Librarians realized what a great opportunity they had to take the lead in promoting math with children, without turning it into school, but could incorporate math in a fun way. I saw libraries that may have started a bit hesitant at math really open up because the activities made them confident that they could do them with their children.

State/regional library leader, pp. 34-35

[Before Math off the Shelf, librarians] may have used books that had math themes … but no way did they try to build on it with an activity that followed the book that helped to strengthen the math. What the project did was make that connection that “I can do what I’m doing regularly, select intentionally books that have a good foundation to talk about math, and have activities that are related.” That was a change in their behavior and they’re [now] making a conscious effort.

State/regional library leader, p. 17

Background: The Math off the Shelf project

TERC initiated Math off the Shelf (MotS) with NSF funding to design, implement, and evaluate strategies for bolstering the presence of math in library-based programs for elementary-grade children. Public libraries exist in virtually every community in the nation, and increasingly, families rely on them as a free, safe place for children to spend time in the absence of other out-of-school care. LBIEs, or, library-based informal educators, including children’s librarians, after-school providers, and family literacy providers, offer programs such as story and craft times, summer reading events, and drop-in after-school activities. At the time MotS was developed, LBIEs rarely embedded math in their offerings, yet they could have: they typically have substantial autonomy in programming, unlike schoolteachers and many after-school educators.

The MotS project was predicated on the premise that if we are to mathematically engage children, particularly those who flourish in out-of-school settings but struggle in school, engaging informal educators is a critical first step. In MotS, we intended to spark a new mathematical reality for library-based out-of-school programs and the informal educators who lead them.

After our LBIE partners chose among, implemented, and gave feedback on the activities, we revised and then invited a wider group to try them.
Design phase (Years 1 and 2). We began by collaborating with LBIEs to create interdisciplinary English and Spanish math activities that they could embed in the projects, activities, and conversations that form the core of their daily work with children. We employed an iterative design process in conjunction with several dozen LBIEs in four regions: Queens NY, Westchester County NY, and several communities in MA and CT. The majority of our LBIE partners were based in urban areas with significant low-income Latino/a or African-American population. First, we solicited from LBIEs upcoming programming themes (e.g., poetry month), special events (e.g., El día de los niños/El día de los libros), and needs (e.g., games children can play quietly while waiting for parents to pick them up). Next, we developed activities designed for LBIEs to embed in these existing contexts, selecting those ripe with accessible math.

Our process continued until we had a varied bank of well-vetted activities, including dozens each of projects, games, and short activities. The activities span the key content areas in the NCTM Standards for the elementary grades.

Extend and evaluate phase (Years 3, 4, and 5). At the start of this phase, we put the draft MorS activities on a public website so anyone could access them (http://mixinginmath.terc.edu). For evaluation purposes, we promoted the activities to groups of LBIEs in San Jose CA, St Louis MO, selected low-income communities in AZ and FL, and additional sites in the original four regions. At each site, we connected with a library leader or library-based after-school leader, who in turn, encouraged LBIEs to review our website and use any of activities they wished, and to provide us with information on what they used and how. We used their input as a basis for final revisions and for development of activities to meet additional LBIE needs.

During the extend and evaluate phase, our independent evaluator, Char Associates, surveyed LBIEs to assess impact of exposure to MorS on their math-related attitudes and beliefs, incorporation of math into their work with children, and reasons for using math. (Near the start of the project, Char Associates gathered baseline data on a subset of these issues.)

This report covers most of the penultimate year of the project, from the last four months of Year 4 to the first eight of Year 5. Our final year (Year 6), granted with a second unfunded extension, will be used primarily for dissemination of findings to the ISE community via conference presentations and writing for publication; we have already done extensive dissemination to library-based practitioners. Our external evaluator has conducted and produced a final report on the summative evaluation, attached to this document. Our additional year allows us to include summative evaluation data in our dissemination efforts.

In prior annual reports, we detailed our partnership-building and materials development processes and our formative research and evaluation. In this, we focus on institutionalization and summative findings.
1. Major Activities

1A. Partner support

Beginning partway through Year 4 and throughout Year 5, we diminished the support (e.g., phone calls, group meetings, copies of materials, etc.) that we gave our partners. This approach enabled our external evaluator to explore the impact under simulated post-project conditions. We continued with a minimal level of support:

- Providing a monthly e-newsletter (also available to LBIEs beyond regions connected to the project), with math activity calendars, ways to use MoS resources in conjunction with upcoming common library themes (e.g., April Earth Day events; Black History Month programs), and math content information.
- Responding to e-mail and phone questions involving use of the MoS resources, but no longer initiating monthly individual phone/e-mail check ins, as we have in prior years.
- Offering support (e.g., materials, talking through session plans) to over a dozen Peer Leaders, a cadre of LBIEs we trained in Year 4, who offered MoS workshops and webinars on their own and with TERC.

1B. Materials and website

As detailed in prior annual reports, we had developed the bulk of our English and Spanish materials for use with the public by the end of Year 3. Last year, in conjunction with our focus on peer leadership, we created professional development resources, such as PowerPoint slides (PPTs) and webinar plans. This year, our efforts included:

- Finalizing our basic webinar formats and PPTs based on input from Peer Leaders who used them in webinars, and putting them online for others to use (http://mixinginmath.terc.edu/training/libr_training.cfm).
- Supporting Peer Leaders in creating versions of the above tailored to their own experiences with MoS and to summer reading themes.
- Creating a Spanish-only version of the webinar format and PPTs, which we piloted with a group of formal and informal educators who work with Spanish-speaking children and families. We led this webinar in conjunction with TODOS, the NCTM-affiliated professional organization focused on equity in math education. We will be making some adjustments to the materials for leading Spanish webinars and posting them on our site.

![Presentaciones](image1)

**¿Qué hay en la agenda?**
- ¿Qué es MIM?
- Tipos de actividades en MIM y cómo usarlas.
- Hágamos un plan para implementar MIM

**¿Por qué usar MIM?**
- Apoya la lectoescritura y la alfabetización cuantitativa
- Mantiene a los niños y niñas interesados y ocupados
- Es fácil de adaptar a diferentes entornos, formatos y programas
- No requiere entrenamiento especial

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NSF project #0714537
• Creating “family numeracy” versions of activities for parents. We designed these on request from the growing number of library-based family literacy providers using MotS resources. Although our materials are designed at a 5th/6th grade reading level (and our website hits suggest they are well-used by home-schoolers), they are written as though to an educator working with a group of children. For parents less skilled at English, this seemingly minor difference in audience can pose an insurmountable obstacle to full comprehension. To address this need, we rewrote several MotS activities at an even lower reading level (3rd/4th grade) using wording that speaks directly to a parent (http://mixinginmath.terc.edu/materials/actlist_athome.cfm). We will be posting the Spanish versions in the coming months.

• Developing a guide to use MotS in conjunction with the 2012 Summer Reading program theme, Dream Big: Read (http://mixinginmath.terc.edu/Themes/index.cfm#dreambig). This theme is used in 49 states. We’ve also developed a guide to using MotS with the TX Summer Reading Theme (http://mixinginmath.terc.edu/Themes/index.cfm#mysteries). As we’ve noted in past years, librarians devote tremendous energy to their annual Summer Reading programs; math activities fitting the summer theme are well-used.

• Cataloging MotS activities for the NSDL’s Common Core Mathematics Collection. NSDL identified MotS as a resource that would serve educators seeking engaging and rich math activities that meet the Common Core Standards. To date, we have aligned about 40 of our activities to the Common Core, and NSDL has entered them into their collection (http://nsdl.org/commcore/math). Our web analytics indicate that they are accessed frequently: nine percent of the traffic referred to our website (from over a thousand referral sites) comes from NSDL Common Collection.

• Revising our search function to better align with the categories in the Common Core and to enable users to search by science topics. We are in the process of completing these efforts; they will be available in the coming months.

• Maintaining our project website (http://mixininmath.terc.edu). This has included revising the back-end from a Cold Fusion-based to a PHP-based system, which will enable TERC to more readily maintain the site post-project.
**1C. Implementation, professional development, and dissemination**

In this section, we summarize institutionalized efforts that LBIEs are leading without direct project support and which they plan to continue post-project, and those efforts in which TERC is involved. Our webinars form a middle ground: LBIEs co-lead them, but TERC has hosted many of them. They will continue post-project if library systems can host them.

*Note on reach.* Given the lessened direct support and wide dissemination of our resources in the last year, we don’t have exact figures on reach for Year 5. In Year 4, we worked with 354 LBIEs (directly, or indirectly, via close connection with their supervisor) and were able to get complete data on MotS use with 33% of them. These 131 LBIEs reported implementing MotS activities directly with 25,575 children and 3,689 parents. They estimate reaching a further 175,389 children and adults in Year 4 with MotS activities, games, and projects that took place in the library but were not directly facilitated. They provided professional development to 2,925 library-based and other informal educators. In Year 5, we gathered data from a sample that included those with prior project involvement and those who had encountered our resources on the web and signed up for our mailing list. The 72 respondents report implementing MotS activities directly with 33,874 children and 7,315 parents. They estimate reaching an additional 55,738 children and adults with non-facilitated MotS activities, and they conducted MotS professional development for 1,667 informal educators. Although the sample size this year about half that of last year, LBIEs reported implementing nearly twice as many MotS-facilitated programs.

**1Ci. Institutionalized implementation, professional development and outreach**

Below we give examples of institutionalization of MotS in our eight partner regions throughout regional or statewide resource collections and trainings (in previous years, we detailed approaches to implementation and institutionalization at individual libraries). We also include examples of librarian-initiated outreach to illustrate the level of efforts we anticipate will continue post-award, in particular, since this during this period the LBIEs did not receive financial incentives from MotS for the outreach they conducted.

*Original partner regions*

**AZ.** Frederica Torres, one of our Peer Leaders and a library-based family literacy provider, submitted and presented a poster session on her use of MotS at the 2011 AZ state library conference.

**CT.** Each year, librarian Jane Ash provides an information session at the annual CT Library conference, and CT Libraries Children’s Services Head Linda Williams promotes MotS for statewide summer reading. Ms Ash and Molly Hancock, a MA librarian, submitted a proposal for a presentation at a national ALA-affiliated children’s librarian conference.
FL. Broward, Brevard, and Lake Counties have made MotS resources integral to their literacy coaching system, which offers literacy, numeracy, and homework support to children and adults. Last year, Sandy Newell of the state library system and Volunteers for Adult Literacy in Florida led a poster session on MotS at the state library conference, an information session at the state literacy conference, and an outreach workshop to LBIEs in Alachua County. The 2011 FL Youth Services summer newsletter included information on MotS resources for summer reading; information on using MotS for summer 2012 will appear in the next issue.

MA. State library Youth Services Head Sarah Sogigian promotes MotS resources annually statewide to summer reading programs and related workshops. Boston Public Library’s HAP (Homework Assistance Program), an after-school enrichment and tutoring program staffed by Boston teens at all 25 city branches, uses MotS as the core math resource.

Queens NY. Leslie Taylor, leader of the library-based after-school programs throughout all 66 Queens branches provides regular MotS professional development to all of her staff, to Youth Counselors, to Teen Tutors, and to children’s librarians throughout the system. Lynn Cole of the (partly) NSF-funded Queens Library Discovery Center included MotS in her presentation at the 2011 NY Museum Educators Roundtable on the Role of STEM in library offerings for children and families.

San Jose CA. San Jose provides centralized programming to all 24 branches. Aleta Dimas of the program planning team provides a monthly MotS “program in a box” to each branch for implementation. San Jose libraries also offer MotS materials in resources available for checkout.

St Louis MO. The citywide library-based after-school educators regularly offer MotS activities and games. Youth Services Director Patty Carleton posts information about MotS on MOYAC and MAPLTalk, the statewide and regional library listservs. St Louis for Kids, a regional out-of-school training and support center with a close library connection, offers MotS two-hour training sessions approximately four times a year.

Westchester Public Libraries NY. An active group of LBIEs (Deb Gaffey, Francine Vernon, Rosemary Rasmussen, Terry Rabideau, and Mary Beth Kendrick) have made MotS a core component of professional development to their library-based Teen Ambassadors, to staff of White Plains YMCA and Youth Bureau staff, and to students from Sarah Lawrence College who come to the library to offer math support to children having
difficulty in school. They have also conducted workshops to librarians in nearby Nassau County, and each year, one or more WLS librarians offers an information session at the annual NY state library conference.

Westchester has also brought MotS to the fore in debates over NY statewide library funding. In August 2011 testimony to the state of NY on the need to support public libraries, Terry Kirchner, executive director of WLS, as one of five exemplary program that WLS has institutionalized in order to better reach the traditionally underserved (www.nysl.nysed.gov/libdev/testimony/wls.pdf).

Nationally

Our ALA liaison, Sarah Sogigian (also MA Youth Services Head), promotes MotS resources and webinars to the national Collaborative Library Summer Reading Program, and through her mailings to children's library heads of all 50 states. As a result, the majority of states have linked to and promoted MotS in their summer reading resource listings. Arlene Dale, the Family Literacy Specialist at the MA DoE has promoted MotS to statewide/DoE-funded family literacy coordinators in 50 states, to Boston area family literacy specialists, and through the new online MA Literacy Network resource listing.

As a result of these dissemination efforts, directors of TX and Multnomah County OR (including Portland and environs) libraries began implementing MotS on a broader scale. Dawn Krause of TX libraries requested webinars geared toward their summer reading programs, so that MotS could be incorporated statewide (we co-led three such webinars). A recording of one of our webinars will be included in their permanent collection of TX mini-courses for librarians. TX library staff are developing an accompanying assessment that will enable librarians to earn continuing education credits. Katie O’Dell, School-Age Services Manger of Multnomah County libraries has distributed MotS information to librarians at the two dozen branches she serves, and a component of each monthly meeting of the 50 children’s librarians is devoted to MotS training and information sharing.

Partner-led dissemination beyond libraries

In last year’s report, we detailed the many uses of our resources we uncovered through web searches at a variety of formal and informal education institutions, including school districts, museums, and family literacy centers. This year, our web searches suggest similar uses, with increasing prominence in the formal education community, in particular, because of TODOS and NSDL. Thanks to TODOS dissemination, our resources came to the attention of Jackie Cooke, the editor of the NCTM-affiliated Oregon Mathematics Teacher journal. Ms Cooke wrote an article on our resources for the journal (Jan/Feb 2012, pp. 4-8), distributed to 2,000 math educators in Oregon and beyond (http://www.octm.org/publications/tomt/).
SMILE (www.howtosmile.org), an informal STEM resource site funded in part by NSF and NSDL has been a strong partner in informal education dissemination; we have contributed about 140 English and Spanish resources to their database. Science writer Deb Rose wrote an article on our resources for the monthly SMILE newsletter and blog (http://howtosmile.org/blog/posts/recipe-for-success), featured our resources in an IMLS/SMILE search engine that offers STEM resources to accompany Michelle Obama’s “Let’s Move” initiative (http://www.imls.gov/about/lets_move_projects_smile.aspx), and included our resources in several thematic STEM resource compilations highlighted in SMILE newsletters.

1 Cii. TERC-led dissemination

To formal and informal educator practitioners. This year, TERC staff led: a workshop at the Boston Children’s Museum Family Literacy Festival, attended by children’s librarians, family day care and child care providers, family literacy providers and parents; a similar workshop at the Holyoke Children’s Museum Family Literacy Festival; and information dissemination at TERC’s booth at the 2011 NCTM conference, at the Cambridge Science Festival, and at the National Recreation and Parks Association conference. We send monthly e-newsletters to our mailing list of nearly 1800 formal and informal educators; about 600 have joined in the last year. We also maintain a math idea exchange page on Facebook, which currently has 312 members.

To a research-oriented audience. We have begun efforts to engage researchers, materials developers, and other leaders in a dialogue involving our project process and findings. PI Kliman gave an invited presentation at the MA Pre-STEM Summit Conference: STEM in Early Education and Out of School Time (Sponsored by the MA Depart of Early Education and Care) in October, 2011. She participated as a representative of the MotS project in an information-sharing session at the International Society for Design and Development in Education Conference in September, 2011. Kliman and Senior Research Associate Jaumot-Pascual attended the ISE PI meeting in March 2012, with a poster session the project. Kliman continues to serve on the advisory board of an ISE funded science in libraries project, LEAP into Science.

Communications via professional conferences and journal articles will be a major focus of our upcoming final project year. We have already submitted and received notification of acceptance for a workshop presentation at NCTM 2013. Our workshop will be part of a strand on equity and diversity in math learning organized by TODOS; we are one of only two workshops selected for this strand, and if previous years are any indication, ours will be one of the only sessions on formal-informal math connections. We have just submitted an article to the journal Teaching Mathematics for Excellence and Equity in Mathematics. In the coming year, we anticipate submitting articles to one or more of Afterschool Matters, Journal of Urban Mathematics Education, School Library Journal, and Teaching Children Mathematics, and to additional conferences including AERA and Creating Balance in an Unjust World.

What [librarians] liked most about [a MotS webinar] was that it was interactive. It wasn’t a lecture...and the facilitator did a good job of [giving] a taste of an assortment of activities and having them actually do it. And then talking about her experience…and how it worked for her. It gave it credibility. I think librarians need their own to say it’s okay. (State/regional library leader p. 35).
1Ciii. Webinars

MotS webinars involve active audience participation, with LBIEs experienced in implementing MotS playing a leading role. In the past year, MotS sponsored 17 webinars primarily for LBIEs, with a total attendance of 337. All but one were co-led by LBIEs and TERC staff; TERC led the Spanish webinar. Of last year’s webinars, we led five in conjunction with partner regions (AZ, CA, WLS, MO, FL); four on request from other library systems (three for TX, one for Multnomah County, OR); three on request from educational groups (TODOS and National Girls Collaborative Project); and the rest open to LBIEs across the nation. National Girls Collaborative webinar is posted on their website (http://www.ngcproject.org/events/events.cfm?eventid=226) for open access; TODOS will post our English and Spanish webinars in the coming months.

ICiv. Website traffic

Below we report access to our website from March 16, 2011 through March 15, 2012, tracked with Google Analytics.

*Who visits?*

In the last year, our site received just over 4,000 visits per month, for a total of 48,323 visits from all 50 States, DC, and 142 countries. We had about 93% more visitors than last year.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique visitors</td>
<td>76%</td>
</tr>
<tr>
<td>Repeat visitors</td>
<td>24%</td>
</tr>
<tr>
<td>Average number of pages viewed per visit</td>
<td>4.1</td>
</tr>
<tr>
<td>Average time on site</td>
<td>2 min., 40 sec.</td>
</tr>
</tbody>
</table>

Data is similar to that of the last two years.

*How did visitors come to our site?*

In the last year, the percent of traffic arriving via search engines has increased. Among the most frequent search terms used were variations of “math games,” “math for parents,” and “math activities to do at home.” This suggests a public eager for math resources.
Where were visitors from?

<table>
<thead>
<tr>
<th></th>
<th>85% from the US</th>
<th>93% from English-speaking or Spanish-speaking countries</th>
<th>32% from states in which our partner regions are located</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Pie chart image]</td>
<td>[Pie chart image]</td>
<td>[Pie chart image]</td>
<td></td>
</tr>
</tbody>
</table>

Compared to last year, a much greater percent of visitors came from states with no direct project involvement, suggesting continued spread. Each state in the union had a minimum of 52 visits in the year, with the number of visits roughly increasing with population.

Top 10 MotS resources accessed (of hundreds)

<table>
<thead>
<tr>
<th>Web Page</th>
<th>Type of Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math card games</td>
<td>independent activity</td>
</tr>
<tr>
<td>Geometric strategy games</td>
<td>independent activity</td>
</tr>
<tr>
<td>Math calendars</td>
<td>independent activity</td>
</tr>
<tr>
<td>Download of all activities</td>
<td>adult-led activities</td>
</tr>
<tr>
<td>Math posters</td>
<td>independent activity</td>
</tr>
<tr>
<td>Common Core math guide</td>
<td>educator resource</td>
</tr>
<tr>
<td>NCTM standards guide</td>
<td>educator resource</td>
</tr>
<tr>
<td>Math moments (quick activities)</td>
<td>independent activity</td>
</tr>
<tr>
<td>Family activities</td>
<td>parent resource</td>
</tr>
<tr>
<td>Summer reading math guide</td>
<td>educator resource</td>
</tr>
</tbody>
</table>

Math content information rose in popularity in the past year. Analysis of referrals suggests many visitors interested in Common Core connections. NSDL Common Core Math collection sent the largest number of referred visitors to our site; several other sites featuring connections between our resources and math/science standards (e.g., FL DoE, AAAS strand maps, CA Math Council, and the Middle School Portal) also sent many visitors. Notably, traffic from STEM or education portals (e.g., at CMU, GATech, and U MO) have also increased.

The majority of state DoE sites and nearly all state library sites and state after-school organization sites link to our site. The top twenty referring sites include resource collections primarily for teachers, homeschoolers, and informal educators, including US DoE (www.free.ed.gov), SMILE (www.howtosmile.org), and LHS (www.lawrencehallofscience.org).

1D. Summative evaluation

Char Associates gathered and analyzed data and then produced the attached summative evaluation report.
2. Findings

In keeping with the project emphasis on LBIEs as a primary audience, summative evaluation focused on the following:

To what extent are impacts on LBIEs stable over time, especially in simulated post-project conditions? In the past two years, external evaluation revealed strong impacts on the math-related attitudes, behaviors, practices, and understandings of our main audience, LBIEs. With substantially diminished support from TERC and a longer time since the introduction of MotS, would the impacts sustain?

What are the impacts on LBIEs who learn of MotS in a “stand alone” manner — without project involvement? MotS resources are available for free downloading; web hits suggest that many informal educators access our materials in this way. How do “stand alone” impacts compare to impacts on those who have had some project involvement?

What are the impacts on children and families? This year we explored LBIEs’ perceptions of impact on children and families. To what extent do children gain mathematical confidence, skills, and enthusiasm? To what extent do parents, in particular, those in family literacy programs, learn to support their children’s math learning and build their own understandings?

Note: Findings below listed with only a page number are drawn from the summative (Year 4) report attached to this document. When a year is listed, the findings come from an earlier external report (Year 3, 2010 or Year 2, 2009), all of which have been submitted to ISE.

2A. Stability of findings over time

Summative evaluation assessed the extent to which the positive impacts found in prior years persisted in Year 4, given significantly diminished support from TERC. Char Associates surveyed 68 LBIEs (primarily children’s librarians) who had been first exposed to MotS at least 6 months prior to the survey; some had been involved as early as the start of the project 4 years earlier.

Evaluation revealed that MotS effected a permanent change in the extent and nature of math offerings in libraries across the nation. Impacts sustained over the years of surveys. Mathematical activities and conversations became integral to LBIEs’ programs, with newfound positive attitudes toward math leading LBIEs to choose to implement math regularly.

Changes in frequency of math activities offered in library settings

Despite almost no use of math pre-MotS, the vast majority, once exposed to MotS, chose to integrate math on a regular basis. LBIEs offer story times, library orientations, craft projects, and conversations with children about a wide range of topics. At baseline, approximately
10% of LBIEs surveyed ever used math in any of these contexts (2009). Because of exposure to MoS, they began incorporating math in a variety of ways at least monthly.

**FIGURE 1. CHANGES IN INCORPORATION OF MATH INTO OFFERINGS**

<table>
<thead>
<tr>
<th>Percentage of total respondents</th>
<th>Because of exposure to MoS, I now at least monthly ... (p.12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y4</td>
<td>… introduce books with math themes to children</td>
</tr>
<tr>
<td>Y3</td>
<td>… create my own math-related activities (apart from using MoS)</td>
</tr>
<tr>
<td></td>
<td>… explain the relevance of math to using the library</td>
</tr>
</tbody>
</table>

Many LBIEs report that they now incorporate math even more frequently. For instance, 28% reported including math in activities with children weekly, and 3% daily (p. 12).

In Year 3, 20% of those surveyed now led math-related activities for families at least monthly, compared to 2% baseline ever leading a math-related family event (2010). In Year 4, LBIEs were asked whether they had held math-related family events in the last six months (rather than monthly): 30% had held at least one recently (p. 9).

In addition to running math-themed programs, because of MoS, LBIEs also incorporate math into their everyday practices in a variety of ways.

**FIGURES 2. CHANGES IN INCORPORATION OF MATH INTO EVERYDAY PRACTICES**

<table>
<thead>
<tr>
<th>Percentage of total respondents</th>
<th>Because of exposure to MoS, I now include math in the way I ... (p.14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y4</td>
<td>… ask children questions</td>
</tr>
<tr>
<td>Y3</td>
<td>… lead crafts activities</td>
</tr>
<tr>
<td></td>
<td>… lead story times</td>
</tr>
<tr>
<td></td>
<td>… choose books for story times</td>
</tr>
<tr>
<td></td>
<td>… show children around the library</td>
</tr>
</tbody>
</table>

Again, only 10% ever included any math before exposure to MoS. That the results sustained is particularly striking given that these LBIEs received little or no support from project staff during Year 4.

Changes in frequency and nature of communication about math

In addition to doing more math with children, LBIEs reported talking about math a great deal more: 61% noted that because of MoS, the nature of their communication with children changed; 54% noted changes in regular communications with parents and caregivers (p. 14).

I think it’s important to help children connect school to the real world. (LBIE, p. 38)

I’ve realized that there are a variety of fun and appropriate ways to include math in what we already do in the library, and that doing so can be a powerful way to make children aware of the math skills they already use every day and the ones they will need to use. It is also a good way to boost their confidence in their math skills. (LBIE, p.16)
A full 68% reported ability to explain how math for elementary grades fit the library mission (p. 15), compared to only 5% at baseline (2009).

One key topic was the role of math in everyday life. At baseline, only 11% reported ever discussing this with children (2009). Because of MotS, this percent grew substantially.

**FIGURE 3. CHANGES IN COMMUNICATION ABOUT MATH IN EVERYDAY LIFE WITH CHILDREN**

<table>
<thead>
<tr>
<th>Percentage of total respondents</th>
<th>Because of exposure to MotS, I now talk about math in everyday life with children … (p. 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y4</td>
<td>Y3</td>
</tr>
<tr>
<td>54%</td>
<td>59%</td>
</tr>
<tr>
<td>31%</td>
<td>31%</td>
</tr>
<tr>
<td>4%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Consistency between Years 3 and 4 data suggests that communicating about math in everyday life became institutionalized as a component of regular interactions.

**Change in beliefs and attitudes about math**

Participating LBIEs, asked to think back pre-exposure to MotS and compare with the present, reported considerable changes for themselves and for their libraries as a whole. Again, these changes sustained over time. In Year 4, 88% (Year 3, 91%) agreed that because of their exposure to MotS, they now believe that all librarians should learn more about integrating math into programming for children. In Year 4, 60% (Year 3, 68%) noted that including more math is now a strong priority for their own libraries.

In choosing to implement MotS, LBIEs acted with autonomy. When asked which factors contribute to decisions to continue using MotS, the top two reasons each year were *their own commitment to offer math to children*, and *interest/demand from children* (p. 33). By contrast, only 8% noted that pressure from supervisor or library director was a factor in decisions to continue using MotS (p. 33).

The nature of the resources themselves, in particular the fact that they can be readily integrated into existing library practices, provide a critical ingredient in continued use. In each of Years 4, 3, and 2, LBIEs noted that the key factors contributing to successful implementation were, in order of importance: the *quality of the MotS materials* and the *range of activity formats* (p. 33; 2010; 2009).

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*Prior to [MotS] I didn’t think about the role of math in the library, as my personal experience using math wasn’t strong or positive. (LBIE, p. 15)*

*I now consider math to be a part of the offerings a library can have. (LBIE, p 15)*
2B. Stand alone project impact

Even those LBIEs who recently learned about MoS and had never received project support reported changes in their math-related practices and attitudes. To assess impact on this audience, Char Associates surveyed 46 LBIEs (primarily children’s librarians) who were exposed to MoS in more “naturalistic” ways (e.g., learned about MoS at a conference session led by a participating librarian; heard about MoS from a colleague) less than 6 months prior to the survey. When asked about impact of exposure to MoS, they already reported changes (REC, recently exposed librarians).

**FIGURE 4. CHANGES REPORTED BY LBIES RECENTLY EXPOSED TO MoS (COMPAARED WITH THOSE EXPOSED LONGER AND WITH SOME PROJECT INVOLVEMENT)**

<table>
<thead>
<tr>
<th>Percentage of total respondents</th>
<th>Because of exposure to MoS, I now include math in the way I … (p. 14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y4</td>
<td>REC</td>
</tr>
<tr>
<td>61%</td>
<td>40%</td>
</tr>
<tr>
<td>59%</td>
<td>27%</td>
</tr>
<tr>
<td>48%</td>
<td>27%</td>
</tr>
<tr>
<td>48%</td>
<td>20%</td>
</tr>
<tr>
<td>32%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Although they reported changes at lower rates than those with some project involvement, they nonetheless made great strides in incorporating math if they are similar to the baseline, of whom only 10% ever incorporated any math (2009). With newfound access to resources for integrating math into library programs and growing experience using these resources, they voiced the view that MoS gave them a new vision of math and its role in the library: 89% agreed that because of their exposure to MoS, they now believe that all librarians should learn more about integrating programming for children (p 18).

2C. Perceptions of impact on children and parents

*Children.* To assess LBIEs’ perception of impact on children, Char Associates surveyed 34 library-based after-school staff tasked with homework help and with academic enrichment when homework help is not needed. Unlike children’s librarians, for whom interactions with children comprise only a portion of their daily jobs (with cataloging, reference, collection management and other tasks consuming time), these other LBIEs spend their working hours with children and are thus poised to observe mathematical growth of individual children over time. Because many children regularly visit the library without parents, we were not able to interview children directly since to do so would require obtaining parental consent.

*While doing [an MoS activity] one child made a connection between counting symbols that he had drawn and his multiplication homework. He discovered that using a grid is a shortcut to counting one by one.* (LBIE, p. 21)
FIG. 5. PERCEPTIONS OF CHANGES IN CHILDREN BECAUSE OF EXPERIENCE WITH MotS

<table>
<thead>
<tr>
<th>Percentage reporting this impact</th>
<th>Because of MotS, children in my library have … (p. 24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>78%</td>
<td>… gained confidence in math</td>
</tr>
<tr>
<td>70%</td>
<td>… see math as relevant in everyday life</td>
</tr>
<tr>
<td>69%</td>
<td>… developed math skills</td>
</tr>
<tr>
<td>67%</td>
<td>… gained enthusiasm for math</td>
</tr>
<tr>
<td>59%</td>
<td>… can better explain their math ideas</td>
</tr>
</tbody>
</table>

Those who reported using MotS to bolster academic success focused on helping children develop a better understanding of school/homework math topics: 88% used MotS as a more fun way to help children develop understanding; 71% used MotS as a more hands-on approach. LBIEs also reported using MotS for a wide range of learners: 59% to offer more challenge, and 53% for those who need more practice (p. 28). When asked which math topics they often used MotS to support, they reported counting (94%), patterns (88%), measurement (82%), arithmetic (65%), data and graphing (65%), and geometry (47%) (p. 29).

Parents in literacy programs. 57% of librarians surveyed offer family literacy programs, in which both parents and children develop literacy and other skills critical to citizenship and family life. Because of MotS, 39% now include numeracy in these programs. Of those, 48% noted parental gains in math skills, 48% cited increased parental ability to explain their math ideas, and 44% found a boost in parental confidence in math (pp. 27-28).

Parents. More broadly, 93% of librarians felt that both children and parents benefited from MotS experiences in their libraries (p. 20). These experiences included family programs as well as non-facilitated programs (e.g., MotS games left out for patrons, interactive displays, etc.). The top benefits cited were: seeing math as relevant to everyday life; gaining enthusiasm for math; gaining new ideas for sharing math with children; and learning how to look for math ideas in story books (p. 26).

2D. Conclusion

MotS gave LBIEs a new and lasting vision of math as contextual, relevant, and accessible. Those surveyed began to weave math into many areas of their practice and regularly shared their everyday math knowledge and skills with children, going beyond use of specific MotS resources. If these LBIEs are representative of informal educators as a whole, they likely felt strongly from the outset that children should succeed in math. However, not until they encountered MotS did they see themselves as capable of playing a role in helping children to realize that success. Through their efforts, children gained mathematical confidence, skills, and enthusiasm, ability to explain their math ideas and appreciation of the role of math in everyday life. Parents, including those in family literacy programs, likewise experienced math-related gains.

Parents started to be aware of the importance of math. They used to come to the library just for practice reading. Now they realize that they can incorporate math in daily activities. They also learn how to make math an interesting subject to their children. (LBIE p. 24)

Parents have a much greater appreciation for math. They don’t feel they are good at math and will directly address that; yet I saw that they are getting better at it because they want their children to do well in math. (LBIE p.22)

I usually set up the activity so that it runs itself and then I try to listen in as parents and kids (or sometimes kids with each other) talk about the displays and activities. Parents get to see how their children reason things out, and if I’m in the room I’ll sometimes help the parents see how they can let their child grapple with a concept to come up with the answer. (LBIE, p. 24)
Project impact extended beyond those in participating regions. One way was via our web resources. Although project involvement—however minimal—and use of MotS over time led to the strongest impacts, even those who encountered the resources recently and without project support began to change their practices, incorporating math regularly and seeing it as a valuable component of library offerings. Impacts also extended via outreach efforts of LBIEs themselves. Through state and regional networks, some participants took it upon themselves to introduce others to MotS; our web searches and analytics data suggests wide access of our resources, with substantial interest in Common Core connections.

Libraries are a mainstay of our society, used for enrichment, entertainment, and education. If LBIEs embrace math, they can pass on their enthusiasm to the increasing numbers of children using the library as a free, safe place to spend time outside of school hours. With that in mind, we conclude by summarizing the strategies that our research found successful.

*Ground activities in authentic situations that informal educators find compelling.* Activities should be designed to honor informal educators’ areas of comfort, expertise, and passion—whether certain topics, types of programs, or ways of interacting with children.

*Ground activities in what children find compelling.* Children typically choose whether to participate in out-of-school activities, especially those in library settings. If children enjoy the offerings, informal educators will provide more. If math is embedded in what children love, they are poised to appreciate math.

*Start with math that informal educators know.* Instead of asking informal educators to undergo a math refresher course, support them in becoming more aware of math they already do in everyday life and in making this math more explicit for children.

*Let informal educators lead.* Informal educators, often from the same demographic as the children with whom they work, serve as role models and mentors. If they defer to others to implement math, they imply that math is best done by others. If they engage in math activities and conversations directly with children, they demonstrate that math is for everyone.

**References**


For me, the biggest impact of MotS is that it encourages us to change how we think about math and to challenge everyone around us to do the same. [Our MotS programming] challenges us to make a meaningful transition from the classroom to real life when engaging kids in math. Doing this in the library has the potential added bonus of reaching a self-selected population that is predisposed to choose reading over math; so we get to change the attitudes and skills of kids who need it most. How cool is that?! —WLS Librarian, personal communication 9/16/11