kit materials. We recruited these teachers through the TEAM-Science network. The response to our request was overwhelming with as many as 40 middle school teachers from all fifteen school districts volunteering to participate. Our original teacher leader network only totaled approximately 50 teachers, K-12. Although university personnel set up this development, teacher leaders in the original network actually led the training and professional development on these materials. In a fairly short timeframe of 18 months, we began to reap the benefits of a functioning network of stakeholders and leadership where regional teachers and administrators were an integral part. This ongoing work did not go unnoticed by our state, and through our lobbying efforts our region was recently designated a new site to begin receiving limited funding to begin the AMSTI initiative in the middle grades (grades 4-8).

Early Fruits of a Collaborative Leadership Network

One of the most important parts of educational collaborations that works is the professional personal relationships and trust that are developed through working together towards a common vision of reform (Darling-Hammond, 1994; Spector, Strong, & King, 1996). By including all stakeholders in our early reform efforts, we have been able to sustain a school system-university network working towards systemic change in our region's science classrooms. Teacher leaders are a vital part of this network if reform is to eventually occur in each teacher's classroom. We have already seen the development of inter-school networking where leaders in each school system reach out to each other in TEAM-Science reform efforts in the classroom. As time passes, we are confident that our continued work through the TEAM-Science collaboration will reap further benefits, as teachers already in the collaboration mentor their colleagues in effective, inquiry-based practices, and they in turn become new teacher leaders. In addition, pre-service teachers in formation at both universities will be able

Teacher leaders are a vital part of this network if reform is to eventually occur in each teacher's classroom.

to work with these same teacher leaders in the classroom as they jointly enact inquiry practice with new resources provided through the AMSTI program. The universities' role will continue to provide leadership in helping coordinate these efforts through sustainable professional development meeting our shared vision for the improvement of science education in our region. We still have a long way to go in systemically leading this work as we continue to hear from university colleagues of their varied and many outreach efforts in science education that are not part of the mission of TEAM-Science. Coordinating all our efforts in this systemic endeavor will be required for a greater collective impact on schools and lasting reform. We have at least begun this process. The seeds of inquiry-based science instruction have been planted into rich, fertile ground. With continued care and attention, we look forward to a bountiful harvest of student achievement in the future.

References

Alabama Math, Science, and Technology Initiative. (2004). *2005 Evaluation Results*. Retrieved June 22, 2006, from http://www.amsti.org

Brady, T. E. (2002). Building natural science communities. *New Directions for Higher Education*, 119, 37-39.

Dallmer, D. (2004). Collaborative relationships in teacher education: A personal narrative of conflicting roles. *Curriculum Inquiry*, 34 (1), 29-45.

Darling-Hammond, L. (1994). *Professional development schools: Schools for developing a profession*. New York: Teachers College Press.

Hall, G. & Hord, S. (2006). *Implementing change: Patterns, principles, and potholes. Boston*: Pearson/Allyn Bacon.

Harmon, H., Henderson, S., & Royster, W. (2003). A research agenda for improving science and mathematics education in rural schools. *Journal of Research in Rural Education*, 18 (1), 52-58.

Lasley, T. J., Matczynski, T. J., & Williams, J. A. (1992). Collaborative and noncollaborative partnership structures in teacher education. *Journal of Teacher Education*, 43, 257-261.

Loucks-Horsley, S. , Love, N., Stiles, K. E., Mundry, S., & Hewson, P. W. (2003). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press.

Lynch, S. J. (2000). *Equity and science education reform*. Mahweh, N.J.: Erlbaum Associates.

National Research Council (1996). *The national science education standards. Washington, D.C.*: National Academy Press.

Schmidt, W., Houang, R., & Cogan, L. (2002). A coherent curriculum: The case of mathematics. *American Educator*, 26 (2), 10-26.

Spector, B. S., Strong, P. N., & King, J. R. (1996). Collaboration: What does it mean? In J. Rhoton & P. Bowers (Eds.), *Issues in science education* (pp.177-184). Washington, DC: National Science Education Leadership Association & National Science Teachers Association.

Charles J. Eick is Associate Professor of Science Education at Auburn University in Auburn, Alabama. Correspondence concerning this article may be sent to eickcha@auburn.edu.

Mary Lou Ewald is Director of Outreach, College of Sciences and Mathematics, Auburn University.

Velma B. Richardson is Professor and Director of the Howard Hughes Medical Institute Undergraduate Biological Research Program, Tuskegee University, 209 Armstrong, Tuskegee, AL 36087

Karen Anderson is Math Science Technology Coordinator for the Auburn City Schools.