



Vermont Early Literacy Initiative -- Science, Technology, Engineering & Mathematics (VELI-STEM) Project

Year Two Evaluation Report December 2017

YEAR TWO EVALUATION: EXECUTIVE SUMMARY

With two of the VELI-STEM project's three years completed, project partners have really hit their stride, consistently demonstrating competence in the:

- Delivery of trainings and resources to librarians to support their provision of STEM learning experiences to children and families;
- Recognition and utilization by librarians of opportunities to infuse STEM throughout their library practices;
- Transfer of STEM knowledge and skills from librarians to community child care providers/early educators to enable them to introduce STEM learning experiences to the young children they serve; and
- On-going development of an online STEM Clearinghouse of Resources.

VELI-STEM Grant Award

In 2015, the federal [Institute of Museum and Library Services \(IMLS\)](#) awarded the [Vermont Department of Libraries](#) three years of [National Leadership Grant for Libraries funding](#) totaling \$339,861 to partner with the [Vermont Center for the Book](#) and [Montshire Museum of Science](#) to expand the [Vermont Early Literacy Initiative \(VELI\)](#) in 25 public libraries by training librarians to provide STEM programming for young children, parents, and child care providers in science inquiry and physical science. IMLS funding runs from November 1, 2015 through October 31, 2018.

During the inaugural year of the project, many lessons were learned, which were applied in Year Two with patently positive results. After streamlining the data submission process based on extensive Year One librarian input, the rate of submission by librarians of all required datasets increased from just under a third (32%) in Year One to just over three-quarters (76%) in Year Two, greatly enhancing the story their collective data could tell and painting a more complete picture of the project's overall impact. Among all evaluation metrics, there were significantly more upward trends (improvements) from Year One to Year Two than downward trends (challenges), revealing a maturation among librarians with infusing STEM throughout their library practices. Further insights into the tremendous progress made in Year Two were gleaned from anecdotal comments from librarians, family members/caregivers, and child care providers/early educators, along with on-site observations by leadership team members, all of which revealed greater facility among librarians for transforming their libraries into community hubs of STEM learning. Therefore, the focus in Year Three will be on staying the course, while strategically targeting any intensive supports certain libraries might need around more challenging areas of the project, such as outreach to child care providers/early educators. Based on a comparative analysis of the rich data and anecdotes generated through the evaluation of the VELI-STEM project in Years One and Two, some particularly noteworthy findings are provided below, with more detailed findings included under [Objective 8](#) and in the [Summary of Year Two Evaluation Findings](#) at the end of the report.

IMPROVED RECOGNITION BY LIBRARIANS OF EARLY CHILDHOOD STEM LEARNING OPPORTUNITIES –

Librarian self-assessment of ability to recognize opportunities to incorporate ongoing STEM learning experiences for 3-7-year-old children and their families throughout their library practices increased from a 3.9 prior to the project to a 4.7 in Year One and a 4.8 in Year Two (with 5 being fully proficient)

REMARKABLE INCREASE IN NUMBER OF STEM PROGRAMS –

There was a 357% increase in the total number of STEM programs reported by librarians, up from 198 combined total programs in Year One to 905 in Year Two, which cannot be explained entirely by increased data reporting rates, since the average number of STEM programs provided per library increased by 300%, up from an average of 9 programs per library in Year One to 36 in Year Two.



SPIKE IN PARTICIPATION LEVELS AND CONTINUED STRONG ENGAGEMENT IN STEM PROGRAMMING –

There was a 271% increase in total participation among all STEM programs, up from 3,711 participants in Year One to 13,778 in Year Two, with an overwhelming majority of young children in both years of the project being perceived as somewhat to very engaged in the STEM programs and family members/caregivers continuing to report feeling more able to encourage their children's interest in STEM.

HIGH LEVEL OF ENGAGEMENT BY PARENTS IN THEIR CHILD'S STEM LEARNING –

One of the most common themes among family member/caregiver survey comments was a sense of excitement about gleaned techniques from library programs for transforming “play” time into fun STEM learning opportunities for their child.



SUCCESSFUL INNOVATION IN TRANSFERRING STEM KNOWLEDGE AND SKILLS TO OTHERS, CAUSING A RIPPLE EFFECT –

Innovative strategies were utilized successfully to reach more child care providers/early educators, such as VELI-STEM libraries teaming up to offer regional trainings, and the number of children who were/will be provided STEM learning opportunities as a result of child care provider/early educator trainings on early STEM literacy rose from 163 in Year One to 1,045 in Year Two.

INCREASE IN QUANTITY AND SHIFT IN PERCEPTION OF COMMUNITY STAKEHOLDER ENGAGEMENT –

There was a 68% increase in the total number of STEM community stakeholders collectively engaged among all librarians, from 572 in Year One to 961 in Year Two, with the average number of community stakeholders each individual librarian engaged rising from 25 in Year One to 38 in Year Two (52% increase), and librarian comments reflected less of a sense of feeling daunted by trying to conduct outreach for the VELI-STEM project while also implementing other components of the project.

TABLE OF CONTENTS

Section	Page Number
<u>Year Two Evaluation Report Overview</u>	5
<u>Year Two Evaluation Findings</u>	7
<u>Objective 1: Recruit and train 25 librarians from rural communities in STEM content (Physical Science Through Inquiry), skills and knowledge over three years</u>	7
<u>Librarian Recruitment (Sample of Libraries)</u>	7
<u>Librarian Training</u>	9
<u>Objective 2: Develop and monitor an online STEM Clearinghouse of Resources for project librarians to access and inform during the three years of the project</u>	11
<u>Objective 3: Investigate with librarians ways to recognize STEM language and concepts in picture books and other existing library resources, in order to be confident and competent in using this knowledge in ongoing programming</u>	12
<u>Objective 4: Assist librarians in the infusion of appropriate STEM content into their regular practice, including collection development, ongoing programming, conversations, bibliographies, displays and outreach</u>	14
<u>Objective 5: Provide librarians with non-fiction books, STEM resources and hands-on learning materials to be used throughout the library setting and in programming with children, families, and child care provider trainings and in the development of library “Discovery Science Centers”</u>	17
<u>Objective 6: Support development of programmatic relationships between librarians and community STEM resource people</u>	18
<u>Objective 7: Develop and promote a YouTube channel and other social media for librarians to use as resources and networking tools</u> ...	20
<u>Objective 8: Evaluate efficacy of training and materials for refinement and dissemination of results, and for replicability</u>	20
<u>Year Two Evaluation Overview</u>	20
<u>Statistical and Anecdotal Findings</u>	22
<u>Impact of Trainings and Materials</u>	23
<u>STEM Programming</u>	26
<u>Family Member/Caregiver Survey on STEM Programming</u>	28
<u>Child Care Provider/Early Educator Survey on Early STEM Literacy Trainings</u>	31
<u>STEM Community Stakeholders</u>	34
<u>On-Site Observations of STEM Programming</u>	36

TABLE OF CONTENTS – continued

Section	Page Number
<u>Objective 9: Disseminate and promote project results</u>	38
<u>Web Presence</u>	38
<u>Evaluation Reports</u>	38
<u>Cultivating a Replication Mindset</u>	40
<u>Summary of Year Two Evaluation Findings</u>	41
<u>Appendices</u>	45
<u>Appendix A: VELI-STEM Year Two – Two-Day Training 3-21-17 Planning Discussion Notes</u>	45
<u>Appendix B: Agenda for the VELI-STEM Training Conference, Year Two, April 24 and 25, 2017</u>	46
<u>Appendix C: Year Two – Building and Engineering Books and Hands-on Materials Distributed to Librarians at Two-Day April 2017 Training</u>	47
<u>Appendix D: Year Two STEM Building Resource Card (provided to families and caregivers)</u>	48
<u>Appendix E: Agenda for the Year Two, October 17, 2017, VELI-STEM Workshop</u>	50
<u>Appendix F: Picture Book Bibliography – VELI-STEM Year 2: Building and Engineering – Resource List</u>	51
<u>Appendix G: Year Two– Building and Engineering Books and Hands-on Materials Distributed to Librarians at October 2017 Workshop</u>	54
<u>Appendix H: Cardboard City activity instructions</u>	55
<u>Appendix I: VELI- STEM Year Two Program Template</u>	57

YEAR TWO EVALUATION REPORT OVERVIEW

This Year Two Evaluation Report serves several important purposes:

- A. It is a **progress report**, documenting the continued forward movement during the second year of the three-year VELI-STEM project toward achieving the overarching goal of transforming library practices through the infusion of STEM content, skills, and knowledge into all aspects of working with young children and their families.
- B. It is a project **monitoring tool**, providing an assessment of the degree to which implementation during the project's second year adhered to what the Vermont Department of Libraries, Vermont Center for the Book, and their partners set out to do, as well as identifies and guides necessary course corrections.
- C. It **supports replication**, compiling successes achieved and lessons learned – and appending information, materials, and resources that other programs can adapt and adopt – to foster the provision of STEM learning opportunities for young children by libraries across Vermont and beyond.

While the thematic focus switched in Year Two to Building & Engineering from Force & Motion in Year One, there were the same two main areas of measurement in Year Two as in Year One, in support of the project's evaluation, implementation monitoring, and broader replication:

1. Measurement of changes in STEM *knowledge levels*, among librarians, children 3-7 years old, families/caregivers of children 3-7 years old, and child care providers/early educators of children 3-7 years old; *and*
2. Measurement of changes in *behaviors*, with the two main focal points of behavioral changes including librarian infusion of STEM concepts and skills throughout their regular library practices (i.e., collection development, ongoing programming, conversations, bibliographies, displays and community outreach) and the incorporation of early STEM learning experiences by child care providers/early educators in their early care and education programs.

This report is structured around the project's nine objectives:

- ❖ [Objective 1: Recruit and train 25 librarians from rural communities in STEM content \(Physical Science Through Inquiry\), skills and knowledge over three years](#)
- ❖ [Objective 2: Develop and monitor an online STEM Clearinghouse of Resources for project librarians to access and inform during the three years of the project](#)
- ❖ [Objective 3: Investigate with librarians ways to recognize STEM language and concepts in picture books and other existing library resources, in order to be confident and competent in using this knowledge in ongoing programming](#)
- ❖ [Objective 4: Assist librarians in the infusion of appropriate STEM content into their regular practice, including collection development, ongoing programming, conversations, bibliographies, displays and outreach](#)
- ❖ [Objective 5: Provide librarians with non-fiction books, STEM resources and hands-on learning materials to be used throughout the library setting and in programming with children, families, and child care provider trainings and in the development of library "Discovery Science Centers"](#)
- ❖ [Objective 6: Support development of programmatic relationships between librarians and community STEM resource people](#)

- ❖ [Objective 7: Develop and promote a YouTube channel and other social media for librarians to use as resources and networking tools](#)
- ❖ [Objective 8: Evaluate efficacy of training and materials for refinement and dissemination of results, and for replicability](#)
- ❖ [Objective 9: Disseminate and promote project results.](#)

For each objective, statistical and anecdotal evidence is provided of the progress made, challenges encountered, and lessons learned during Year Two of the VELI-STEM project, as compared to baseline and Year One. That evidence was collected from a variety of sources, including:

- Participating librarians
- Family members/caregivers who accompanied children at STEM programming
- Child care providers/early educators who were trained by librarians on early childhood STEM literacy
- Project leadership team members.

YEAR TWO EVALUATION FINDINGS

Objective 1: Recruit and train 25 librarians from rural communities in STEM content (Physical Science Through Inquiry), skills and knowledge over three years

Librarian recruitment – The Vermont Department of Libraries (VDOL) and Vermont Center for the Book (VCB) have maintained their goal of 25 libraries participating throughout the first two years of the three-year VELI-STEM project. An analysis of the original sample of 25 libraries selected for participation in the VELI-STEM project was conducted in Year One and is [posted on the VELI-STEM Weebly website](#). Later in Year One following that original sample analysis, an additional library was enlisted to offset any future attrition, which proved prudent later in Year One when one of the original 25 libraries had to drop out of the project due to staffing transitions. That left the project with the target sample size of 25 libraries as of the end of Year One of the project (October 31, 2016).

At the beginning of Year Two, Norman Williams Public Library in Woodstock, Vermont, ended their participation, and Springfield Town Library agreed to participate in the project for Years Two and Three of the grant, thereby restoring the Year Two sample size to 25. Springfield Town Library began their participation in the Vermont Early Literacy Initiative (VELI) project¹ in 2010 and, just before joining the VELI-STEM project, the library had just hired a highly experienced new children's librarian, Michelle Stinson. Wendy Martin from the VELI-STEM leadership team met with Ms. Stinson and the library director to discuss goals of the project, librarians' responsibilities, what had been accomplished to date, and plans for Years Two and Three. Ms. Martin also shared the [Year One Evaluation Report](#), encouraged Ms. Stinson to visit the VELI-STEM Weebly website to access resources and templates, and gave her a selection of the Year One books and materials so that she could enhance the STEM programming she would begin to offer. Ms. Stinson was excited to be participating in VELI-STEM, which would draw on her experience in and current connections with local early care and education providers. Also, Ms. Stinson reached out to other nearby VELI-STEM libraries to learn more about the project from her more "seasoned" peers. In addition, the project evaluator, Kelly Myles, provided extra assistance to Ms. Stinson with Year Two data tracking and submission. The Year One replacement library was somewhat more rural than the library it replaced, whereas the Year Two replacement library was less rural than the library it replaced, with the overall sample retaining its predominantly rural attributes.

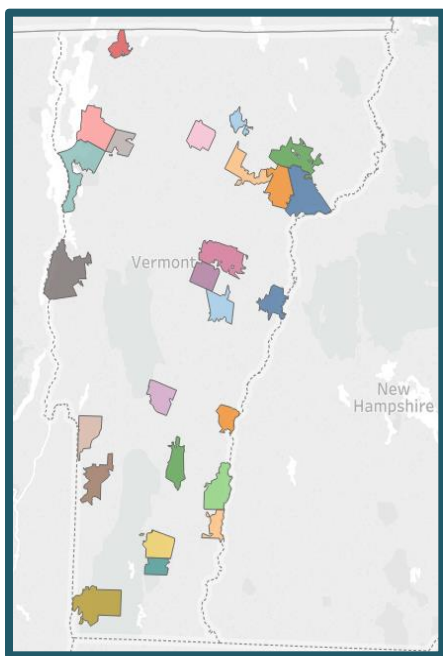
Looking ahead, there will be more shifts in the VELI-STEM sample. At end of year two (late September 2017), VELI-STEM librarian, Karen Cawrse, began transitioning from Jamaica Memorial Library in Jamaica, Vermont, to Lydia Taft Pratt Library in Dummerston, Vermont. Later in October, Jamaica Memorial Library's board approved the continuation of the VELI-STEM project for the remaining year of the grant, with Cassidy Menard as the new librarian. The VELI-STEM leadership team will meet with Ms. Menard to orient her to the project and share materials, and Ms. Menard will attend all Year Three trainings. Also, the project evaluator will provide an orientation to data tracking and reporting requirements and assist her in getting up to speed with those processes.

¹ Launched in 2010, VELI is a partnership between the Vermont Department of Libraries and the Vermont Center for the Book to support the development of early literacy skills and school readiness by providing training and resources to public librarians working with young children and their parents and caregivers.

The Board of Trustees of Lydia Taft Pratt Library also gave approval in late October to allow Ms. Cawrse to implement the VELI-STEM project at her new site going forward in Year Three. Although Lydia Taft Pratt Library is not a VELI library (one of the criteria for inclusion in the original VELI-STEM sample), Ms. Cawrse participated in VELI during her time at Jamaica Memorial Library, so that sampling criterion has been approximated.

These late Year Two transitions leave the project with 26 librarians (versus the target 25) at the start of Year Three, but funds have been identified to purchase some of the Year One and Year Two books and materials for the 26th library to enable programming on the themes from the first two years (Force & Motion and Engineering & Building), along with Year Three Programming on Sound, Air & Water.

An important lesson learned from library transitions is that the group dynamic of the trainings improved as a result of the on-boarding of libraries with a stronger level of engagement in the project. The leadership team sensed at both Year Two project convenings that having every library excited and energized made the experience better for all.



LIST OF 25 VELI-STEM LIBRARIES IN YEAR TWO OF PROJECT

Ainsworth Public Library (Williamstown)	Aldrich Public Library (Barre)	Bennington Free Library	Bixby Memorial Free Library (Vergennes)
Bradford Public Library	Burnham Memorial Library (Colchester)	Chelsea Public Library	Cobleigh Public Library (Lyndonville)
Craftsbury Public Library	Fletcher Memorial Library (Ludlow)	Hartland Public Library	Highgate Public Library
Jamaica Memorial Library	Jeudevine Memorial Library (Hardwick)	Lanpher Memorial Library (Hyde Park)	Milton Public Library
Pawlet Public Library	Pope Memorial Library (Danville)	Poultney Public Library	Rockingham Free Public Library (Bellows Falls)
St. Johnsbury Athenaeum	Wardsboro Public Library	Westford Public Library	Sherburne Memorial Library (Killington)
			Springfield Town Library

[Lydia Taft Pratt Library](#) in Dummerston on-boarded in October 2017 to participate in Year Three (November 1, 2017-October 31, 2018).

Similar to the Year One sample of librarians, approximately a third (8) of the librarians who were the main point of contact for the VELI-STEM project in Year Two held the primary role of library director,

while just over two thirds (17) held the primary role of children/youth services librarian, with one of those 17 also holding the title of Assistant Librarian. Time spent working in those library roles in Year Two averaged 30 hours per week (same as Year One), with a range of 4-40 hours per week (as compared to 11-40 in Year One).

Librarian training – Librarian trainings that were conducted during Year Two of the VELI-STEM project are summarized here, with more specific librarian training details relevant to [Objective 3](#) (librarian training on recognition of STEM language and concepts in library resources) and [Objective 4](#) (librarian training on infusion of appropriate STEM content into regular library practice) provided under those objectives.

Well in advance of the first librarian training in April 2017 of the project’s second year, a planning discussion² was held among the project leadership team³ and subject matter experts (SMEs), including:

- Sally Anderson, Executive Director, Vermont Center for the Book
- Wendy Martin, Associate Director, Vermont Center for the Book
- Karen Worth, Chair, Elementary Education Department, Wheelock College
- Greg DeFrancis, Education Director, Montshire Museum of Science

To inform that planning discussion and formulate suggestions for the first Year Two training, the team reviewed project evaluation reports, site visits, program templates, and other information capturing important insights about Year One.

The first Year Two training took place on April 24 and 25, 2017 at Lake Morey Resort Conference Center in Fairlee, Vermont, and focused on STEM Inquiry – Building and Engineering. An outline of the topics and activities covered during the 2-day training is provided here:⁴

- [What is Science for Young Children?](#) (a “refresher” from the Year One April 2016 training, Ms. Worth’s PowerPoint presentation, which was co-presented in April 2017 with Mr. DeFrancis)
- Building With Cups, Cardboard and Block
- Building With Keva Planks
- Building With Straws and Connectors
- Building With Found Objects Without Tape or Glue [cereal/pasta boxes (boxboard), tubes, chenille sticks, string, binder clips, clothespins]
- Program Template Review and Review of the Previous Day’s Work and Expectations
- Evaluation requirements for Year Two
- Distribution of Books and Materials, including *Building Structures With Young Children* by Ingrid Chalufour and Karen Worth and *Constructions (Windows on Science)* by Joan Westley as the Year Two curricula⁵
- Connections to the Summer Reading Program, Planning, and Program Templates.

² See [Appendix A](#) for notes from that planning discussion.

³ The only leadership team member not present was the Vermont Department of Libraries Youth Services Consultant, as that position was still vacant at the time of the planning meeting.

⁴ The full agenda for the Year Two April 2017 training conference is included in [Appendix B](#).

⁵ For details on the books and materials distributed at the April 2017 librarian two-day training, refer to [Appendix C](#) (including the Year Two STEM Building Resource Card for families and caregivers in [Appendix D](#)) and to the section below on [Objective 5](#) on providing librarians with materials for STEM programming and trainings.

The objectives of the two-day training were that librarians would gain an understanding of:

- (a.) What science means to/how it is experienced by young children;
- (b.) The need for children to have repeated experiences with materials – same materials, same book over and over again;
- (c.) The Year Two theme of Building and Engineering and how science and inquiry is “messaging around” or exploring with blocks, while application is engineering [also, that prompts should focus on a challenge (engineering design)];
- (d.) Children are doing the same thing (building), but librarian focus (as facilitators for children’s learning) is more on engineering;
- (e.) The differences between and similarities among engineering and science.

Librarians from all 25 Year Two libraries attended the two-day April 2017 training, with four libraries sending more than one person.

The Year Two October 17, 2017, workshop, which also was held at Lake Morey, was organized into four topics⁶ (approximately one hour per hands-on activity):

- Sorting, Estimating and LARGE Numbers
- Launching Into Design (Gliders)
- Pom-Pom Launchers
- Sorting Collections

The leadership team invited science educator Meredith Wade to present at that workshop. Ms. Wade has worked with VCB for over 20 years, and has been the co-developer for most of VCB’s science and math curricula for librarians and other educators. Ms. Wade was asked to focus on design (inventing) and engineering, and she distributed an Engineering & Building picture book resource list,⁷ and the leadership team distributed more books and materials⁸. The main objective of the Year Two October 17, 2017, workshop was to reinvigorate librarians and equip them with additional STEM activities to conduct throughout the winter. Librarians from five libraries were not able to attend, but arrangements were made for them to receive the books that were distributed at the workshop.

The Year Two budget for the training venue for both the two-day April 2017 training and the one-day October 2017 convening was \$11,484, and this budget was not exceeded. As part of the project budget, STEM experts and trainers received a per diem to develop STEM content and deliver the training, ranging from \$563 to \$1,000 per diem. There were no audio-visual fees, nor was there transportation reimbursement. In helping to underwrite the trainings, Vermont Center for the Book is providing an indirect cost share amount of \$2,500 each year. Because the VELI-STEM project is intended to be a replication model, the project team tried to keep book and material expenses to a minimum so that any library, no matter its size or location, can afford to implement the project.

⁶ The full agenda for the October 2017 workshop is included in [Appendix E](#).

⁷ The Engineering & Building Picture Book Resource List is included in [Appendix F](#) and posted on the [VELI-STEM Weebly website](#).

⁸ For details on the books and materials distributed at the October 2017 librarian workshop, refer to [Appendix G](#) and to the section below on [Objective 5](#) on providing librarians with materials for STEM programming and trainings.

Objective 2: Develop and monitor an online STEM Clearinghouse of Resources for project librarians to access and inform during the three years of the project

In Year One, a comprehensive [VELI-STEM website](#) was launched on a Weebly platform that is publicly accessible and linked to the [Vermont Department of Libraries website](#). The [VELI-STEM website](#) serves several important purposes, including linking VELI-STEM librarians to essential project and other related STEM resources, establishing an on-line presence for the project, and supporting replication of STEM-infused library practices across Vermont and beyond. The [VELI-STEM website](#) includes a wide array of useful resources, ranging from training information and program resources (activity ideas, book lists) to project-specific administrative and evaluation forms. In addition, the site helps bring the project alive with photos and narrative information about the project.

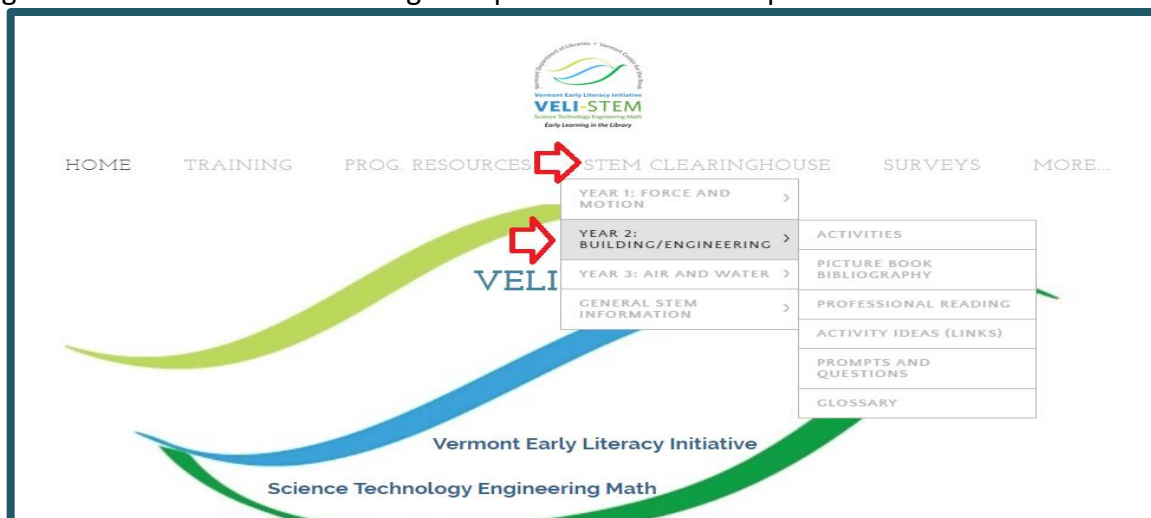
The [VELI-STEM website](#) also hosts the [STEM Clearinghouse of Resources](#), which compiles the strongest hands-on STEM activities already available into an easy-to-use, online location. The Clearinghouse is organized by project year topics – Year One: Force and Motion; Year Two: Building and Engineering; and Year Three: Sound, Air, and Water. After Year One, a link was added to the [STEM Clearinghouse](#) to access helpful information on the [Next Generation Science Standards](#) under both the Year One and Year Two [Professional Reading](#) page, in direct response to survey scores and anecdotal feedback during Years One and Two indicating that training had not been sufficient for a complete understanding of how to encourage children to develop and use a range of science practices as described in the Standards.

"I am grateful for the VELI STEM website ... so that we have access to all of the information that was covered at the training to refer back to and use."

VELI-STEM Librarian

In Year Two, a [General STEM Information](#) tab was added under the Clearinghouse, because there were so many resources available that did not necessarily fit into one of the three annual project topics.

The Year Two Clearinghouse Building and Engineering resources covered six main areas: [Activities](#), [Picture Book Bibliography](#), [Professional Reading](#), [Activity Ideas \(Links\)](#), [Prompts and Questions](#), and a [Glossary](#). At the October 2017 Year Two workshop, librarians commented that they found the Clearinghouse links useful when talking with parents about the importance of STEM.



Not only do VELI-STEM librarians access the resources, they also inform the content of the Clearinghouse based on their own experiences with STEM-infused practices. After the end of Year One, the leadership team reviewed all the program templates librarians submitted and synthesized them into five templates for cohesive and consistent activity planning around Force and Motion. The five Force and Motion templates were posted on the [Clearinghouse Year One Activities web page](#), making them accessible to librarians within the project, Vermont, and beyond. At the conclusion of Year Two, the leadership team again asked librarians to submit at least one Building and Engineering template. All templates will be reviewed, and a limited number will be posted on the [Clearinghouse Year Two Activities web page](#).

The [VELI-STEM website](#), including the [STEM Clearinghouse](#), is an effective strategy for developing an on-line presence in support of project implementation and broader replication. A lesson learned after Year One was how important it is to remind librarians about the VELI-STEM website and for the leadership team to post regular information to enhance programming; so, in addition to continuing to update the bibliographies, the leadership team plans to post other resources more frequently and then notify librarians to drive them to the site. Also, the leadership team has begun to tell other librarians and early care providers about the site, encouraging them to use the resources. VELI-STEM website analytics indicate that the site now averages 500 page views per *week* and 115 unique visitors each *week*, up from an average of 118 visits per *month* from May through October 2016 of Year One of the project.

Objective 3: Investigate with librarians ways to recognize STEM language and concepts in picture books and other existing library resources, in order to be confident and competent in using this knowledge in ongoing programming



Year Two trainings were designed to increase awareness and comprehension of STEM language and concepts in books and other STEM materials, to foster confidence and competence in ongoing programming and trainings that librarians provide. Given the efficacy and popularity of the experiential learning model used in Year One trainings, the bulk of Year Two trainings were hands-on, with “lecture” style instruction kept brief.

At each training, a collection of old and newly published picture books was used to illustrate how a “regular” book can be a jumping-off point for the introduction of a STEM activity, with an emphasis on how STEM can be gleaned from almost all books. Consequently, during the site observations of STEM programming that the leadership team members conducted, librarians were observed use “everyday” story hour books to introduce a STEM activity with confidence (e.g., one librarian used a Berenstain Bears book). Librarians are showing more ability in “finding” STEM and introducing it throughout their programming.

In Year Two, librarians also were trained and supported in using other materials for their STEM programming. A portion of the first day of the April 2017 two-day training centered around three activities with specific challenges at three stations that librarians rotated through: “Building With Cups, Cardboard and Blocks”; “Building With Keva Planks”; and “Building With Straws and Connectors.” Focus was placed on giving librarians time and guidance in experimenting with the Keva planks and Straws and Connectors, since each library received a set to take back to their libraries. Ms. Worth and Mr. DeFrancis introduced a model of plan, create, test, improve, and finalize, and librarians followed that process during the training activities. Challenges included: build a three-story house; build a bridge; build a tall tower; and build an enclosed structure.

The two-day April 2017 training also included a discussion of the possible ways to connect the Year Two VELI-STEM project theme of Building & Engineering to the national Summer Reading Program theme: *Build a Better World*, and there was a brief brainstorming session in small groups seated around tables, so librarians could bounce ideas off each other.

To help foster facility with using Year Two STEM books and materials in programming, the following processing framework was used during the April training:

- Interactions that lead to doing/thinking – nature of questions and comments: How do we encourage children to do the thinking? What kinds of prompts can we use?
- Use of the program template and tying it in with questions;
- Inclusion of discussion of picture books: which ones can be used?
- How to document the work so that parents, trustees, and the community see what’s happening in the library;
- Whom to recruit in the community to enhance STEM programming.



Further support in using picture books and other library resources for STEM programming was provided at the October 2017 Year Two workshop. Seasoned science educator, Meredith Wade, distributed bags of buttons and asked each small group to come up with a “sort” using a Venn diagram. After everyone completed that task, the groups visited each other to guess what their sorting “rule” was. Librarians were surprised to find that the task was not as simple as they first thought – most had thought they understood what a Venn diagram was, but executing it correctly with just one type of item (buttons) was difficult. That encouraged a rich discussion of how the activity could be introduced to young children and adapted for older ones (and adults). Then, Ms. Wade

distributed large quantities of different materials (plastic cubes, acorns, buttons, bottle caps, etc.), and asked librarians to practice ways to estimate the number of materials there were altogether. For example, one group had a large quantity of acorns in a jar, and Ms. Wade asked each person to take a handful and count the handful, then use that information to estimate how many acorns might be in the whole jar. VCB brought large quantities of a wide variety of objects, and librarians were invited to take a plastic bag and fill it with their own sorting collection to use in their libraries, with guidance provided on how to pick a “good” collection, beyond just sorting by color of the object [i.e., material object is made from, use (is it a tool?), numbers or letters, faces, etc.]. Librarians suggested that the sorting activity would be well suited for a Discovery Center set-up, and throughout Year Two it proved to be a fun and effective way to introduce the concept of estimating to young children.

During the October workshop, other hands-on activities, each followed by group processing about how librarians would implement the activity in their libraries, helped librarians gain confidence and competence in using STEM books and other library resources. The librarians made “Loop Gliders” out of paper, straws, and other materials, and experimented with different designs to make their gliders go further. Also, the librarians had been asked to bring empty plastic soda bottles to make “launchers,” and Ms. Wade introduced the launcher activity through the book *Whoosh! Lonnie Johnson’s Super-Soaking Stream of Inventions* (Barton), which was one of the books distributed to libraries. Ms. Wade also showed a short documentary piece about the inventor and invention. Librarians then made many kinds of launchers using pom-poms and other “safe” materials. It is important to note for replication purposes that the materials needed for all the October workshop activities were “found” objects easily attainable by librarians (cardboard, paper, straws, empty plastic soda bottles, pom-poms)⁹.



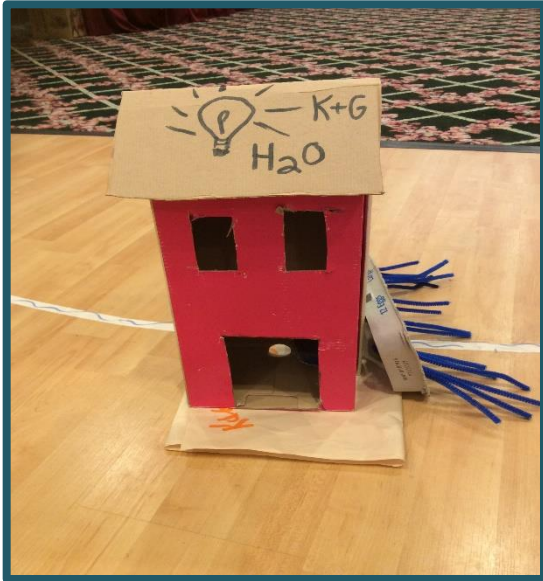
The experiential format, immediately followed by how to apply each activity to librarians’ settings and audiences, used throughout all Year Two training activities provided an immediacy to recognizing STEM language and concepts in the context of instantly applying that knowledge to program development. This, in turn, translated into librarian proficiency in using picture books and other existing library resources in STEM displays, activity centers, and other STEM programming.

Objective 4: Assist librarians in the infusion of appropriate STEM content into their regular practice, including collection development, ongoing programming, conversations, bibliographies, displays and outreach

Year Two convenings were designed to further enable librarians with infusing STEM content into their regular library practice, ranging from ongoing programming to outreach.

⁹ See [Appendix G](#) for the list of resources Ms. Wade used with the librarians at the October 2017 Year Two workshop.

A key lesson that was learned in Year One and applied to Year Two approaches to supporting librarians was the importance of being concrete. At the Year One training, Ms. Worth and Mr. DeFrancis had introduced several Force and Motion activities that did not directly translate into library programming for ages 3-7. The simple ramp activities that had been reviewed in Year One with librarians did work well, and the leadership team learned that the more hands-on experiences librarians have with the materials they are given (without any enhancements), the more confident librarians are in their STEM programming abilities.



Another carry-over from Year One was encouraging librarians to introduce an activity geared especially to family programming (e.g., marble runs in Year One); so, during the Year Two April training, the leadership team introduced "[Building a Cardboard Town With Found Objects](#)¹⁰."

Librarians had been asked to bring objects to build with (e.g., corrugated boxes and boxboard or cereal boxes and other objects such as plastic cups and clean yogurt containers). At the training, Mr. DeFrancis designated a "town" by marking off areas of the floor with masking tape, designating empty "lots" where buildings and other structures would go.

Librarians followed a planning process first, presented their plan to "permit grantor" Ms. Worth, and then began to build. Some librarians worked in teams and others worked alone.

This was a highly successful activity, and STEM programming

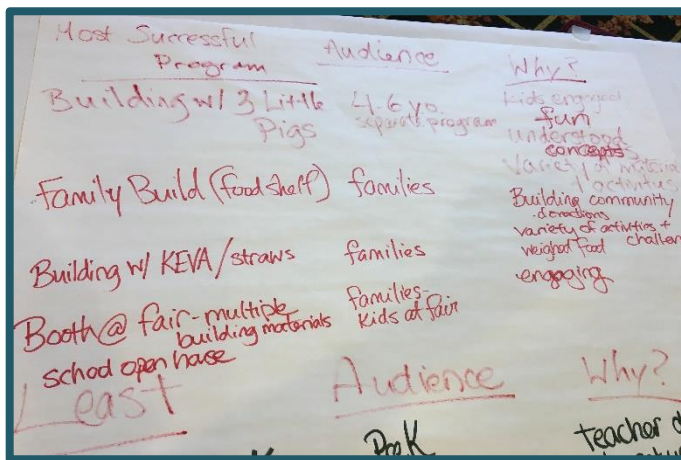
data and Family Member Surveys submitted at the end of Year Two indicated that librarians had great success in implementing the activity in their libraries.

Throughout the April 2017 two-day training, Ms. Worth and Mr. DeFrancis demonstrated building activities that librarians could present almost exactly as shown at the training. Everyone on the training team circulated throughout each of the activity sessions and offered suggestions and encouragement where needed. The Cardboard City activity, in particular, covered a myriad of STEM topics, as well as crossed domains (Social Studies and Literacy).

The April Year Two training also included time for the leadership team to discuss expectations for the second year. Librarians wanted to know if they could continue with Year One theme activities on Force and Motion, in addition to providing Building and Engineering activities (Year Two theme), which the leadership team confirmed they could. Also, librarians asked, "How many programs do I have to do?" Questions related to defined (quantitative) expectations are frequently posed by librarians to Vermont Department of Libraries (VDOL) and Vermont Center for the Book (VCB), and the leadership team has had to regularly remind librarians that the VELI-STEM project expectation is that librarians will infuse their programming with STEM concepts and content, but that no particular number of programs is required. However, since many of the librarians are concrete thinkers, they still push for a defined target number.

¹⁰ The template for the Cardboard City activity (from the Montshire Museum) is included in [Appendix H](#), as well as [posted on the VELI-STEM Weebly website](#).

In addition, the April training included the introduction and distribution of a new program template¹¹ for librarians to use in planning, which was adapted from the *Constructions* book (Chalufour & Worth). The template had been refined based on feedback from librarians in Year One, as well as on the programming information librarians submitted in the first year. Based on insights gleaned during Year One, the leadership team asked librarians to share at least one program template during Year Two, not several, to show an example of a program, emphasizing the message, “We would rather have one excellent template than several so-so ones” (i.e., quality, not quantity). Also, an emphasis was placed on how the program templates would be used to support replication of successful STEM programming, lending an element of immediacy to developing and sharing program templates. Librarians were encouraged to share their delivery/outreach models as well, to give other librarians relatable, useful suggestions.



During the October training, time was set aside for collecting information about the programming librarians had done throughout the year. Each table of librarians was asked to use one large sheet of easel paper to describe their most successful program and their least successful program, including:

- What was the audience?
- Why was it successful/not as successful?

After all the groups had a chance to answer the questions, each table reported out on what was shared.

Librarians also were given the opportunity to ask questions about forms (time/cost-share forms and evaluation information needed), and a distinct difference was observed between Year One versus Year Two’s librarian feedback about administrative and evaluation requirements, with librarians seeming more at ease in the second year of the project.

At both Year Two gatherings, ample time was allocated to allowing librarians to explore how their library could adapt a particular activity to their space and audience. Librarians also were given time to network with other librarians at the training around planning programs, and librarians were given time to do some of the actual program planning, with the goal being for librarians to return to their libraries ready to go.

One of the most successful avenues for assisting librarians with STEM-infused practices was choosing a topic that so readily lent itself to incorporation into programming, conversations, bibliographies, displays, and outreach.



¹¹ The Year Two program template is included in [Appendix I](#).

Building and Engineering opened up programming to a wider array of audiences. Hands-on activities at trainings helped librarians discover the many entry points to the Keva planks and Straws and Connectors, since anyone ages 3 to 103 could participate. Librarians showed more confidence about their programming going forward from the October 2017 workshop than they did after the October 2016 workshop. Librarians talked about their successes in weaving STEM easily into all their programming, especially around tying the VELI-STEM project theme of Building and Engineering into the Summer Reading Program theme (“Build a Better World”). Throughout all the Year Two training activities, an effort was made to model prompts and open-ended questions, and Building and Engineering seemed to offer more opportunities for librarians to practice those techniques. One librarian commented at the October 2017 fall project gathering that her community felt “fully STEMEd.”

Remote tools for supporting librarians with the infusion of appropriate STEM content into their regular practice, such as the closed VELI-STEM Facebook group, also were successful in Year Two. The Facebook page received a high number of posts from librarians showing their STEM programming in action, with the participation in that page growing significantly during the second year of the project. Seeing pictures from fellow librarians proved to be an effective means of encouraging librarians to think outside of the box and try new delivery systems – e.g., “First Friday programs in the village square? Why not? Harvest Fair in the village school? Sure! Drag Queen STEM Story Hour? Let’s do it!”

Objective 5: Provide librarians with non-fiction books, STEM resources and hands-on learning materials to be used throughout the library setting and in programming with children, families, and child care provider trainings and in the development of library “Discovery Science Centers”

In Year Two, librarians were provided with STEM books and materials on Building and Engineering at the April 2017 two-day training and again at the October 2017 one-day convening.¹² Librarians also were given a Building and Engineering bibliography, since some libraries have sufficient funds to purchase additional STEM books.¹³ A discussion of how librarians were trained on using the materials they were provided is included above under [Objectives 3](#) and [4](#) above.

The leadership team found that there are not as many building picture books available that meet the standard of “excellent,” including books that reflect the diversity and realities of our current society. Most construction books continue to depict outdated scenarios, showing men doing all the work in their hard hats, while women pack the lunches. However, *Building Our House* was one book that depicted a whole family actively involved in building a house; so, that was one of the books that was provided to everyone – libraries, families, and child care providers.

In addition to books, other STEM resources were provided to librarians. While Keva planks have been used by Vermont Center for the Book over the years, VCB had never provided them as part of a project, due to the expense (approximately \$50 for a set of 200 planks), nor had VCB seen them in action in a group setting. More recently, VCB has been using them in trainings with child care providers and has seen the enthusiasm they bring to that kind of building. Therefore, the decision was made to provide

¹² For details on the books and materials distributed at the April 2017 librarian two-day training and the October 2017 librarian workshop, refer to [Appendix C](#) and [Appendix G](#), respectively.

¹³ Refer to the Picture Book Bibliography, VELI-STEM Year 2: Building and Engineering – Resource List in [Appendix F](#).

both a 400-piece set of planks (\$89.95) and a large (705-piece) set of Straws & Connectors to libraries. At site visits, leadership team members observed the Kevas used virtually everywhere. One librarian told us she leaves them out all the time and everyone uses them to build.

Objective 6: Support development of programmatic relationships between librarians and community STEM resource people

Outreach is a part of regular library practice; so, all the librarians recruited for participation in the VELI-STEM project have a foundation in that aspect of library practices. Also, all the original (and over 95% of current) VELI-STEM libraries were selected out of the larger pool of Vermont Early Literacy Initiative (VELI) libraries. As part of their VELI participation, librarians were supported in serving children and families and offering outreach to local organizations, including child care programs. Therefore, VELI-STEM librarians already have a proven track record of collaboration and outreach in their local communities, and the VELI-STEM project was designed to provide these librarians with additional opportunities to leverage their community engagement skills and knowledge.

At the end of Year One, a number of librarians reported that the STEM outreach component of the project was a struggle, due to getting up to speed on other elements of VELI-STEM. Therefore, at both Year Two trainings, time was allocated to brainstorm with librarians on the different relationships they could forge in their communities. This topic definitely provided more potential opportunities to pursue, and there was a notable improvement with the outreach component of the project during the second year of the project. There was a sharp increase in the total number of STEM community stakeholders engaged among the 25 libraries – 961 in Year Two, up from 572 in Year One (a 68% increase). Also, the average number of STEM community stakeholders engaged per library rose from 25 in Year One to 38 in Year Two (a 52% increase). Also, librarians reported engaging engineers and builders in their STEM programming.¹⁴

A more specific challenge related to community outreach during the inaugural year of the project was engaging child care providers/early educators to fulfill the VELI-STEM's objective of providing training on early STEM literacy, with some of the most common issues cited including:

- A limited or no pool of child care providers/early educators for librarians to train within the library's own community;
- Lack of willingness or ability of libraries in nearby towns to partner with VELI-STEM sites in providing trainings to the providers in neighboring communities;
- Poor or no attendance by child care providers at trainings that librarians offered; and
- A lack of librarian time or confidence in their early childhood STEM literacy acumen to conduct the trainings.

Therefore, at the Year One October 2016 workshop, librarians were given time to brainstorm how to better recruit child care providers/early educators for trainings and programs, and it was agreed that more time would be given to supporting this type of outreach at future trainings. In Year Two, a few of the libraries continued to have trouble reaching child care providers, but hearing others' experiences at

¹⁴ More detailed data on the community outreach component of the project are cited below under [Objective 8](#).

trainings seemed to boost their confidence in persevering. Also, many librarians made great strides in connecting with child care providers/early educators through innovative strategies to provide early STEM literacy training, such as a couple of libraries that struggled in Year One with this type of outreach teaming up with a library that had successfully conducted trainings in the first year.¹⁵

Also, a few of the VELI-STEM libraries are seizing outreach opportunities presented by their town's designation as a Promise Community. Leveraging Federal Early Learning Challenge – Race to the Top funding, the Department for Children and Families of the Vermont Agency of Human Services has invested in 24 [Promise Communities](#) over the past three years.¹⁶ Vermont's Promise Communities initiative brings together local representatives from education, health care, social services, private and public sectors, as well as parents and community members, to create a comprehensive approach to transforming the community to better support young children and families, particularly those with high needs.¹⁷ The Promise Communities initiative strives to make use of both state and local resources and promote community-based changes to improve school readiness for young children in Vermont's highest need, rural (by federal standards) communities.¹⁸ Being a VELI-STEM library within a Promise Community affords those libraries an opportunity to infuse STEM content throughout their library practices in intentional ways around their community's efforts to "move the needle" on Kindergarten readiness, third grade reading proficiency, and high-quality afterschool programs.¹⁹

One of the VELI-STEM libraries that did not have any child care provider/early educator participation in trainings noted, "This area of the grant requirements has been a challenge for my library/community. This past summer my greater community received a 'Promise Community' grant and my library is a participant. Through the contacts with the Promise Community, I will be holding another series of programs for childcare providers."

Also, the VELI-STEM project leadership team has offered support to another librarian in one of the newer Promise Community cohorts, and that librarian has shared her skills and knowledge with others in the community. Another VELI-STEM librarian reported that her town's Promise Community meetings have been stressful and, while she was glad the library was included on the steering committee, she was not certain that she would be able to stay engaged in that effort, except for continuing to welcome families to the library (something she already does), and the VELI-STEM leadership team has offered any type of support that would be helpful. In addition, one of the VELI-STEM libraries conducted a Science in the Park STEM program, which entailed local playground activities offered in partnership with the Promise Community initiative. Yet another VELI-STEM librarian shared about her library's participation at Promise Community meetings, and noted that she had plans to bring more families to the library. However, follow-up conversations indicate that she has encountered significant challenges, including less than hoped for attendance at many family programs offered over the summer. Again, the VELI-STEM leadership team has offered encouragement and support. For all three libraries, Vermont Center for the

¹⁵ More detailed data on child care provider/early educator trainings are cited below under [Objective 8](#).

¹⁶ Let's Grow Kids. (no date). [Vermont's Promise Communities blog](#).

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ Department for Children and Families, Vermont Agency of Human Services. (February 26, 2015). [Promise Community Initiative - Frequently Asked Questions](#).

Book has offered resources they have access to, to support VELI-STEM libraries in Promise Communities in being seen as an important resource.

A key lesson learned in Year Two is that there needs to be checking in with librarians to be certain that outreach plans and ideas are followed up on, and the leadership team plans to do that over the 2017-2018 winter months when more programming is taking place.

Objective 7: Develop and promote a YouTube channel and other social media for librarians to use as resources and networking tools

In order to provide librarians with ready access to STEM resources and networking tools and support, a variety of social media have been utilized.

The VELI-STEM Facebook (closed) group that was created in April 2016 “blew up” (to quote the parlance of today’s youth) in Year Two, without any targeted encouragement from the leadership team, indicating that this is a natural entry point to share about their STEM practices. Also, almost all the VELI-STEM libraries are already on Facebook with their own library site for promotion and outreach purposes, and those who are on Facebook posted photos and captions for their programming.

As for the other social media, a VELI-STEM YouTube channel was created in Year One. However, the Vermont Department of Libraries was without a Youth Services Consultant for most of the year (the position that takes the lead for the Department on the VELI-STEM project); so, the YouTube channel was not further developed in Year Two. Now that the position has been filled, the leadership team will encourage the uploading of videos to the YouTube channel.

Also, in Year One, a blog post was submitted to IMLS on the project. However, again, the challenge in Year Two was the absence of a Youth Services Consultant at the Vermont Department of Libraries. Now that the position has been filled, plans are underway to submit another blog post to IMLS highlighting the Year Two programming successes.

Objective 8: Evaluate efficacy of training and materials for refinement and dissemination of results, and for replicability²⁰

Year Two Evaluation Overview – A detailed evaluation plan was fully developed by a consultant in close collaboration with the leadership team during the early phase of the project’s implementation in Year One, based on the high-level evaluation plan synopsis that was included in the VELI-STEM grant proposal. That fully developed evaluation plan was designed to gauge whether training and materials provided to librarians resulted in an improvement in the librarians’ proficiency in the delivery of STEM programming to 3-7-year-old children and the application of STEM concepts and skills throughout their regular library practices. Only minor modifications to the project’s evaluation plan have been made since its development in Year One. The key elements of the evaluation plan include:

²⁰ Refer below to [Objective 9](#) for a discussion of dissemination and replication of project results.

1. Librarian completion of a Baseline Self-Assessment Survey prior to the project being launched and post-training surveys after each of the three annual spring trainings, on STEM knowledge, concepts, skill, and delivery levels/proficiency.
2. Librarian tracking of quantitative data and anecdotes each project year on –
 - a. STEM programming they delivered/provided;
 - b. Family Member/caregiver perceptions of the impact of STEM programming on them and their child(ren);
 - c. Child Care Provider/early educator perceptions of the impact of the early STEM literacy training they received from librarians;
 - d. Outreach librarians conducted with STEM resource people.
3. Leadership team evaluative input on trainings and on-site observations of at least 13 STEM programs over the three-year project period.
4. Evaluator interviews of a subset of librarians and community members on the impact of the project (to be conducted during Year Three).

At the end of Year One, feedback was volunteered by and solicited from librarians on the evaluation process, prompting the simplification, streamlining, and automation of data submission:

- Librarians were eager to receive maximum credit for their efforts; so, the data tracking period was extended to a full 12 months (November 1 to October 31 for Years Two and Three) from April to October in Year One, now that a time period was no longer needed for the planning and roll-out of the project as it was during the pilot year.
- All data submission deadlines for librarians were moved to the common date of October 31, to reflect the 12-month data tracking period and simplify reporting requirements.
- While librarian opinions were mixed regarding paper versus on-line submission, a majority preferred on-line; so, data submission was transitioned to on-line mode for all four sets of data that librarians are required to track, although paper tracking forms were provided to librarians to record their data throughout the project year. Also, a paper option for the child care provider/early educator survey and family member/caregiver survey was made available, in case that was the preferred mode of data submission/collection or Internet access was an issue at certain programming or training sites.
- The timing of the surveying of child care providers/early educators who received early STEM literacy training was moved from the end of the project year to immediately following each training throughout the project year, so that their training experience was still fresh in their minds and the survey would be administered by someone they know (the librarian) versus the project evaluator. This also aligned well with the already established practice of surveying family members directly after each STEM program.
- Since many child care providers were hesitant in Year One to share their contact information out of a concern that it would be shared with Vermont Child Care Licensing personnel (which was an unfounded concern, but nonetheless important to respect), the "Name" field in the child care provider/early educator survey was made optional, as it already was on family member surveys.
- A [SURVEYS tab](#) was added to the navigation bar across the top of the [VELI-STEM Weebly website](#), and links to all on-line data submission forms were added to that tab, including active forms for data entry, as well as form previews for librarians to review and get acclimated without creating an actual completed form.

- All on-line surveys were formatted onto just one page to make it easier for librarians to look them over without having to enter fake data to advance to the next page.
- All paper data tracking forms also were re-formatted and simplified to fit onto just one page to make them easier to print out and fill in by hand, to accommodate librarians who indicated they are uncomfortable using Excel.
- Terms that librarians found ambiguous in Year One, such as what constitutes a “STEM program” or a “STEM community stakeholder,” were clarified in the data tracking form instruction sheets.
- A two-page “at a glance” overview of all librarian evaluation requirements – including deadlines and links to data forms – was distributed at the beginning of Year Two, at the project year mid-year point, two months prior to the year-end deadline, and one month prior to the year-end deadline, as well as was displayed on and linked to the [Surveys page](#) on the website. The multiple distributions of evaluation requirements provided opportunities to remind librarians of data reporting requirements and offer technical assistance, to increase compliance and improve data quality.

The efficacy of these librarian-driven revisions to evaluation strategies is supported by librarian anecdotal feedback. Some of the librarians commented to the leadership team at the October 2017 workshop that the organization of the data/evaluation information was much more intuitive this year. Further evidence of the improved efficacy of Year Two evaluation strategies include significant improvements in data submission rates. A comparison of Year One and Year Two response rates for each evaluation tool is provided directly below. One of the more notable changes in response rates is the increase in submission of all 4 required datasets from just under a third to over three-quarters of the librarians, with a 100% submission rate for STEM Programming data and Community Stakeholder data, which are the two datasets over which librarians have the most control (family members/caregivers and child care providers/early educators are strongly encouraged to complete a survey, but that is not a condition of their participation in programs and trainings). Also, all 25 participating libraries submitted at least one of the four required datasets, up from 88% in Year One.

Evaluation Tools:	Year One		Year Two		Change in submission rate
	# submitted	submission rate	# submitted	submission rate	
April Post-Training Librarian Survey	25	100%	25	100%	0%
STEM Programming data	20	80%	25	100%	20%↑
Family Member/Caregiver Surveys	15	60%	21	84%	24%↑
Child Care Provider/ Early Educator Surveys	14	56%	21	84%	28%↑
Community Stakeholder data	22	88%	25	100%	12%↑
Any of the 4 datasets	23	92%	25	100%	8%↑
All 4 datasets	8	32%	19	76%	44%↑
*On-Site Observations by Leadership Team					
*(3-year target = 13)	2	15%	6	62%	N/A

Statistical and Anecdotal Findings – Statistics and narrative comments are provided below to capture the key accomplishments of Year Two, with analysis provided on how Year Two accomplishments

compared against and built upon the accomplishments of Year One. The ultimate arbiter of the project's impact is the quantity and quality of STEM-infused library practices. In other words, did the knowledge and skills that librarians acquired through trainings and materials actually translate into regular and effective STEM-infused library practices? The following data analysis bullets, visualizations, and anecdotal feedback convey the affirmative answer to that question.



❖ Impact of Trainings and Materials

DATA SOURCES:

1. Post-training Librarian Survey
2. Anecdotal feedback from librarians
3. Anecdotal feedback and summarized observations from leadership team

FINDINGS:

- Over the first two years of the project, there has been an overall average increase among librarians in all STEM knowledge & skill levels, from a level of 3.6 at baseline to 4.7 after the Year One two-day April training and 4.8 after the Year Two two-day April training (total 1.2 percentage point increase from baseline):
 - The biggest gain since the project was launched was 1.7 percentage points on ability to regularly provide STEM learning opportunities for 3-7-year-old children, which had the lowest baseline score (greatest amount of room for improvement);
 - The smallest gain since the project was launched was just under a percentage point (0.9) on ability to identify STEM learning opportunities for 3-7-year-old children, which already had the highest baseline score (least amount of room for improvement).
- Likewise, there has been an overall average increase in understanding among librarians of all STEM concept & delivery areas since the project was launched two years ago, from a level of 3.2 at baseline to 4.3 after the Year One two-day April training and 4.5 after the Year Two two-day April training (total 1.3 percentage point increase from baseline):
 - Encouraging children to develop and use a range of science practices as described in the Next Generation Science Standards continues to generate the lowest score at 4.1, but the 1.8 percentage point gain since baseline represents the largest gain for any STEM concept & delivery area, indicating that training in this area has been effective for librarians;
 - The 1.3 percentage point increase in engaging children in science-learning opportunities was the smallest gain among all STEM concept & delivery areas, but still represents a 37% rate of improvement since baseline (there was only moderate room for improvement).

Post-Training Librarian Survey	Baseline	Year One	Year Two	Trends Green = improvement Red = decline	Change
Average librarian self-reported STEM knowledge & skill Levels (Scale of 1-5, with 5 being fully proficient)	3.6	4.7	4.8		1.2
Average librarian self-reported level of understanding of STEM concepts and delivery (Scale of 1 to 5, with 5 indicating a strong understanding)	3.2	4.3	4.5		1.3

- One of the most prevalent types of comments provided in the April 2017 Post-Training Librarian Survey related to how invaluable the trainings, resources, and other supports they receive through the project are to their library. A sub-sample of librarian comments from the survey is provided below:

Building & Engineering April Two-Day Training & Materials – what librarians had to say:

- *This was an amazing training. It completely revived and motivated me. I am really looking forward to another year of VELI-STEM.*
- *The books and materials provided are fantastic and I'm looking forward to more STEM programming!*
- *Thank you for providing another wonderful, hands on and engaging workshop. During a conversation with other librarians at the conference, it [was] mentioned how ... there were really no other hands on, “useful and practical” training workshops available to children's librarians here in Vermont. The importance of VELI[-STEM] to our Libraries is huge. Through these opportunities we are provided with training, experience and guidance- all which greatly helps to 1) build our knowledge 2) build our confidence and 3) provide us with ideas to replicate in our communities and 4) supply us with materials to share with families and utilize within the library, that we would otherwise not be able to afford.*

In addition to the librarian survey, the evaluation of the annual Year Two spring training includes observations from the leadership team:

- What worked particularly well at the April 2017 Year Two two-day training –
 - Being concrete in the delivery of content and introducing stations/activities that librarians could take home and implement immediately;
 - Not including any extraneous activities;
 - Ensuring all training activities could be connected to the Summer Reading Program;
 - Including an activity (Building with Found Objects—Cardboard City) that any library could do, regardless of budget or size;
 - Introducing Keva planks, which were new to the majority of librarians and created extra excitement about the programming possibilities.
- Main challenges encountered at the April 2017 Year Two two-day training –
 - The logistics and physical demands of collating and sending sets of hardcover books home with librarians (over 500 sets in total, including family and child care provider/early educator copies).

The October librarian workshop held each year is less of a formal training and more of a chance for librarians to learn from one another, for librarians and the leadership team to exchange important insights, and for expert input on STEM-infused library practices going forward. Therefore, a survey

format is not used to evaluate that event, but instead the leadership team captures key insights from the day:

- Tying the Year Two Building & Engineering program to the Summer Reading Program was a hit and that proven strategy will be continued in Year Three. Next year, the Summer Reading theme is Music; so, the leadership team has decided to include “Sound” with the original Year Three VELI-STEM theme of “Air and Water.” Karen Worth and Greg DeFrancis believe this will allow for richer programming.
- Being able to listen to librarians talk about their successes was important to the leadership team and the librarians. Hearing about librarians’ challenges and having everyone contribute to possible solutions was also important.
- Using the second meeting as an opportunity to encourage librarians to continue STEM programming throughout the winter is important, as is encouraging them to repeat programming from Years One and Two. Some librarians reported that they had already done Marble Runs [Year One Force & Motion activity] multiple times, and they saw no reason not to continue.

The leadership team also captured input from librarians at the end of the October 2017 workshop, with a few of the responses provided here:

- *I like the opportunity to hear what other people have done for their programs, like the details of what they planned and what worked and didn’t work. It’s always good to see on Facebook but it is much easier to understand in person and see what kind of awesome stuff everyone came up with.*
- *The second year of this program has been a really positive experience. I’ve started a monthly STEM Night program that my library patrons and their families really look forward to.*
- *Love the energy! Librarians are so enthusiastic and willing to experiment! Wish the librarians had been like this when I was young.*
- *I learned I get too excited when I try to sort items. I had items with too many characteristics. I learned through failing! This is a good lesson to pass on to children.*
- *Having Meredith [Wade] as a special guest was great. She has so much knowledge and gave us insight into ‘why’ on some of these things that we will do with children...I am definitely going back with many ideas I’ll use at my library over the winter.*
- *Now that I have done this for a while, I feel that I was able to enjoy and process the info much easier—not in a panic! Weblinks, sorting kits, pompom shooter ideas were great takeaways. I also love connecting with folks and sharing ideas in informal conversations.*

❖ STEM Programming

DATA SOURCES:

1. Librarian data
2. Anecdotal feedback from librarians

FINDINGS:

- From Year One to Year Two, the collective numbers on STEM programming among all reporting libraries experienced a remarkable increase:
 - There was a 357% increase in the total number of STEM programs reported by librarians, up from 198 combined total programs in Year One to 905 in Year Two.
 - There was a 271% increase in total participation²¹ among all STEM programs, up from 3,711 participants in Year One to 13,778 in Year Two.
- While it is important to factor in the 20% increase in the submission rate of STEM programming cited above, that does not fully account for the increase in the collective number of programs and participation levels in Year Two.

Variable	Year One	Year Two	Trends <small>Green = improvement Red = decline</small>	Change
# of STEM programs reported by librarians	198	905		357%
Total participation (children & adults) in all STEM programs combined	3711	13778		271%

- Drilling down into those impressive combined totals, there also were remarkable increases on a more granular level:
 - The average number of STEM programs provided per library increased by 300%, up from an average of 9 programs per library in Year One to 36 in Year Two, with a range of 8 to 142 programs conducted per library during Year Two.
 - The average participation per program per library stayed about constant, dropping slightly from 18 participants per program in Year One to 15 in Year Two, which – given the sizeable increase in collective total participation for Year Two and the relatively small number of average participants per program in both years – suggests that there were a limited number of individual programs with exceptionally high participation (e.g., anecdotal information indicated that a number of libraries hosted community STEM programs revolving around the August 2017 eclipse, with just one of those programs drawing an attendance of 265 people).
 - The total participation among all programs per library during Year Two ranged from 80 to 1,723.

²¹ Total participation counts may include the same participant more than once, if they attended multiple programs.

- Another statistic that has held steady (and maintained a strong majority) is the percentage of libraries for which 3-7-year-old children were the most frequent primary target audience (76% in Year One and 80% in Year Two), which is in keeping with the focus of the VELI-STEM project.
- The most frequent setting among all STEM programs during Year Two was once again the library (96% in Year Two, up from 86% in Year One), but – like Year One – anecdotal feedback revealed some interesting settings outside of the library, such as bookmobiles, farmers markets, street festivals, schools, museums, camps, playgrounds, and take-home kits.

Variable	Year One	Year Two	Trends <small>Green = improvement Red = decline</small>	Change
Average # STEM programs delivered per library	9	36		300%
Average participation per STEM program per library	18	15		-17%
% of librarians selecting children 3-7 years old as the most frequent primary target audience for their STEM programming	76%	80%		4%

- One of the key insights gleaned from librarian anecdotal feedback on their STEM programming was how much they are now weaving STEM throughout all their library programming. A sub-sample of the comments librarians provided on their Year Two STEM programming is provided below:

STEM Programming – what librarians had to say:

- *Our STEM-in-a-Bag program was new this summer, and was very popular (thank you to Bennington Library for sharing the idea at the Summer Reading Workshop) ... especially popular at the Bookmobile stop at [local park], our pool and rec summer program. The kids would work on their projects in the park with their friends. The bags also were popular in the children's room, especially for kids who couldn't get to our weekly programs because of busy schedules. Kids received a stamp on their reading logs for each project they showed us was complete (either by bringing it in or by video or photo). There was a display area in the children's room for completed STEM-in-a-Bag projects.*

STEM Programming – what librarians had to say (continued):

- *Our library is small so conducting story times and other STEM programs in the outside world works well. A captive audience at the market! The people passing by at [local summer street festival]! Using the straws and conductors and building stuff with cardboard were both big hits ... The most attended event we held was for the eclipse. We did an eclipse viewer-making afternoon at the market and then hosted an eclipse viewing.*
- *This was a wonderful theme and it was so smart to tie it in to the national Summer Reading program.*
- *I was amazed to see how the children loved to build using various types of objects and things. I incorporated it in my usual seasonal themes as well.*
- *Build the Bennington of Your Dreams: Families were asked to imagine that they could design a part of Bennington's future. They used recycled materials to create a model community where families' biggest dreams take shape. The results were amazing! Engineering and design aspects of STEM were essential to the experience.*

❖ Family Member/Caregiver Survey on STEM Programming

DATA SOURCES:

- 1. Post-STEM Program Family Member/Caregiver Survey**
- 2. Anecdotal feedback from librarians**

FINDINGS:

- **There was a 42% increase in the number of surveys completed by family members/caregivers on the STEM programming they attended, up from 209 in Year One to 296 in Year Two.**
- **Since the average number of surveys submitted for each library stayed at 14, the 42% increase in number of surveys must be attributable to the 24% increase in the rate of submission among libraries of Family Member/Caregiver Surveys (84% this year, up from 60% the previous year).**
- **The number of Family Member/Caregiver Surveys completed per individual library ranged from a 0 to 63.**
- **The percent of 3-7-year-old children whose family members/caregivers rated them as “very” engaged in the STEM programming dipped slightly from 82% in Year One to 79% in Year Two, but the percent of 3-7-year old children who were rated as “Not At All” engaged dropped from 1% in Year One to 0.34% in Year Two, meaning that an overwhelming majority of young children in both years were somewhat to very engaged.**
- **The percent of 3-7-year-old children who “very much” received a grounding in STEM knowledge and skills dipped 10% (70% in Year One, 60% in Year Two), but – again – the percent of children reported as having “Not At All” received a grounding dropped from 1% in Year One to 0.68% in**

Year Two; so, an overwhelming majority of children somewhat to very much received a grounding.

- The percent of family members/caregivers who felt "very much" more able to encourage their children's interest in STEM held steady at 78% from Year One to Year Two.

Variable	Year One	Year Two	Trends Green = improvement Red = decline	Change
# of Family Member Surveys submitted on STEM programming experience	209	296		42%
Average # of Family Member Surveys submitted per library	14	14		0%
% of 3-7-year-old children who were "very" engaged in STEM programming	82%	79%		-3%
% of the 3-7-year-old children who "very much" received a grounding in STEM knowledge and skills	70%	60%		-10%
% of family members/caregivers who felt "very much" more able to encourage the children's interest in STEM	78%	78%		0%

- Consistent with STEM program participation trends indicated by librarian data, the total participation of children of all ages reported by family members/caregivers increased from Year One to Year Two, up by 51% (from 485 in Year One to 733 in Year Two).
- The sub-total participation for children 3-7 years old also increased, up by 27% (from 355 in Year One to 451 in Year Two).

Variable	Year One	Year Two	Trends Green = improvement Red = decline	Change
Total participation of children of all ages reported by family members at STEM programming (some children may be counted more than once if they attended more than one program)	485	733		51%
Sub-total participation of 3-7-year-old children reported by family members at STEM programming (some children may be counted more than once if they attended more than one program)	355	451		27%

- One of the most common themes among family member/caregiver comments was a sense of excitement about gleaning techniques for transforming “play” time into fun STEM learning opportunities. A sub-sample of the comments family members/caregivers provided on the Year Two survey is provided below:

STEM Programming – what family members/caregivers had to say:

- *This has been such a positive experience for [child name]. He has been so proud of what he has learned, and has benefited greatly from the small group work with his STEM Buddy [name]. He believes himself to be an engineer, and it is wonderful to see his confidence grow. Thank you for bringing this to [town name]!*
- *My older kids really got into the experiments and challenges that were offered. My younger son (4 years) had no idea what a ruler was and that was an interesting insight for me. After the programming, I plan on getting my son a ruler, yard stick, and measuring tape and just playing around with them. Measuring things was never this fun when I was a kid!*
- *As a grandmother who cares for her grandchildren, this has given me many great (and simple) ideas and has inspired me to do more learning activities with my grandchildren. Who knew learning could be so fun!*
- *I loved building with my child. I never thought to use recycled materials to make things. We are going to start doing this at home. It's such a simple idea but I just never made the connection. Thank you*
- *Learning about science is important, especially when the kids are little.*
- *We do lots of building with blocks at home so nice to know that we are encouraging STEM and have ideas for books to go along with building.*
- *We found your first STEM event listed in [weekly periodical] and are glad we drove the 40 miles to get here! [Town name] may be a little community with a little library, but you really do big things for the kids. You have us hooked!*
- *It was awesome! The project pairing with book was perfect. My kids haven't stopped talking about it! Thank you!*
- *A traditional tale was a great basis to engage them in building and learning the "wh" and "how" of building structures and materials. They had fun also!*

STEM Programming – what family members/caregivers had to say (continued):

- *Very accessible, engaging programs in a variety of activities. We looked forward to every program and had a great time being creative and engineering. Please offer these programs regularly to our community. Thank you, [Town name] Library!*
- *Lovely program. Makes nature and literature link together. We will do this again many times.*

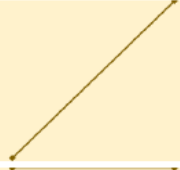


❖ Child Care Provider/Early Educator Survey on Early STEM Literacy Training

DATA SOURCES:

1. Post-training Child Care Provider/Early Educator Survey
2. Anecdotal feedback from librarians
3. Anecdotal feedback from leadership team

FINDINGS:

- In Year Two, librarians had greater success in reaching child care providers/early educators to conduct early STEM literacy trainings, as both anecdotal information from librarians and quantitative data from the Child Care Provider/Early Educator Survey attest:
 - Two libraries that were unable to reach child care providers/early educators in Year One teamed up with another library that had successfully conducted trainings in the first year, resulting in 12 child care providers/early educators collaboratively trained by the three libraries in Year Two.
 - The number of surveys completed by child care providers/early educators rose from 18 in Year One to 94 in Year Two (over 400% increase).
 - In Year One, only 9 (36%) of the VELI-STEM libraries were represented among completed surveys, whereas 21 (84%) of libraries had surveys completed on the training they conducted in Year Two.
 - NOTE: The significant increase in total number of surveys completed and number of librarians represented by those surveys may reflect the impact of revisions suggested by librarians and then incorporated into the timing and format of the surveying process.
- The average number of hours of early STEM literacy training that each child care provider/early educator received stayed at 2, with a range of 1 to 16 hours of training.
- The percent of child care providers/early educators who reported that the training they received “very much” helped them develop a better understanding of what STEM means to children 3-7 years old dropped from 89% in Year One to 82% in Year Two, but the percent reporting having “Not At All” developed a better understanding held steady at 0%; so, all child care providers/early educators somewhat to very much developed a better understanding of early STEM literacy from the training they received.

Variable	Year One	Year Two	Trends <small>Green = improvement Red = decline</small>	Change
# of Child Care Provider/Early Educator Surveys submitted on STEM training experience	18	94		422%
Average # of hours of training received per CC Provider/Early Ed Survey respondent	2	2		0%
% of CC Providers/Early Eds reporting that the STEM training by librarian(s) "very much" helped them develop a better understanding of what STEM means to children ages 3-7 years old	89%	82%		-7%

- The percent of child care providers/early educators who introduced or planned to introduce STEM learning experiences to the 3-7-year-old children in their program dropped from 100% in Year One to 93% in Year Two.
- The number of children who were/will be provided STEM learning opportunities rose from 163 in Year One to 1,045 in Year Two.
 - NOTE: The seemingly large jump in number of children who were/will be involved in the STEM learning experiences child care providers/early educators introduced/planned to introduce is likely more of an artifact of the spike in number of surveys submitted; yet, since many more library communities were represented, it does do a better job of capturing the extent of the ripple effect of this program throughout communities in Vermont, as librarians train child care providers/early educators, who – in turn – provide early STEM learning opportunities to the children in their programs.
- The average number of children who were/will be involved in the STEM learning experiences child care providers/early educators introduced/planned to introduce averaged 11 for both Year One and Year Two, with a range of 0-42 children in Year Two.
- There were shifts in how the survey respondents were distributed across types of early care and education programs, with representation among family child care programs hold steady at around a third of all survey respondents:
 - Preschool program – 33.3% in Year Two, down from 44.4% in Year One
 - Early Head Start/Head Start program – 4.17% in Year Two, up from 0% in Year One
 - Child care center – 18.75% in Year Two, up from 11.1% in Year One
 - Family child care program – 30.21% in Year Two, slightly down from 33.3% in Year One
 - “Other” child care/early education program – 13.54% in Year Two, up from 11.1% in Year One.

Variable	Year One	Year Two	Trends Green = improvement Red = decline	Change
% of CC Providers/Early Eds who introduced/ planned to introduce STEM learning experiences to the 3-7-year-old children in their program following training provided by local librarian(s)	100%	93%		-7%
Approximate # of children who were/will be involved in the STEM learning experiences CC Providers/Early Eds introduced/planned to introduce	163	1045		541%
Average # of children per CC Provider/Early Ed who were/will be involved in the STEM learning experiences	11	11		0%

- A prominent theme among comments shared by child care providers/early educators on the Year Two survey was gratitude for the rich training and materials provided on early STEM literacy. A sub-sample of the comments child care providers/early educators provided about the early STEM literacy training they received in Year Two is provided below:

STEM Programming – what child care providers/early educators had to say:

- *I was on vacation this week from my family child care. I came to the training because I love [our local librarian] and always have fun when she does a training for us. I like getting new books and reminders of what we are doing is science skills and literacy. I had my first parent conference for my child care ... after 17 years a parent requested one and I will be able to tell her that we are doing math and science and literacy with her children.*
- *I am very thankful that opportunities like this are being made available to small home daycare providers.*
- *I enjoy the classes very much. I'll continue to expose children to the language and offer more time to experiment/create using this training. Thank you! [Family Child Care Program]*
- *Loved the Keva planks! We are going to buy those for building in our preschoolers and after-schoolers! Thanks!*

STEM Programming – what child care providers/early educators had to say (continued):

- *I was introduced to some new materials that I will be incorporating in my [preschool] classroom.*
- *I really enjoy using new materials & books and hope to bring these to my [preschool] class to engage them in STEM learning*
- *Loved the hands-on activities to help us connect to what we were learning. [Child Care Center teacher]*
- *Great new resource materials. Great to see the [after-school program] students taking the lead on their projects.*

❖ STEM Community Stakeholders

DATA SOURCES:



1. Librarian data
2. Anecdotal feedback from librarians
3. Anecdotal feedback and summarized observations from leadership team

FINDINGS:

- In Year Two, there was a 68% increase in the total number of STEM community stakeholders collectively engaged among all librarians, from 572 in Year One to 961 in Year Two.
 - While a portion of the 68% increase could be attributable to the higher submission rate for that dataset from 88% in Year One to 100% in Year Two, the average number of community stakeholders each individual librarian engaged also rose (by 52%), from 25 in Year One to 38 in Year Two, with the number of stakeholders each librarian recruited ranging from a 0 to 211. This indicates a real increase in the scope of outreach, not a statistical artifact.
- Drilling down to a more granular level, here are the changes in total number collectively engaged among all 25 librarians for Year One versus Year Two:
 - STEM professionals/businesses – 88 in Year Two, up from 43 in Year One
 - Library staff, directors, and trustees – 228 in Year Two, up from 175 in Year One
 - BBF Regional Council Members²² – 91 in Year Two, up from 39 in Year One
 - Town officials – 114 in Year Two, up from 4 in Year One
 - Public or private school staff members – 247 in Year Two, up from 173 in Year One

²² [Building Bright Futures \(BBF\) Regional Councils](#) are a central artery in Vermont's early childhood system of care, health and education. Regional Councils organize local communities to engage, plan and act. They disburse local, state, and federal funds to community programs and offer technical support so services to children and families are high quality, accessible and affordable. The purpose of this network of regional councils is to align solutions at the local level with effective policy at the state level. [Retrieved from the [Building Bright Futures website](#)]

- Child care organizations²³ – 77 in Year Two, up from 66 in Year One
- Higher education staff and faculty members – 23 in Year Two, up from 13 in Year One
- Other local library stakeholders – 93 in Year Two, up from 39 in Year One
- For both years, the most highly engaged types of STEM community stakeholders were public or private school staff members (26% in Year Two and 30% of all stakeholders in Year One) and library staff, directors, and trustees (31% of all stakeholders recruited in Year One and 24% in Year Two).

Variable	Year One	Year Two	Trends Green = improvement Red = decline	Change
# of STEM community stakeholders engaged	572	961		68%
Average # of STEM community stakeholders engaged per library	25	38		52%

- A couple of shifts from Year One to Year Two in librarian comments on stakeholder engagement included a greater awareness this year of the value of engaging STEM resource people and less of a sense of feeling daunted by trying to conduct outreach for the VELI-STEM project, while also implementing other components of the project – instead, STEM outreach was viewed as a complement to other aspects of the project. A sub-sample of the comments that librarians provided on their STEM community stakeholder engagement efforts in Year Two is provided below:

STEM Community Stakeholder Engagement – what librarians had to say:

- *Involving the community helps build a community. Involving them also increases my attendance, as each community member involves another!*
- *[Our local] Rotarians gave [our library] a literacy grant for STEM books and activities. They assisted with a borrowed kit/activity from VEEP [Vermont Energy Education Program] to have a STEM station on [town name] Home Day.*
- *I am lucky to have a grandparent who attends my monthly STEM Night programs with her 7 year old grandson. She is always willing to lend a hand and help out as needed. She has promoted my programs to her friends and other community members, which is always appreciated.*
- *The Friends of the [town name] Library group is very committed to youth and youth programming.*

²³ “Child care organizations” refers to child care providers/programs engaged beyond training purposes, such as members of Starting Points, VAEYC representatives, and other child care providers/programs that may have helped with delivering programming, recruiting child care providers for trainings, etc.

STEM Community Stakeholder Engagement – what librarians had to say (continued):

- *I was ...able to engage the assistance of a math-major college student who was home for the summer.*
- *[O]ther local stakeholders include local businesses who support VELI efforts through donating materials and advice on materials and construction!*
- *The ... other local library stakeholders ... are members of the Friends of the [name] Library and the [town name] Rotary. Both have been supportive of this Veli-STEM program.*
- *This summer provided the best opportunity to engage community stakeholders. I did a lot of collaborative programming with utilizing library patrons that led or assisted with Summer Reading STEM activities. Local camps and organizations brought their kids to the library and the counselors joined in and led events, also. A very good year for engaging the community.*

❖ Leadership Team On-Site Observations of STEM Programming

DATA SOURCES:

1. On-site observations forms completed by leadership team
2. Anecdotal feedback from leadership team

FINDINGS:

- During Year Two of the project, important insights were gleaned from first-hand observations by leadership team members of librarians' STEM programming:
 - There was a significant increase in the number of on-site observations conducted (6 in Year Two, up from 2 in Year One), and almost a third (32% or 8) of the 25 VELI-STEM libraries have now had their STEM programs observed by a member of the project's leadership team over the past two years of the project, which represents 62% of the target of 13 total observations for the three-year project period.
 - The total number of children observed participating in STEM programs during on-site observations increased by 554% (85 in Year Two, up from 13 in Year One):
 - The sub-total of 3-7-year-old children observed participating in STEM programs during on-site observations increased by 392% (64 in Year Two, up from 13 in Year One).
 - The average percent of 3-7-year-old children who seemed "very engaged" in observed programs remained extremely strong at 100%.
 - The total family member/caregiver participation that was observed also increased, by 900% (30 in Year Two, up from 3 in Year One), while the average percent of family members/caregivers who "very much" encouraged their child(ren)'s interest in STEM during or after STEM programming dipped from 100% in Year One to 83% in Year Two.

- NOTE: In Year Two, two different members of the leadership team conducted on-site observations, which could explain some of the variance in the ratings of how much family members/caregivers encouraged their child(ren)'s interest in STEM.

Variable	Year One	Year Two	Trends <small>Green = improvement Red = decline</small>	Change
% of libraries that have had an on-site observation of their STEM programming and practices	8%	24%		16%
# of on-site STEM program observations conducted by leadership team	2	6		200%
Total participation of all children	13	85		554%
Sub-total participation of 3-7-year-old children	13	64		392%
Average % of 3-7-year-old children observed in active & passive STEM programming who were "very engaged"	100%	100%		0%

- The leadership team did not recommend any course corrections for Year Three, based on the efficacy of the process they used for conducting site visits in Year Two. A sub-sample of the comments that leadership team members shared on the on-site observation forms in Year Two is provided below:

STEM Programming Observations – what leadership team members had to say:

- *This was a family building program. Each child was asked to bring a foodstuff (boxed or in cans) to be given to a local food drive. Before donating the item, the boxes and cans were used to build structures on top of tables. [The librarians] also offered other building materials (cardboard boxes) to supplement what they were building. After structures were made, parents took pictures and children made drawings of what they had built. [The librarians] engaged with children and parents the whole time and offered challenges occasionally: "What would happen if you moved this box there?" "How can you make your structure more stable?"*

STEM Programming Observations – what leadership team members had to say:

- *[The librarian] was offering ... a Family Night centered around building a community out of found objects. She put out the word for needing boxes and other kinds of building materials. In addition to children and families, there were a couple of trustees there as well ... If a child didn't have a parent to help him/her, a trustee pitched in and helped or children worked in small groups with one parent. [The librarian] based the activity around something we had presented in the April training: Building a Cardboard City. She had downloaded the instructions and trustees pitched in to make it happen. Children and parents were asked to fill out a "permit application" to build their community structure, based on community needs. The "official" signed off on the permit and parent/child chose the materials they would use to build. During the activity it was so quiet because everyone was intent on their plans, then their building. [The librarian] checked in with the groups regularly to spark conversation.*

Objective 9: Disseminate and promote project results

Dissemination and promotion of VELI-STEM project results foster transparency and collaboration among the leadership team and librarians in the project's ongoing implementation and continuous quality improvements. It also supports replication across Vermont and beyond. There were some challenges in Year Two with the project's dissemination and promotion component, including the vacancy of the VDOL Youth Services Consultant for most of Year Two. However, efforts continued to be pursued through several effective strategies, which are summarized here.

Web Presence – As discussed above, the online [STEM Clearinghouse of Resources](#) and the [VELI-STEM website](#) where the Clearinghouse is located have been utilized to promote opportunities for libraries in Vermont and across the country to learn how VELI-STEM librarians have incorporated rich, hands-on STEM learning experiences for young children, their families, and community child care providers/early educators. The project leadership team has continued to sort through and catalog the numerous photos of project activities and posted them on the VELI-STEM website to help animate other content on the site. Also, as previously noted, VELI-STEM libraries have promoted the project on their own individual library Facebook pages, as well as on the closed VELI-STEM Facebook group. In addition, there was media coverage of the April 24 and 25, 2017 VELI-STEM training on STEM Inquiry: Engineering & Building through a May 5, 2017 piece in the [Eagle Times](#).

With the recent on-boarding of a VDOL Youth Services Consultant, more activity is expected with uploading of videos to the VELI-STEM YouTube channel, and plans are underway to submit another blog post to IMLS highlighting the Year Two programming successes. Also, the leadership team has discussed the need for VDOL to promote the program within the state and at the legislative level.

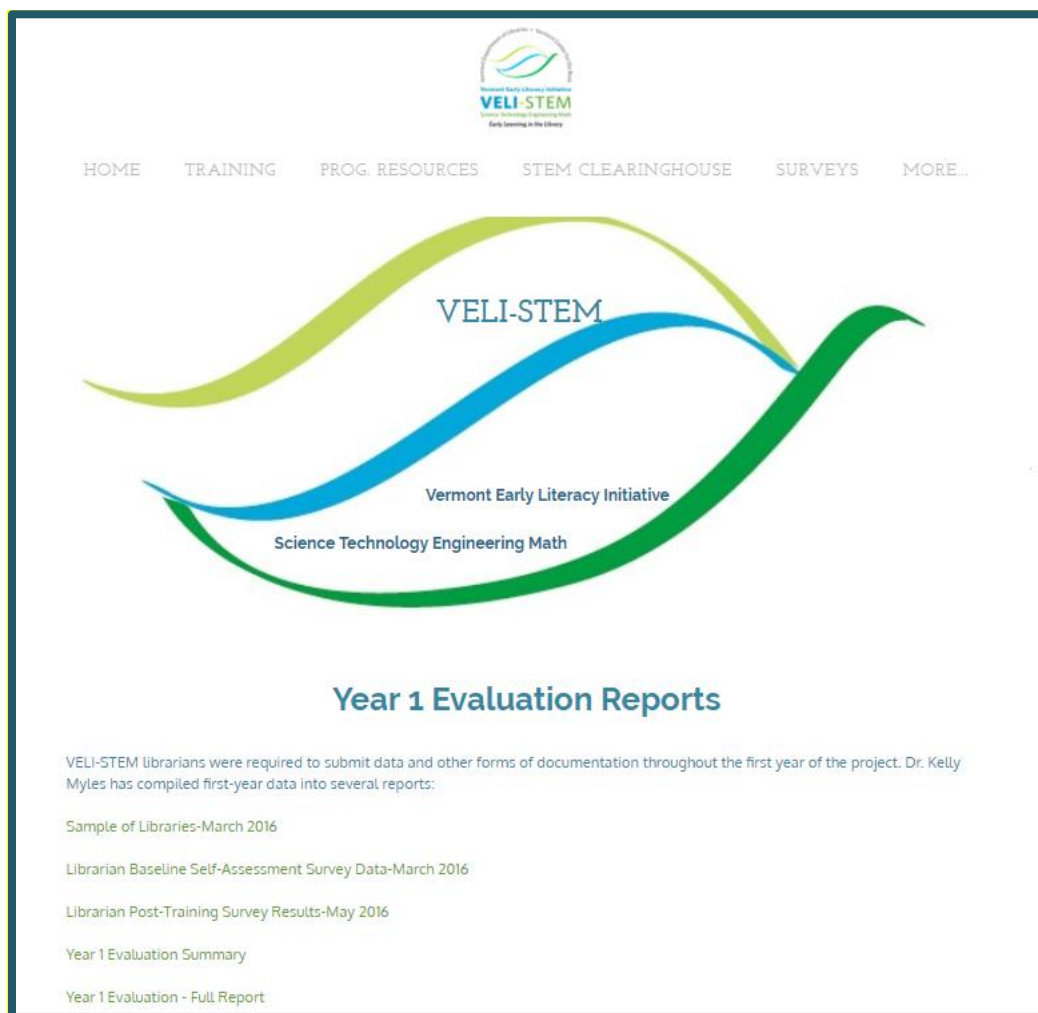
Evaluation Reports – In Year Two, the evaluator disseminated the year-end Year One Evaluation Report to VDOL and VCB leadership team members. In turn, the leadership team distributed the report to

librarians and encouraged them to share the report with trustees and the community. A customizable press release template was developed by Wendy Martin of the Vermont Center for the Book for librarians to use to publicize Year One VELI-STEM achievements as a group, while showcasing their own achievements. The Year One Evaluation Report also was shared with VELI-STEM partners Karen Worth (Wheelock College) and Greg DeFrancis (Montshire Museum of Science). In addition, excerpts of the report that high-lighted year one results were shared by VCB with their funders, and VELI-STEM librarians shared the report with their library trustees.

The year-end Year One Evaluation Report was posted on the publicly-accessible [VELI-STEM Weebly website](#), along with three other Year One evaluation reports, for VELI-STEM librarians and others to pull from for myriad purposes (disseminating results, supporting replication, etc.), and librarians were pointed to those report postings:

- Analysis of Sample of Libraries (March 2016)
- Analysis of Librarian Baseline Self-Assessment Survey Data (March 2016)
- Analysis of Post-Training Survey Data (May 2016).

For Year Two, the evaluation report, Analysis of Post-Training Survey Data (May 2017), was posted on the [VELI-STEM website](#).



This Year Two Evaluation Report, which will be posted on the VELI-STEM website, supports broader replication, by compiling successes achieved and lessons learned and by appending information, materials, and resources that other programs can adapt and adopt, to foster the provision of STEM learning opportunities for young children by libraries across Vermont and beyond.

Cultivating a Replication Mindset – A major initiative to support replication occurred on October 4, 2017, when Sally Anderson, Greg DeFrancis, and Wendy Martin met with representatives from 16 state libraries to introduce and talk about the VELI-STEM project at the 2017 COSLINE (Council of State Library Agencies in the Northeast) Conference. The Vermont Department of Libraries hosted the conference in Burlington, Vermont, from October 2-4, 2017. Each of the 16 participating states in the VELI-STEM session at the conference was provided with four picture books plus one 400-piece set of Keva planks. The goal was for the 16 library representatives to return to their state with the books and materials, train children’s services personnel, purchase additional materials, and offer programming in libraries. The five-hour training was a “train the trainer” model, with stations set up to represent the first two years of programming: ramps and balls (Year One: Force and Motion); and Straws and Connectors, Keva planks, and Building with Cups and Cardboard (Year Two: Building and Engineering). The VELI-STEM team also introduced the VELI-STEM website to the group and encouraged them to access it and offer feedback on the site. In addition, there was a preliminary discussion about possibly submitting a grant proposal to the IMLS, which might include some or all of the 16 states that attended the 2017 COSLINE meeting. While that grant idea is only in the very early stages of discussion, the initial line of thinking that was discussed at 2017 COSLINE revolved around possibly expanding the VELI-STEM model into some or all the 16 states, plus additional libraries in Vermont.

Year Two efforts to cultivate a replication mindset will be continued in Year Three by:

- Requiring librarians to track data and share insights on their experience of infusing STEM content throughout their library practices, which can be compiled and widely disseminated to support replication;
- Using additional evaluation strategies (e.g., interviews) to capture data and corroborate anecdotal information on the project’s progress, outcomes, challenges, and successes; and
- Capturing the leadership team’s methods of administrative and fiscal oversight of the project, including tracking expenses related to time and materials and a streamlined [on-line form for librarians to track their time offered as cost share](#).

In Year Three, a greater effort will be made to encourage and support VDOL’s efforts to promote the VELI-STEM project.

SUMMARY OF YEAR TWO EVALUATION FINDINGS

At the end of three years, the key VELI-STEM project outcomes will be that a cohort of librarians from 25 rural and small libraries will have:

1. Received advanced STEM training, mentoring, learning tools (such as picture books), hands-on learning methods and materials and other STEM resources;
2. Been trained to recognize opportunities to incorporate STEM learning experiences for children and families throughout their library practice, including story hours, after-school programming, collection development, displays, “Discovery Science Centers,” newsletters and bibliographies;
3. Been given ample opportunity to access and contribute to an online STEM Clearinghouse of Resources developed throughout and after the project; and
4. Transferred their newly acquired STEM knowledge and skills to community child care providers through outreach and training programs so that providers will, in turn, introduce STEM learning experiences to the young children in their care.

With two of the VELI-STEM project’s three years completed, project librarians and leadership team members have really hit their stride, consistently demonstrating competence in all four outcome areas. During the inaugural year of the project, many lessons were learned, which were applied in Year Two with patently positive results. After streamlining the data submission process based on extensive librarian input, the rate of submission by librarians of all required datasets increased from just under a third (32%) in Year One to just over three-quarters (76%) in Year Two, greatly enhancing the story their collective data could tell and painting a more complete picture of the project’s overall impact. Further insights into the tremendous progress made in Year Two were gleaned from anecdotal comments from librarians, family members/caregivers, and child care providers/early educators, along with on-site observations by leadership team members, which revealed greater facility among librarians for transforming their libraries into community hubs of STEM learning.

Based on a comparative analysis of the rich data and anecdotes generated through the evaluation of the VELI-STEM project in Years One and Two, some particularly noteworthy findings are provided below, with more detailed findings included under [Objective 8](#):

- **Better ability to evaluate and replicate project –**
 - **Marked improvement in data submission compliance (and, thus, data utility)** – One of the most helpful developments from Year One to Year Two for evaluation and replication purposes was the increase in the rate of submission of all 4 datasets from just under a third (32%) to just over three-quarters (76%) of librarians.
 - **Full compliance with STEM Programming and Community Stakeholder data** – There was a 100% submission rate for STEM Programming data and Community Stakeholder data, which are the two datasets over which librarians have the most control (family members/caregivers and child care providers/early educators are strongly encouraged to complete a survey, but that is not a condition of their participation in programs and trainings).
 - **Double-digit increases in submission rates for all datasets** – For each of the 4 required datasets, there was a double-digit increase in the submission rate.
- **Prevailing upward trends** – There were significantly more upward trends (improvements) than there were any downward trends (challenges) from Year One to Year Two across all four datasets (programming, Family Member/Caregiver Surveys, Child Care Provider/Early Educator Surveys,

and community outreach), with the few downward trends being slight and partially attributable to intervening variables.

- **Maturation among librarians in infusing STEM throughout library practices** – Just as important as the impressive improvement in data submission rates are the comments that librarians, family members/caregivers, and child care providers/early educators shared, which made it very clear that librarians have significantly "matured" in their infusion of STEM throughout their library practices.
- **Effective STEM trainings and resources** –
 - **Continued increase in STEM knowledge & skill levels** – Over the first two years of the project, there has been an overall average increase among librarians in all STEM knowledge & skill levels, from a level of 3.6 at baseline to 4.7 after the Year One two-day April training and 4.8 after the Year Two two-day April training (total 1.2 percentage point increase from baseline):
 - **Greater understanding of STEM concepts & delivery** – There has been an overall average increase in understanding among librarians of all STEM concept & delivery areas since the project was launched two years ago, from a level of 3.2 at baseline to 4.3 after the Year One two-day April training and 4.5 after the Year Two two-day April training (total 1.3 percentage point increase from baseline).
 - **Value of STEM trainings and resources** – One of the most prevalent types of comments provided through the April 2017 Post-Training Librarian Survey related to how invaluable the trainings, resources, and other supports they receive through the project are to their library.
- **Dramatic rise in quantity and pervasiveness of STEM programming activity** –
 - **Remarkable increase in number of STEM programs** – There was a 357% increase in the total number of STEM programs reported by librarians, up from 198 combined total programs in Year One to 905 in Year Two, which cannot be explained entirely by increased data reporting rates, since the average number of STEM programs provided per library increased by 300%, up from an average of 9 programs per library in Year One to 36 in Year Two.
 - **Spike in participation levels in STEM programming** – There was a 271% increase in total participation among all STEM programs, up from 3,711 participants in Year One to 13,778 in Year Two – again, only partially attributable to increased data reporting rates.
 - **Broader infusion of STEM throughout library practices** – One of the key insights gleaned from librarian anecdotal feedback on their STEM programming was how much they are now weaving STEM throughout all their library programming.
- **Excitement about and engagement in STEM learning opportunities among children and family members** –
 - **Increase in family member/caregiver feedback** – There was a 42% increase in the number of surveys completed by family members/caregivers on the STEM programming they attended, up from 209 in Year One to 296 in Year Two.
 - **Continued high levels of child engagement in STEM programming** – An overwhelming majority of young children were rated by family members/caregivers as somewhat to very engaged in the STEM programming and an overwhelming majority of children were rated as having somewhat to very much received a grounding in STEM, in both Year One and Year Two.
 - **High level of engagement by parents in their child's STEM learning** – One of the most common themes among family member/caregiver survey comments was a sense of

excitement about gleaned techniques from library programs for transforming “play” time into fun STEM learning opportunities for their child.

- **Expansion of outreach to child care providers/early educators, extending the impact of the project –**
 - **Greater success in reaching child care providers/early educators to conduct early STEM literacy trainings** – Innovative strategies were utilized successfully to reach more child care providers/early educators, such as VELI-STEM libraries teaming up together to offer regional trainings.
 - **Ripple effect of the VELI-STEM project** – The number of children who were/will be provided STEM learning opportunities as a result of child care provider/early educator trainings on early STEM literacy rose from 163 in Year One to 1,045 in Year Two, which captures the ripple effect of the project throughout communities in Vermont, with librarians training a number of child care providers/early educators, who – in turn – provide early STEM learning opportunities to the children who cycle through their programs.
 - **Gratitude among child care providers/early educators for STEM training** – A prominent theme among comments shared by child care providers/early educators on the Year Two survey was gratitude for the rich training and materials provided on early STEM literacy.
- **Tremendous strides in overcoming barriers to conducting STEM outreach –**
 - **Significant increase in STEM outreach** – In Year Two, there was a 68% increase in the total number of STEM community stakeholders collectively engaged among all librarians, from 572 in Year One to 961 in Year Two, with the average number of community stakeholders each individual librarian engaged rising from 25 in Year One to 38 in Year Two (52% increase).
 - **Strong STEM allies** – For both years, the most highly engaged types of STEM community stakeholders were public or private school staff members (26% in Year Two and 30% of all stakeholders in Year One) and library staff, directors, and trustees (31% of all stakeholders recruited in Year One and 24% in Year Two).
 - **Stakeholder engagement perceived as win-win** – There was a shift from Year One to Year Two in librarian comments on stakeholder engagement, reflecting less of a sense of feeling daunted by trying to conduct outreach for the VELI-STEM project while also implementing other components of the project – instead, outreach was seen as a complement to other aspects of the project.
- **Richer insights from on-site observations of STEM programming –**
 - **Dramatic increase in the scope of what was observed** – The total number of children participating in STEM programs during on-site observations increased by 554% (85 in Year Two, up from 13 in Year One), with the sub-total of 3-7-year-old children participating in STEM programs during on-site observations increasing by 392% (64 in Year Two, up from 13 in Year One).
 - **Continued high level of engagement among children** – The average percent of 3-7-year-old children who seemed “very engaged” in observed programs remained extremely strong at 100%, which is especially meaningful given the dramatic increase in the number of children observed participating in STEM programs.
 - **Great strides in meeting project observation target** – Over the past two years, 32% (8) of the 25 VELI-STEM libraries have had their STEM programs observed by a member of the project’s leadership team, which is 62% of the target of 13 total observations for the three-year project period.

- ❖ **Effective feedback loop to maximize value and promote use of the STEM Clearinghouse –**
 - **Expanding the value of content** – The [VELI-STEM website](#), including the [STEM Clearinghouse](#), has proven to be an effective strategy for developing an on-line presence in support of project implementation and broader replication. The leadership team continues to factor in project librarian feedback in identifying the most valuable content to post and to utilize this on-line tool to make rich STEM resources available more broadly to other librarians throughout Vermont and beyond, as well as promote the site to early care providers.
 - **Increased site usage** – VELI-STEM website analytics indicate that the site averaged 500 page views per *week* and 115 unique visitors each *week* in Year Two, up from an average of 118 visits per *month* from May through October 2016 of Year One of the project.

Given the remarkable progress made in Year Two of the project, the goal in Year Three will be to stay the course, while strategically targeting any intensive supports that might be needed around more challenging areas of the project, such as outreach to child care providers/early educators. Also, the leadership team plans to correspond with librarians more frequently to “check in,” offer encouragement, and answer questions.

Moving forward into Year Three, broader promotion of the project will be an even higher priority for the leadership team, to foster on-going support of STEM-infused library practices among project libraries beyond the scope of IMLS funding and encourage wider replication in Vermont and across the country. In addition, the VELI-STEM website will continue to be promoted among project librarians, as well as with COSLINE participants, with refinements made to the website as often as possible.

At least six additional site visits will be conducted by members of the leadership team to continue to get a more complete picture of the quality and impact of the STEM programming being delivered by project librarians. To round out the information gleaned from on-site observations and other evaluation tools used throughout the three years of the project and to glean retrospective insights, the project evaluator will conduct interviews with a cross section of librarians and community members on the impact of the project during Year Three.

In summary, Year Three of the VELI-STEM project will be focused on maintaining gains made in Year Two, engaging in continuous quality improvements, heightening awareness of and garnering support for STEM-infused library practices, and supporting replication going forward.

Appendix A

VELI-STEM Year Two: Two-Day Training

April 24-25, 2017 at Lake Morey

3-21-17 Planning Discussion Notes (Sally, Wendy, Karen, Greg)

After reviewing evaluation reports, site visits, program templates and other information about what happened in the first year, here are the components we think are necessary for this training:

- We need to emphasize doing a *series* of programs—not doing everything at the same program, not just “one-off” programs
- Librarians need experience *doing focused, well-defined, almost prescriptive hands-on investigations* that can be easily adapted for their own libraries and that can be implemented in a series of programs
- We need to introduce a *new program template* (here’s one suggestion based on the *Constructions* book we sent you):
 - Investigation
 - Skills
 - Setting Up
 - Starting Out
 - Guiding Children’s Actions
 - Stretching Their Thinking
- We need to spend time looking over the books and materials we’re giving them, one or two of the websites we’ve posted on the Weebly VELI-STEM site, evaluation materials, grant expectations (including Documentation Panels)

More suggestions:

- We think there needs to be time for everyone to do the same investigation(s) and time for small groups (of three?) to work with the new program template and plan a program (and/or series of programs) using *Building Structures With Young Children* (we’re giving them this book) and *Worms, Shadows and Whirlpools* (they have from last year)
- We need to make connections to their planning/implementing the summer reading program (theme is “Build a Better World”)
- Gather resources together in a binder (perhaps?) and include:
 - https://www.wcu.edu/WebFiles/PDFs/CEAP-HS-BK_PreschoolEngineeringHandout.pdf
 - Preschool engineering: Information, resources, engineering challenges, suggested materials, and a sample letter to families
 - Templates for group work and planning
 - Investigations from *Constructions* and other sources

Appendix B



VELI-STEM Conference, Year 2 April 24 and 25, 2017 Lake Morey Inn and Resort

Monday, April 24:

- 8:30-9:15 Arrival and Registration
- 9:30 am Welcome and Introductions, Goals of the Conference and Expectations
Sally Anderson, Executive Director, Vermont Center for the Book
- What is Science for Young Children?
Karen Worth, Chair, Elementary Education Department, Wheelock College
Greg DeFrancis, Education Director, Montshire Museum of Science
- 10 am Building With Cups, Cardboard and Block
- 12 noon Lunch
- 12:45 pm Building With Keva Planks
- 2:45 pm Building With Straws and Connectors
- 4:30 pm Break
- 6 pm Dinner
- 7 pm Building With Found Objects Without Tape or Glue (cereal/pasta boxes (boxboard), tubes, chenille sticks, string, binder clips, clothespins)

Tuesday, April 25:

- 7 am Continental breakfast in Terrace Ballroom
- 8:30 – 9:15 Program Template Review and Review of the Previous Day's Work and Expectations
- 9:15 – 10:30 Evaluation
- 10:30 am Distribute Books and Materials that haven't already been distributed (and room check-out)
- 12 noon Lunch
- 12:45 pm Connections to the Summer Reading Program, Planning and Program Templates
- 2:30-3 pm Questions and Adjourn

Appendix C

Year Two– Building and Engineering Books and Hands-on Materials Distributed to Librarians

April 2017 Training:

Non-Fiction

Building Structures by Ingrid Chalufour and Karen Worth. Identifies important science inquiry skills and concepts appropriate for the very young.

Constructions (Windows on Science) by Joan Westley. Excellent resource for more building activities.

Girls Think of Everything by Catherine Thimmesch. Stories of ingenious inventions by women.

How a House is Built by Gail Gibbons. From architect's plans to a family moving in, general house building information.

Let's Try it Out With Towers and Bridges by Seymour Simon. Hands-on learning materials.

Whoosh! Lonnie Johnson's Super-Soaking Stream of Inventions by Chris Barton. A biography of Lonnie Johnson, inventor of the Super Soaker.

Fiction

Building a House by Byron Barton. Perfect for even the youngest readers.

Building Our House by Jonathan Bean. A family builds their own house, from empty lot to finished home.

Dreaming Up: A Celebration of Building by Christy Hale. How children's constructions are reflected in the world's architecture.

Look at That Building! A First Book of Structures by Scot Ritchie. Introduces children to basic construction concepts.

Not a Box by Antoinette Portis. What can you do with just a box?

Roxaboxen by Alice McLerren. A group of children build an imaginary town with found objects.

Hands-on Materials:

1 set of Straws & Connectors (705 pc.)

1 set of Keva planks (400 pc.)

Resource cards for families and child-care providers –

For families (15 sets per library):

How a House is Built

Let's Try it Out With Towers and Bridges

Building Our House

Resource cards (next 2 pages)

For child-care provider trainings (5 sets per lib):

How a House is Built

Let's Try it Out With Towers and Bridges

Building Our House

Resource cards (next 2 pages)

Build it!



Look around—much of what you see is constructed: houses, stores, libraries, schools, roads, bridges, cell towers and other structures. All of these structures were designed and engineered using STEM practices.

Children follow the same process as working engineers when they:



Explore building materials and ask: *What will we make? How will we do it?*

Create as they try out their ideas: *How can we build it? What materials do we need?*

Improve their designs to make them better, using different shapes, sizes and materials: *How can we make it taller? Stronger? What will happen if we...?*

Represent as they make simple visual plans to build structures, then draw pictures of their structures.

As children design, experiment, construct, refine and solve problems, they use STEM practices. They:

- Explore and compare the properties of different building materials.
- Decide what function a building will have and design and build a structure to meet that need.
- Explore different design elements to make a structure stronger and more stable.
- Build and rebuild more complicated structures using a variety of materials—experiment with size and balance.



Scan this code for more building activities

or go to: [www.mothergooseprograms.org/ resources/building activities](http://www.mothergooseprograms.org/resources/building-activities)



Building Challenges



Collect a variety of building materials: blocks, Legos®, cardboard boxes, plastic containers, cereal and shoe boxes, toilet or paper towel tubes, straws, cups, eggs cartons, bottle caps and lids—use your imagination! Take time to explore the materials and discuss all the building possibilities.

Towering Towers: Discuss which building materials you'll use to build your towers. Ask: *Which material will be best for the base? How tall can we build a tower? How can we keep it from falling down? How can we make it taller? What will happen if we use more than one kind of material?*

Enclosed Structures: Design and build a structure for an ant, a car, a giraffe. Ask: *What's the same about these structures? What's different?*

Building Bridges: Use paper cups or columns of blocks to create the span of your bridge. Use a flat sheet of paper for your first bridge, then test its strength with objects of equal weight. Experiment building different paper bridges: arch, pleat (make folds in) the paper, and use several sheets of paper. Ask: *What did you notice about the different bridges? Which held the most objects?*



libraries.vermont.gov

www.mothergooseprograms.org

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Appendix E

VELI-STEM October 17, 2017 Year 2 Follow-Up Workshop

9—9:15	Welcome and day's agenda (Sally Anderson)
9:15—10:15	Sorting, Estimating and LARGE Numbers (Meredith Wade) (With discussion of possible programs and Discovery Center ideas.)
10:15—11:15	Launching into Design—Gliders (Meredith Wade) (With discussion of possible programs and Discovery Center ideas.)
11:15—12:00	Collecting information about Building and Engineering programs (Sally and Wendy) <i>What worked? What didn't work?</i>
12:00—12:45	Lunch
12:45—1:30	Questions about Forms, the Weebly and Evaluation (Wendy)
1:30—2:30	Pom Pom Launchers (Meredith) (With discussion of possible programs.)
2:30—3:00	Expectations, Questions, Closure (Sally and Wendy)

Picture Book Bibliography
VELI-STEM Year 2: Building and Engineering –
Resource List



Non-fiction

Build it! Structures, Systems and You. Adrienne Mason

Explores the function of structures, the materials they're made of, how their parts are joined together and more.

Girls Think of Everything. Catherine Thimmesh (illustrated by Melissa Sweet)

Stories of ingenious inventions by women.

Houses and Homes. Ann Morris.

A photographic survey of housing around the world.

How a House is Built. Gail Gibbons.

From architect's plans to a family moving in, general house building information.

Let's Try It Out With Towers and Bridges. Seymour Simon.

Hands-on early learning activities.

The House That Max Built. Maxwell Newhouse.

Takes readers through the major steps of the construction of a house, from the architect's drawings to the completed house.

Twenty-one Elephants and Still Standing. April Jones Prince.

How will people know that it's safe to cross the newly constructed Brooklyn Bridge?

What it Feels Like to be a Building. Forrest Wilson.

How different parts of a building, such as columns, walls, beams, buttresses, rods, and cables, function to support great weight and stress.

Whoosh! Lonnie Johnson's Super-Soaking Stream of Inventions. Chris Barton.

A biography of Lonnie Johnson, inventor of the Super Soaker.

Fiction (and some facts)

Albert's Alphabet. Leslie Tryon.

Resourceful Albert builds the alphabet for the school playground in just one day.

Alphabet Under Construction. Denise Fleming.

A mouse builds the alphabet with found objects.

Arches to Zigzags. Michael Crosbie (OP)

Introduces both the alphabet and diverse architectural elements.

Architecture According to Pigeons. Speck Lee Tailfeather.

A pigeon's view of the world's great architecture and structures.

B Is for Bulldozer. June Sobel.

A construction ABC featuring a special building project.

Block City. Robert Louis Stevenson.

A child builds a block city based on the Stevenson poem.

Builder Goose. Boni Ashburn (OP)

Mother Goose favorites with construction themes, it's Construction Rhyme Time!

Building. Elisha Cooper (OP)

All about what goes on at a construction site.

Building a House. Byron Barton.

Perfect for even the youngest readers.

Building Our House. Jonathan Bean.

A family builds their own house, from empty lot to finished home.

Changes, Changes. Pat Hutchins.

A house made of blocks is transformed into several other structures.

Dreaming Up: A Celebration of Building. Christy Hale.

Shows how children's constructions are reflected in the world's architecture.

Homes. Fiona MacDonald (OP)

Features different kinds of homes from different world cultures.

A House Is a House for Me. Mary Ann Hoberman.

Where does everyone and every thing live?

If I Built a House. Chris Van Dusen.

Children will want to plan and build their own house after talking about this book.

Iggy Peck, Architect. Andrea Beaty.

Iggy has one passion, building.

Look at The Building! Scot Ritchie.

A first book of structure introduces children to basic construction concepts.

Mike Mulligan and His Steam Shovel. Virginia Lee Burton.

Mike and steam shovel Mary Anne dig the cellar for the new town hall.

Not a Box. Antoinette Portis.

What can you do with just a box?

Old MacDonald Had a Woodshop. Lisa Shulman.

Together with the other farm animals, Old MacDonald is building a surprise for the babies on the farm.

Roberto The Insect Architect. Nina Laden.

Termite Roberto has always wanted to be an architect, much to his family's dismay.

Rosie Revere, Engineer. Andrea Beaty.

Rosie invents gizmos and gadgets and dreams of becoming an engineer.

Roxaboxen. Alice McLerren.

A group of children build an imaginary town with found objects.

Three Little Javelinas. Susan Lowell.

A retelling of the 3 Little Pigs set in the American Southwest with javelins and a coyote.

Three Little Pigs. Paul Galdone

...and versions by James Marshall, David Wiesner, Jon Scieszka

Up! Up! Up! Skyscraper. Anastasia Suen.

The step-by-step construction of a skyscraper explained with illustrations, rhymes and sidebars.

Who Made This Cake? Chihiro Nakagawa.

Little people use big machines to make a giant birthday cake.

Books for information, images and discussions

Building Big. David Macaulay.

A classic text.

Story of Buildings. Patrick Dillon.

Clear explanations of building concepts with detailed, labeled drawings.

Skyscrapers: A History of the World's Most Extraordinary Buildings. Judith Dupre.

A "super-tall book" with drawings and photographs and easy to share information.

Women of Science. Rachel Ignotofsky.

Stories of 50 fearless women who changed the world.

Appendix G

Year Two– Building and Engineering Books and Hands-on Materials Distributed to Librarians

October 2017 Workshop:

STEM Inquiry

Adler, David. *Circles*.

Bradley, Kimberly Brubaker. *Forces Make Things Move*.

Cobb, Vicki. *I Fall Down*.

Davis, Kathryn Gibbs Davis. *Mr. Ferris and His Wheel*.

Gibbons, Gail. *From Seed to Plant*.

Hirsch, Rebecca. *Plants Can't Sit Still*.

Lauber, Patricia. *Be Friends to Trees*.

McCarthy, Megan. *Pop! The Invention of Bubble Gum*.

Muldrow, Diane. *We Planted a Tree*.

Pfeffer, Wendy. *Wiggling Worms at Work*.

Price, April Jones. *What Do Wheels Do All Day?*

VCB et al. *Where Does My Shadow Sleep?*

Schwartz, David. *How Much is a Million?*

Shillady, Amy. *Spotlight on Young Children: Exploring Science*.

Sweeney, Joan. *Me and the Measure of Things*.

Hands-on Materials:

Wooden unit blocks (Melissa & Doug)

10 hand lenses

measuring tape

Cardboard City @ Montshire Museum

Building/Vehicle Construction and Use Permit

*Design must be approved by planning board member before construction begins.

Design firm: _____

Application for: _____

Construction Type:

☐ Residential (single family)

☐ Industrial (factory)

☐ Residential (multi-family)

☐ Transportation/Infrastructure

☐ Retail (stores)

☐ Transportation/Vehicle

☐ Commercial

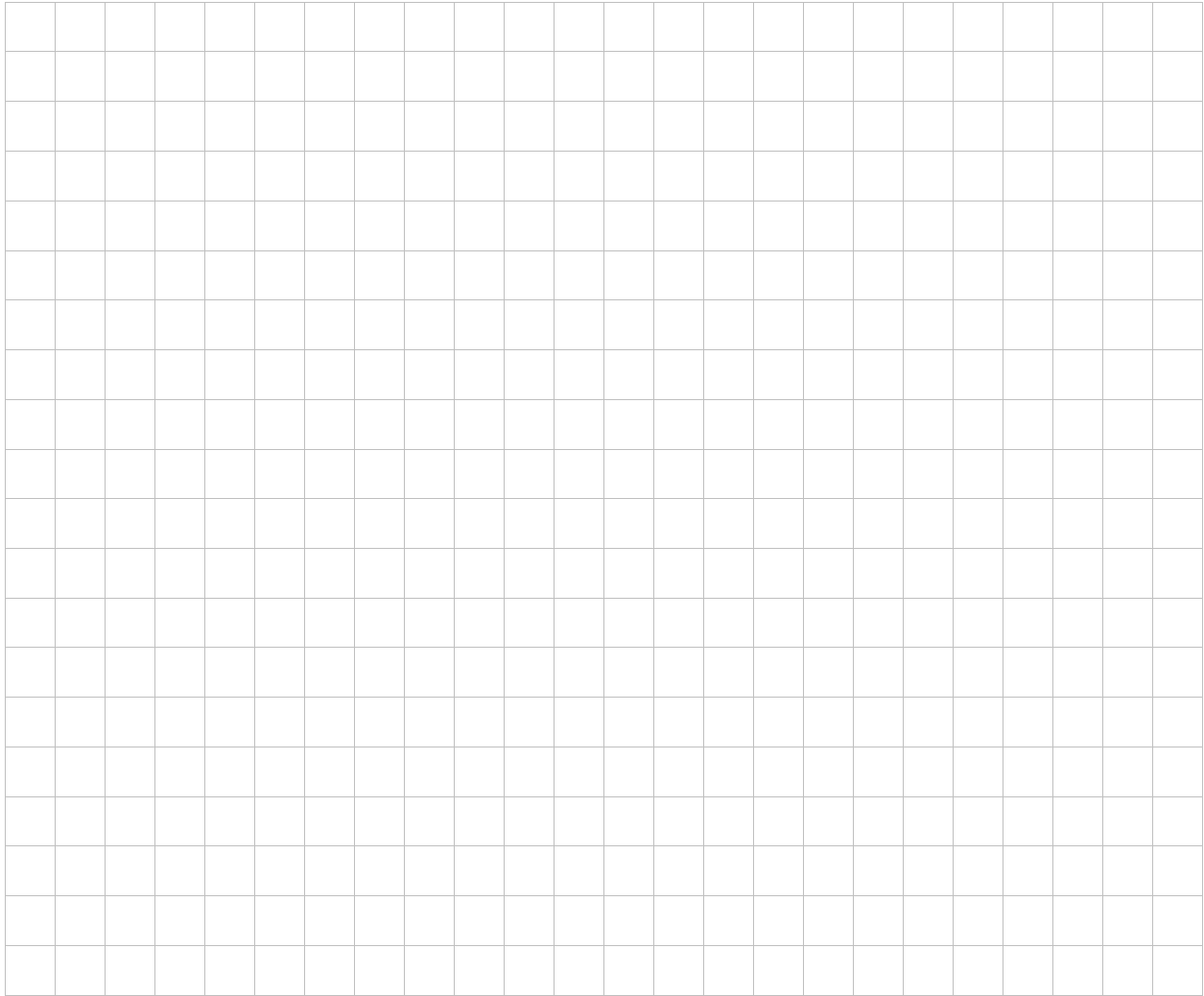
☐ Municipal (school, fire dept.)

☐ Mixed Use

☐ Recreation (park, pool)

Footprint: _____ inches X _____ inches

Height: _____ inches (single story should be approx. 6 inches)



Program Template

(adapted from *Constructions*)

Investigation:

Practices / Process Skills:

Materials:

Setting Up:

Starting Out:

Guiding Children's Actions:

(over)

Stretching Their Thinking:

Discovery Centers / Learning Centers (passive learning):

Family Programs (Family Nights):

Child-Care Programs:

