

A District-University Partnership to Support Teacher Development

by Katherine Wade-Jaimes, University of Memphis; Shelly Counsell, University of Memphis; Logan Caldwell, University of Memphis; & Rachel Askew, Vanderbilt University

Abstract

With the shifts in science teaching and learning suggested by the Framework for K-12 Science Education, in-service science teachers are being asked to re-envision their classroom practices, often with little support. This paper describes a unique partnership between a school district and a university College of Education. This partnership began as an effort to support in-service science teachers of all levels in the adoption of new science standards and shifts towards 3-dimensional science teaching. Through this partnership, we have implemented regular "Share-A-Thons," or professional development workshops for in-service science teachers. We present here the Share-A-Thons as a model for science teacher professional development as a partnership between schools, teachers, and university faculty. We discuss the logistics of running the Share-A-Thons, including challenges and next steps, provide teacher feedback, and include suggestions for implementation.

Background

As the 2019 school year ends, Tennessee K-12 teachers have completed a full year of implementation with new science standards. While Tennessee did not adopt the Next Generation Science Standards (NGSS), the newly created Tennessee Science Standards reflect the concepts and layout of the NGSS (NGSS Lead S). The Tennessee Academic Standards for Science provide grade level guidelines that utilize the 3-Dimensional approach of Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts (Tennessee State Board of Education, n.d.). This new framework requires shifts in teachers' pedagogy and practices in the classroom, as well as reconceptualization of science education. While the previous standards stressed science content knowledge with scientific inquiry included separately, the new standards incorporate engagement in scientific and engineering practices as a means of learning science content. Based on the Framework for K-12 Science Education (National Research Council, 2012), the new standards require teachers to not only re-evaluate the content taught, but also how students directly engage with the content. This led the university science education faculty to question and challenge: How can we support local teachers through this shift?

Overview of MAST/Share-A-Thons

With a change in standards and a need for continued support, the Memphis Area Science Teachers (MAST) group was formed. Initially, science administration at Shelby County Schools, the school district surrounding the University and the largest school district in Tennessee, contacted science education faculty at the University to discuss how the two institutions could work together. At the first meeting between faculty and district officials, a variety of topics were discussed, but the primary concern of the school district revolved around supporting teachers as they shift and transition to the new science standards. Meeting with district officials and visiting classrooms showed great things taking place in science across schools. The university faculty suggested building on what was already going well in the district and using the resource of teachers. Instead of trying to develop a formal, pre-determined series of professional development, a more flexible, informal approach might better serve the needs of the teachers. A vision was developed of teachers throughout the district coming together to share ideas and resources with each other. This vision became MAST. The goal of MAST is to establish a community of science teachers across the metropolitan area, from all grade levels, districts, and school types (public, charter, or independent). Both preservice and in-service teachers are invited to participate in MAST; because the local school district has a significant number of teachers in the field who are still earning a teaching credential, this format allows the university to provide additional support for those teachers, and to provide networking among teachers of all experience levels. This community is designed to support science teachers by facilitating the sharing of ideas, lessons, materials, and other resources.

Three pieces were developed at the founding of MAST: a website, a listerv, and regular teaching meetings we call Share-A-Thons. The website was developed as a central location for sharing information about MAST, such as meeting topics and dates, and resources, such as lesson plans or articles. Faculty from the University developed the website for MAST using free website development tools. The website serves several roles for MAST: It is the first place events like the Share-A-Thons are announced, including links to registration; resources from Share-A-Thons are available on the website; there is a section devoted to local phenomena and resources; and state and national science education resources are available. Teachers can also join the listserv and contact science education faculty through the website. The listserv is also maintained by the University, using the university infrastructure. The primary use of the listserv currently is to send out announcements about MAST events and other events or resources that would be of interest to science teachers. Any listserv member is also invited to send questions or relevant announcements to the listserv. There are currently about 150 members of the listserv. The final piece of the MAST community is the Share-A-Thon, a regular meeting of science teachers that occurs 2-3 times per semester to provide informal professional development on a wide range of topics (see Table 1). Teachers were recruited to join MAST, and attend Share-A-Thons, through existing science teaching listservs, the school districts professional development newsletters, emails directly to teachers and principals from the University as well as school district personnel, and word of mouth.

Table 1 (Click on image to enlarge)

Share-A-Thon Topics

Table 1 <i>Share-A-Thon Topics</i>
Share-A-Thon Topics
Introduction to the New Science Standards and 3-Dimensional Science
Using Science and Engineering Practices
Crosscutting Concepts
Lesson Planning for 3-D Science Using the 5E Learning Cycle
Integrating Engineering in Your Science Classroom
Optimizing Your Science Classroom for 3-D Science
Integrating Technology into 3-D Science
Phenomena-Based Science Teaching

Framework for Professional Development

With changes facing science education today, including the adoption of new national and local science standards in most states, there has been a call for flexible and ongoing approaches to professional development (PD) for science teachers (Luft and Hewson, 2014). New views of professional development move away from static presentations of information for teachers and toward dynamic, interactive learning opportunities between teachers and schools (Opfer & Pedder, 2011), where teachers are empowered to control their own development (Kennedy, 1999; Shapiro & Last, 2002; Wilson & Berne, 1999). Research has also pointed out importance of collaboration (Wilson and Berne 1999) and the need to relate PD to local contexts and standards (Supovitz and Turner, 2000). However, districts today are faced with challenges in delivering PD to teachers, including addressing the needs of teachers with varying levels of experience and limited resources and time. A lack of high quality PD can contribute to concerns around teacher retention, achievement, and quality of science instruction. For example, many teachers in the primary grades demonstrate low levels of scientific knowledge (Palmer, 2004), which impacts confidence and self-efficacy beliefs about teaching science (McDuffie, 2001).

Basing our ideas from the NGSS Framework document and the needs of our local school district, an emphasis was placed on creating and cultivating the MAST community, including the Share-A-Thons, website, and listserv, as a flexible professional development network. As the NGSS framework document stated, “The framework and subsequent standards will not lead to improvements in K-12 science education unless the other components of the system—curriculum, instruction, professional development, and assessment—change so that they are aligned with the framework’s vision” (NRC, 2012, p. 17). Our resources as a University allowed us to design and implement a professional development network that would offer continuous opportunities for growth, based on the needs of the participating teachers. With the main components of the new standards leading the way for the first meetings, topics then covered recommendations from teachers, aligning with the NGSS framework ideas on

professional development that states, “professional development should not only be rich in scientific and engineering practices, crosscutting concepts, and disciplinary core ideas but also be closely linked to teachers’ classroom practices and needs” (NRC, 2012, pg. 259).

Description of Share-A-Thons

The MAST Share-A-Thons’ initial purpose was to provide professional development and to focus local educators on one topic of the new science standards and/or framework over the course of an academic school year. Another goal for the MAST Share-A-Thon was to connect local K-12 educators experiencing the same struggles and to provide a place to problem-solve together and share ideas on implementing these practices in one’s classroom. The first two Share-A-Thons were in Spring 2018, the semester before the new science standards were implemented across the state. Teachers were recruited primarily through email and word of mouth, as described above. These Share-A-Thons focused on helping teachers understand the new standards and providing a space for sharing lessons and discussing how they align to the new standards. At the Share-A-Thons, teachers were asked to provide suggestions for future topics, through conversation as well as a survey administered at the end of the Share-A-Thon. These suggestions were compiled and at the beginning of each semester, an email was sent to the listserv allowing teachers to vote on topics. The most popular topics are then chosen for the next Share-A-Thons. At each Share-A-Thon, there were between 20 and 60 participants, across all grade levels. The largest groups of teachers are usually elementary (3rd – 5th grade) and middle school. As an incentive for participation, the local school districts offer professional development credit and the University provides door prizes, such as science teaching books, class sets of markers, or classroom equipment.

An initial challenge with conducting teacher professional development experiences like Share-A-Thons is determining the days, times, and frequencies for scheduling workshops that is the most convenient for everyone across the K-12 spectrum. Due to varying time restrictions and commitments during the work week at the different grade levels, professional learning and development opportunities are generally relegated to the weekend when more teachers are available and have greater flexibility with juggling their personal commitments in order to attend. Because of this, we decided all Share-A-Thons would be held on Saturday mornings and would finish by noon so that attendees still had the afternoon free. Therefore, the Share-A-Thons were always offered on a Saturday morning from 9:00am-11:30am and were held about 3 times a semester (or about 6 times over a K-12 academic school year). Each meeting was guided around a similar structure. The meetings began with a 30 minute allowance for breakfast (provided complimentary by the university or a community sponsor), check-in/registration, and a warm up activity where the participants responded to an open-ended question on the topic (often through an online platform such as menti.com). The meeting would then move into a whole group format with a general overview of that month’s topic and a small group activity which always included discussion and share out. This portion

would last about for about 45 minutes. After the whole group overview, participants moved to their grade band breakout session. These small group sessions lasted at least an hour and provided participants with hands-on examples of implementing that session's topic specifically in the grade level the participant is teaching. Another purpose of these small group sessions was to allow educators to network with other science teachers in the area in a smaller and safe setting. The grade bands included grades K-2, 3-5, 6, 7, 8, biology, chemistry, physics, and other high school level topics as needed (teachers were asked to provide their grade level/content area when registering). Following the breakout session investigations, the whole group would reconvene and share what each group experienced and ways to implement the new knowledge into their classrooms. Each MAST Share-A-Thon concluded with a review of that month's topic with a wrap-up from a faculty member and a survey on the session.

For example, in September 2018, crosscutting concepts were the topic (see Figure 1 for the agenda from this Share-A-Thon). While checking in, participants responded, using their own laptops or Smartphones via [menti.com](https://www.menti.com), to the warm-up question: "What questions do you have about the TN Science Standards and Crosscutting Concepts?" This guided the beginning of the whole group discussion and led into the initial learning portion. A faculty member from the university gave an overview of the new standards and 3-dimensional science teaching and learning, based on the Framework for K-12 Science Education and focusing on the role of the crosscutting concepts. Following the overview, participants worked in pairs to sort specific scenarios/K-12 lesson topics on premade cards into the different crosscutting concept categories. Scientific talk was required and utilized during the problem solving process, as faculty circulated and facilitated conversations, and all groups shared their findings at the conclusion of the activity. At this time, participants were given seven color-coded cards, one for each of the crosscutting concepts, that were printed on cardstock to help with durability. Each of these teacher tools listed NGSS' definition of the concept; usefulness of this concept to scientists and engineers; the science and engineering practices that are closely related; and ended with sentence starters and discussion prompts specific to the relevant crosscutting concept. Next, the meeting transitioned into breakout grade band sessions for an hour. Each session engaged teacher participants in a grade level appropriate lesson (according to student perspectives). The attendees were then provided with a written lesson plan and had to identify which crosscutting concepts were covered and exactly where in the lesson plan did this take place. Participants worked together in discussion groups to identify and explain the crosscutting concepts that were covered in the lesson. The lessons provided were aligned to the district's pacing guide for each grade, and teachers were invited to share activities or other resources they used for addressing the same topics. Following the small group activities and immersion into that meeting's topic, members reassembled into a whole group setting for volunteers to share what they learned and for a final review of the topic. Participants also completed monthly surveys to help determine each meeting's usefulness and relevance.

Figure 1 (Click on image to enlarge)

Share-A-Thon Agenda



Teacher Response to Share-A-Thons

The teacher response to the Share-A-Thons has been overwhelmingly positive. Across the seven Share-A-Thons to date, there have been around 200 attendees, with a range of 11 to 40 attendees per event and many teachers attending multiple Share-A-Thons. At the end of each Share-A-Thon, teachers are asked to complete a six question online feedback survey to indicate how useful the Share-A-Thon was for them, what parts were most useful, what they would like to see in future Share-A-Thons, and any other feedback they would like to offer the organizers (Figure 2). Across all of the Share-A-Thons, 121 surveys were completed. The responses across Share-A-Thons were consistent; i.e., no one Share-A-Thon topic received significantly different responses from any of the others. Most teachers rated the Share-A-Thons “Extremely Useful” (89) or “Very Useful” (29). The Response Scale includes: “Extremely Useful,” “Very Useful,” “Moderately Useful,” “Slightly Useful,” and “Not At All Useful.” To date, no teachers have rated the Share-A-Thons “Slightly Useful” or “Not at All Useful.”

Figure 2 (Click on image to enlarge)

Share-A-Thon Online Feedback Survey

How useful you rate today's Share-A-Thon?

☐ Extremely useful
☐ Very useful
☐ Moderately useful
☐ Slightly useful
☐ Not at all useful

Which parts of the Share-A-Thon were most useful for you?

☐ Whole Group Overview
☐ Assessment practice in Grade Bands
☐ Teacher discussion in grade bands
☐ Other (Please describe)

Why were these parts useful for you?

What else would you have liked to see included in the Share-A-Thon today?

No additional comments or suggestions are needed for this Share-A-Thon. If you would like to be part of the process, please indicate how you'd like to be involved and provide your email address.

☐ Email this to me later
☐ Email to me later in a week
☐ Do not include my name in the list of participants

Name

Please e-mailing this form to share with the organizers please include it here.

When asked, “Which parts of the Share-A-Thons were useful?” teachers indicated that “working or talking with other teachers” was the most useful part (67 responses), closely followed by “evaluating example lessons” (60 responses) and “whole-group overviews of the topic” (49 responses); teachers were able to select multiple responses for this section. When asked to explain why each part was useful, teachers focused on “the practicality of each section” and “being able to access resources.” Many respondents indicated they most appreciated “having the time to talk to other teachers,” although not always about the topic of the Share-A-Thon. Teachers responded, “When I collaborate with other teachers, I always learn something new that I can implement in my class!” and “I could get ideas from other teachers to make teaching a little easier.”

Some teachers found it interesting to compare what was happening in their school or district with other schools or districts from an overall perspective, saying, for example, “It was nice to discuss with teachers from other districts about what’s working and what’s not working.” Other teachers indicated they valued learning from other teachers in their areas saying, “It was good to hear new strategies from other teachers,” and “Loved the collaboration in the moment as we processed the resources.” Most of this discussion with other teachers occurred during the grade band breakouts with example lessons. Teachers also indicated that this part of the Share-A-Thon was valuable as they had access to both district personnel and science education professors to discuss the lessons, further indicating that they valued the, “availability of science advisors to ask questions.”

Another common point teachers made when asked why the Share-A-Thon was useful for them was that the information provided was relevant to their teaching. This was a benefit of working strategically with a local school district in two ways. First, we were able to align the overall topics of the Share-A-Thons with the district’s science focus. Second, the example lessons provided by grade and subject not only demonstrated the overall topic, they were also aligned to the district’s curriculum pacing guide, further enabling teachers to use the

lesson in their classroom within a few weeks of the Share-A-Thon. Teachers indicated that this strategic alignment made the Share-A-Thons particularly relevant and helpful noting, “The overview and lesson plans offer insight that can translate directly to classroom practice.” Teachers also said that as a result of attending the Share-A-Thon, “I have information that I can actually use.”

Teachers were also asked to describe what else they would like to see at Share-A-Thons. This information was used to directly inform future Share-A-Thons. For example, in the fall of 2018, teachers indicated that while they appreciated the example lessons provided, they did not always have the resources necessary to implement them in their classroom and asked for information on “how to implement lessons in class with least expensive products” and “how to organize materials for labs, demos, etc.” This became the topic of a Share-A-Thon the following semester. Teachers also indicated that they wanted more information on incorporating the topics from the Share-A-Thons into their own classrooms, saying “I am struggling to fit everything.... I am curious how the implementation of the full lesson plan would look,” and “I would like to actually plan a lesson. I am responsible for training K-5 teachers on how to create and implement effective Science lessons.” Other teachers said, similarly, that they needed support around balancing the demands of the district’s pacing and testing schedule and the topics presented at the Share-A-Thons. One teacher explained that they would like, “Exploration of how to balance the demands of the 3-D model with the curriculum so that we can stay close to the expected schedule for content.” This indicated to us that teachers wanted to move beyond learning about the changes in the standards and 3-dimensional science teaching and learning in order to incorporate these changes in their own teaching practice. As a result, we dedicated future Share-A-Thons to lesson planning and unit planning.

This feedback from teachers highlights the importance of allowing time for teachers to interact with each other to process material in professional development sessions, a key feature of the Share-A-Thons. We, as University faculty and “experts” in science education, had to provide resources around the topic and then step back to let the teachers dissect and discuss the material. Another important piece of the Share-A-Thon is responsiveness to teachers: Having district personnel attend the Share-A-Thons meant they could answer teacher questions about, for example, district resources or curriculum. Working together with the district also meant that the resources provided were immediately useful for teachers, such as using example lessons and activities that are timed with the district’s pacing guide.

Role of the School District

Partnering with a local school district was instrumental for the development and sustainability of both MAST and the Share-A-Thons. The role of the school district in this process has been three-fold: providing support, access, and complementary learning activities. First, the school district is a partner in determining topics and planning for each Share-A-Thon. At least one, and usually multiple, district representatives attend each Share-A-Thon, representing

both professional development and curriculum and instruction departments in the district. Other district and school administrators, including vice-principals and instructional coaches, have also attended Share-A-Thons. Additionally, the school district is able to provide seamless access to teachers and schools to distribute information about Share-A-Thons. This is accomplished through the district's weekly newsletters sent to teachers and administrators as well as their online professional development platforms. Finally, because the district helps to plan and attend each Share-A-Thon, they are able to ensure that we are providing consistent support to teachers across learning opportunities. Not only do we ensure that we do not duplicate information, the language used, approaches discussed, and resources provided are likewise consistent and complementary across learning opportunities. Teachers receive professional development (PD) credit hours for attending Share-A-Thons, and the school district offers follow-up PD sessions to further build on the topics discussed.

It is important to note that even though one district has partnered with the university, other districts are invited to participate and provide feedback on the development of Share-A-Thons. Because of the nature of the metropolitan area, the other districts are much smaller and often do not have the resources to support ongoing professional development for science teachers to the same extent as the larger school district. For the initial Share-A-Thon, other school district personnel (including principals and science coaches) were contacted via listservs and direct communication and asked to share information about the Share-A-Thons with their teachers. Multiple school districts give teachers professional development credit for attending Share-A-Thons and assist in disseminating information about the Share-A-Thons. When we solicit feedback about the usefulness of the Share-A-Thons, teachers from smaller school districts, who are sometimes the only science teacher in their school or at the only high school in the district, have expressed that the value of meeting and working with other science teachers is the most valuable part of the experience. Although they often list similar challenges as teachers from larger school districts, such as adjusting to the new standards and working with limited resources, attending Share-A-Thons also helped to address the ongoing challenge of isolation experienced by teachers in their individual schools.

Role of the University

The call to educate and prepare highly qualified educators to teach STEM content warrants the urgent need to find ways to create learning opportunities and experiences for preservice and inservice teachers with meaningful, real-world applications. This effort includes strategic partnerships with local school districts and community programs (as described above) in ways that maximize teacher preparation experiences, professional development, and learning outcomes. The MAST Share-A-Thon is an alternative to the typical stand-and-deliver, one-shot workshops presented by science experts who lecture while adult learners listen passively (Author, 2011; National Research Council, 2007). The MAST Share-A-Thon

actively engages teachers to participate in a long-term scope for *change* in science teaching and learning that reaches far beyond the careers of individual participants in order to make change that encompasses *entire* learning communities. To achieve this ambitious goal, the University plays a key role in developing and implementing the STEM professional development (in collaboration with the local school district) according to teachers' identified areas of "need" or on topics/skills they want to improve in ways that increase learners' active STEM exploration, investigation and higher order thinking. In this way, Share-A-Thons uniquely begin with what teachers' "already know and understand" and eventually lead to "ways to expand and improve their current practices." Teachers share their lesson plans and activities during cooperative group discussions using Socratic dialogue guided by inquiry and problem solving along with constructive feedback and teacher reflection in order to reveal new insights and multiple perspectives.

University science, early childhood, and elementary faculty play a key role in helping to guide and facilitate K-12 teachers' STEM investigations, activities and discussions to encourage and support sense-making, practicing, modeling, and reflecting on new strategies (Yoon et al. 2007). The university faculty also strive to create a safe space where all voices and perspectives are valued, appreciated, and celebrated as community members work to improve STEM teaching practice (Counsell, 2011; Ingersoll, 2004; Wenger, 1998).

Ongoing Challenges and Next Steps

Several challenges have been identified with the MAST website and listserv. The first is maintenance: after the initial setup of both, they need regular maintenance to ensure that content and membership are up-to-date. Additionally, teachers have hesitated to email the listserv themselves, to ask questions or share information. It is currently primarily a one-way source of communication from the university science education faculty to the teaching community. Additionally, the usefulness of the website to the MAST participants is not known; although they indicate that they do visit the website for Share-A-Thon materials, in the future we would like to collect more information about what teachers would find useful in the website, for example, if they would use discussion boards or links to local resources.

An ongoing challenge experienced with Share-A-Thons pertains to the continued struggle with how to reach a broader and more diverse audience beyond the teachers who initially begin to participate. While word-of-mouth is critical and firsthand testimonies are quite valuable, they largely resulted in additional participants limited to the same schools where current participants teach. Therefore, increasing future teacher participation will include coordinated efforts to invite teacher participation with local school districts by email, flyers, and announcements on the district website and shared during school-level faculty meetings. Broadening the range of educators who serve diverse urban communities entails a need to balance different community needs and school settings in ways that includes everyone while satisfying local challenges (such as less time allocated to science; fewer resources and materials; fewer parent/grandparent volunteers).

In addition to ongoing efforts to increase K-12 teacher participation in Share-A-Thons, next steps also include diversifying the expertise of the University Share-A-Thon faculty. For example, future Share-A-Thons will include math and English language arts (ELA) faculty to discuss how to integrate math and ELA with science. Instructional time requirements for math and ELA at the elementary levels tend to minimize instructional time allowed for science teaching. Math and ELA faculty can help teachers to see how they can easily connect and address math and ELA standards during science teaching and investigations. This enables teachers to maximize children’s overall learning experiences and learner outcomes by effectively teaching across the curriculum without excluding or prioritizing one content area more than another. Additionally, we have partnered with other on-campus groups to offer supplementary professional development for teachers, for example, the Biology Department offered Project Learning Tree Training to teachers, and will continue to grow that network.

A final challenge is in expanding the “Share” portion of the “Share-A-Thon.” We would like to increase teacher ownership of both MAST and the Share-A-Thons, ideally developing teacher leaders to plan and facilitate some Share-A-Thons. We have started encouraging this by soliciting teacher ideas and feedback at Share-A-Thons and discussing specific topics with teachers. At the Share-A-Thons, many teachers share wonderful ideas and thoughts on the various topics. However, many teachers are still reticent to present themselves as “experts” and more work is needed to support the development of teacher leaders within MAST.

Suggestions for Implementation

Table 2 presents a general time line for implementation of a partnership like MAST. This partnership started with a brainstorming meeting between University faculty and district personnel. At the initial meeting, we noted the topics that the district seemed most in need of support: the new science standards and providing professional development for a wide range of science teachers. With that in mind, we took inventory of the resources they could offer, in terms of personnel/expertise, space, funding, materials, and technology infrastructure. We also began informal discussions with teachers about their concerns and needs, which largely echoed the conversations with district personnel. The result of this pre-planning was the start of the three pieces of MAST: The university had infrastructure in place to support the listserv and website, and initial plans for the Share-A-Thons began.

Table 2 (Click on image to enlarge)

General Time Line for Implementation

Step	Purpose	Stakeholders involved
General Pre-planning		
Initial Meeting	Determine needs of school district	University and District Personnel
Campus Inventory	Determine resources available through the university	University Faculty
Teacher Discussions	Solicit ideas for topics and areas of need from teachers (contact via other professional development or listservs, local conferences)	University Faculty
Funding	Look for funding for food, door prizes, materials	University and District Personnel
Share-A-Thon Planning		
Format	Decide best way of delivering PD or other support to teachers	University and District Personnel
Logistics	For in-person PD, what days, times, length, location would be best?	University and District Personnel
Registration	Set up system for teachers to reserve a spot	University Faculty
PD Credit	Set up system for teachers to receive PD credit	District Personnel
Advertise	Invite teachers through listservs, other PD, conferences, etc.	University and District Personnel
Each Event		
Logistics	Reserve space Arrange for food, order door prizes/materials	University Faculty University Faculty
Content	Review latest relevant research on topic Compile example activities and lesson plans Align to district pacing guides	University Faculty University Faculty District Personnel
Ongoing		
Feedback	Set up system for feedback from teachers	University Faculty
Future planning	Solicit teacher volunteers for planning and delivery of materials	University and District Personnel, Teachers
Planning Meetings	Meet at the beginning of each semester to set topics, dates Continue to update website with relevant information and resources from Share-A-Thons	University and district personnel University Faculty
Website	Update listserv with new members, send out announcements	University Faculty

When beginning a program such as the Share-A-Thon, there are many logistical details to consider. As part of our partnership, we secured a space on the University campus. This first step is vital as the space impacts the ease and available resources for the meetings. Our goal for implementation was to make the meetings easily accessible for teachers to attend. This required checking with district personnel for any conflicts with dates and acquiring access to easy parking.

Open communication with district personnel and the attendance of district faculty at the Share-A-Thons is vital in the beginning stages and should continue throughout the program to ensure the alignment to their specific needs. After securing an easily accessible space and aligning the programming to district needs, the available University resources need to be inventoried. These include but are not limited to materials, technology, and other faculty, including graduate assistants. Finally, for teachers to attend the meetings they must first know about the meetings. Create an easy way for teachers to get information, such as a listserv or website.

The partnership with a local school district was crucial to the success of MAST in general and the Share-A-Thons in particular. The school district took several steps to help ensure this success. The first step was similar to that taken by the university: make sure the Share-A-Thons are convenient for the teachers. This involved advertising for the Share-A-Thons through existing district channels and having district personnel attend Share-A-Thons to answer district-specific questions and ensure participants received professional development credit for attending without having to complete any additional steps (district personnel simply take a copy of the sign-in sheet and enter it into their system, so there is no extra work from the teachers required). District officials were also an important piece in ensuring the Share-A-Thons met the needs of the teachers. District personnel interacted with teachers between Share-A-Thons and were aware of district and state-wide initiatives in science education. Knowing what the teachers were saying in the field and what initiatives were coming soon for

teachers from the state Department of Education meant the Share-A-Thons could be planned both reactively, to address teacher concerns, and proactively, to help teachers prepare for changes in science standards, curriculum, and assessment. Finally, the school district was able to align their own professional development for teachers to the content of the Share-A-Thons, ensuring teachers received consistent messages around science teaching and learning.

Ongoing work is necessary to sustain and continue to grow this partnership. In particular, at each Share-A-Thon, teacher feedback is solicited about the Share-A-Thons and volunteers are recruited for future Share-A-Thons. Each semester, we meet with school district personnel to confirm the topics and dates for the Share-A-Thons. The website and listserv also require ongoing maintenance to make sure they are providing relevant information and reaching as many teachers as possible.

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