Grow Up Great
Great Lakes Science Center

Year-2 Final Evaluation Report
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Open Minds

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"We have learned a great deal from this program. We've been able to identify a model that works, for both GLSC and its partnering institutions, adopt and reframe an age-appropriate, data driven science curriculum for early learners, and most importantly, connect with local families and their children- expose them to the world of science, technology, engineering and math and invite them to see the possible in what a quality education can provide."

Sarah Carothers
Project Lead
Great Lakes Science Center

Executive Summary

The Great Lakes Science Center (GLSC) partnered with Catholic Charities Head Start (CCHS) to support quality science programming for young children and their families. This is the second year that GLSC has trained early childhood educators to implement the Early Childhood Hands On Science (ECHOS) curriculum from the Miami Museum of Science, and the first year of CCHS' participation.

Programming included professional development (PD) sessions and an individual classroom coaching session for each of 26 lead teachers and their assistants. Supervisors also received targeted PD sessions. Each classroom received an in-class presentation from GLSC staff and enjoyed three field trips. Families were invited to two family events, received newsletters with suggestions for at-home science activities, and a family pass to visit the science center.

The impact of this year's project was evaluated by collecting data through teacher surveys, family surveys, teacher interviews, classroom visits and feedback from project leads. Among the factors that key GLSC and CCHS staff identified as contributing to the project's success were the organization-wide buy in by CCHS staff, with an administrator who was very involved with the implementation, the purposeful alignment of the excellent ECHOS curriculum with CCHS' HighScope curriculum, and engagement of site supervisors.

The results of the project were very impressive. 80% of the teachers interviewed provided examples of their classroom science activities that were rated in the "higher quality" range, twice the rate for comparison teachers, and a marked increase over project teachers' own ratings from the beginning of the year. Classroom environment scores for science approached the "excellent" range.

Teachers reported greater confidence in their skills and knowledge related to early science teaching. They are offering quality science activities with increasing regularity, with all teachers offering science activities at least weekly and 50% reporting daily activities.

Supervisors reported providing more frequent feedback related to science by the end of the year, with half of the supervisors providing feedback monthly or more. Teachers rated the supports for their science teaching highly. Teachers are using the supports for their science teaching available through the project more frequently, with the materials provided by GLSC being used most often.

84% of project families attended a science event with their child. More than half of the project families reported doing a recent at-home science program with the child. Both of these rates were slightly lower than the rate for comparison families. However, of those families who did at-home activities, project families reported doing so more frequently.

Next year the project can build on their success by considering how to build a community of learners, including teachers and supervisors, to help support continued excellence in their early science programming.

"I am sure my enthusiasm and changing attitude about science has found its way to the parents."

Participating Teacher

Introduction

The Great Lakes Science Center (GLSC) has completed the second year of their project supporting early childhood STEM education. This year they worked with a new partner, Catholic Charities Head Start (CCHS), so the participating teachers are completing their first year of programming. The project continues to use the Early Childhood Hands On Science (ECHOS) curriculum from the Miami Museum of Science. Fifty-three educators are participating in the project, including 25 lead teachers and 28 assistant teachers in nine participating sites. Supports provided so far in the project include professional development sessions, classroom science kits, mentoring visits by GLSC staff to teachers in the classroom, field trips and a family event at each site and at GLSC. An interim report providing baseline data was submitted in February. Open Minds is pleased to share the final results of the Year 2 program evaluation, to help the project partners in their future planning and implementation.

"We do a lot more science focused work. We have ideas and resources we didn't have before and so there is no excuse not to give the kids exposure to science and how it relates to their everyday world."

Participating Teacher

Evaluation Questions and Data Sources for Year 2 Final Report

The specific evaluation questions to be addressed in this final report are:

1. How does the implementation of the program in Year 2 compare to what was proposed and what are the key factors that have been identified for successful implementation?
2. How is the quality of science teaching changing in the classroom?
3. How has the project had an impact on the quality of classroom science environments?
4. How have teachers' perceptions of their confidence and knowledge related to science teaching changed?
5. To what extent are science-related mentoring and supervision changing?
6. To what extent are teachers aware of and using resources developed through the project to support their science teaching?
7. How are families engaging in science-related activities at home or in the community with their children, and how are they supported to do so?

Data Sources

Information was gathered from several sources to help address the above questions, A cohort of 10 teachers were chosen at random, each from a different site, to participate in interviews and classroom visits as described below. All teachers were asked to complete the surveys. Specific data sources included:

- **Phone interviews** were completed with 10 project teachers in Nov/Dec and with 9 project teachers in May. Teachers were asked to describe in detail an example of classroom science activities that they found highly effective, supervision they have received, use of supports for their science teaching, support for at-home science learning, and changes in their science teaching.
- **Classroom visits** were made to 10 project teachers in May. The visits provided information on the science learning environment and science activities in progress.
- **Family surveys** were returned by 112 families from 9 of the 10 project classrooms participating in the evaluation. Families provided feedback about visits to community science events and at-home science activities with their children.
- **Teacher surveys** were completed by 48 teachers in the fall, and 53 teachers in the spring. Teachers were asked about their confidence and knowledge regarding science teaching, their satisfaction and use of supports in comparison to other subject areas, and the frequency and source of supervision for science teaching.

Data from project teachers and families were compared to data collected from a set of comparison teachers and families. In the past, teachers who were participating in the PNC *Our Kids and the Arts* project evaluation in Cleveland were given the opportunity to answer an additional set of questions focusing on both their science teaching and supervision received around science for an additional incentive gift card. Thirteen teachers completed the science questions and comprise the teacher comparison group. For the ECERS, previously collected data from similar classrooms participating in the PNC *Our Kids and the Arts* project were used for comparison. For the comparison family data, previously collected data from comparison families identified through the PNC *Grow Up Great with Science* projects in urban areas were compiled and compared to the Great Lakes families. A total of 26 comparison families were drawn from New Brunswick, Pittsburgh and Philadelphia.

1. How does the implementation of the program in Year 2 compare to what was proposed and what are the key factors that have been identified for successful implementation?

Conclusion: The project has been well implemented as Great Lakes Science Center staff has partnered with Catholic Charities Head Start on the* Grow Up Great *project for the first time this year. Services have focused on professional development and individual coaching for teachers and staff, special training for early childhood supervisors, classroom presentations and field trips for children and events for families.

Factors identified as contributing to the project's success were CCHS' buy-in from the top down, excellent communication between partners, alignment by CCHS supervisors of the well-structured ECHOS curriculum with the HighScope curriculum, training of site supervisors, transportation for families, and in-classroom coaching where teachers could discuss challenges and successes in implementation.

Evaluation Results

Key Result: [From Project Lead Survey]

The Great Lakes Science Center implemented the program as planned. This was the first year of participation for Catholic Charities Head Start. Program services focused on two sessions of professional development (12 hours total) for teachers and classroom staff. An individual coaching session was provided for each teacher and her assistants during classroom visits by Great Lakes staff. Two PD sessions were provided specifically for supervisors (4 hours total.) In this early stage of work with Catholic Charities, no specific training was yet provided to support teachers in mentoring other teachers.

Children enjoyed an in-class presentation and three field trips. Families were invited to two family events, received regular newsletters with suggested at-home activities and a pass for adults and children to visit the science center at their convenience.

Participants Served

Participants	*Estimated Number Served*
Classroom Teachers (Lead Teacher)	26
Classroom Staff (Assistants, Paraprofessionals, etc.)	28
Supervisors / Principals / Administrators	7
Children (approximate number)	677
Families (approximate number)	450

Services Provided

Type of Service	*Number Offered Per Individual Participant, Classroom or Family*	*Estimated Hours Per Session*
PD sessions primarily for classroom teachers and staff (not focused on mentoring)	2	6
PD sessions primarily for teachers focused on mentoring	0	0
PD sessions primarily for supervisors / administrators	2	2
Individual coaching sessions for teachers	3	1
Classroom presentations for children	1	
Field trips	3	
Family events	2	

"We had 100% support from above. We invested in the project and included every classroom….. We took it so seriously from the top down that it was easier for teachers to buy in."

Administrator from CCHS on key factors in the project's successful implementation

Key Result: [From Survey and Phone Interviews with Project Leads from GLSC and CCHS]

Sarah Carothers, who helped lead the project for GLSC, and Barb Dolejs, the education coordinator from CCHS, provided feedback through survey or phone interview on the key elements they felt were linked to the project's success. Among the factors they felt would be important to consider in future projects were:

- The project lead (Ms. Carothers) from GLSC and the key contact within CCHS shared a high level of organization and communicated very regularly.
- CCHS, the education partner, had buy-in to the project from the top and this commitment was echoed at every level. CCHS invested in additional science kits so the project could be implemented in all classrooms. CCHS also invested by committing teacher and site supervisor time for PD sessions.
- Both partners engaged in planning from the beginning of the project regarding how to sustain program gains after the grant period.
- Education and site supervisors reviewed the curriculum and project materials to identify any potential or perceived conflicts teachers might experience with their overall program curriculum (HighScope.) Supervisors determined in advance how to address any potential conflicts and how to work with teachers so that their classroom science activities helped them meet other curriculum requirements.
- Site supervisors were engaged in training specific to their role as science supervisors.
- CCHS' education administrator (Ms. Dolejs) was involved with the project throughout and could provide ongoing support for supervisors and teachers.
- Transportation was provided for field trips and for families and teachers to attend "family nights" at the Science Center.
- During Family Nights, families could observe the children in a lesson from their classroom, so they could see first-hand what the program involved day-to-day.
- Ms. Carother's classroom visits specifically provided time for teachers to talk about any concerns or struggles they were having with implementation and also allowed them to report their successes.
- The ECHOS curriculum provided teachers with a structured approach that developed ideas over extended time periods. With repetition, teachers became comfortable with the structure and could apply it to introducing new ideas and concepts.

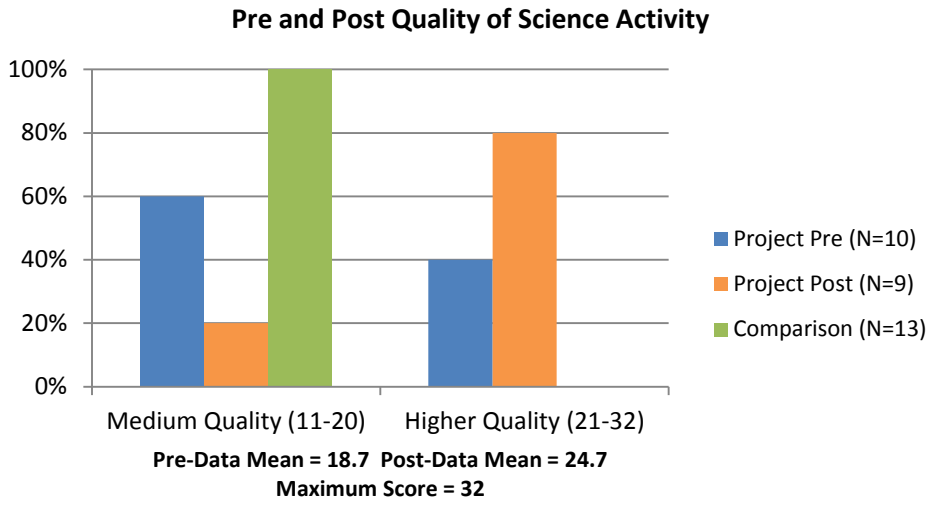
2. How is the quality of science teaching changing in the classroom?

Conclusion: 80% of teachers provided an example of their classroom science activities that was scored in the "higher quality" range – compared to 40% at the beginning of the year. All but one of nine teachers interviewed showed measurable improvement in the reported activities. These activities are being offered very regularly with half of the teachers reporting daily science in the classroom, and no teachers reporting less than weekly.

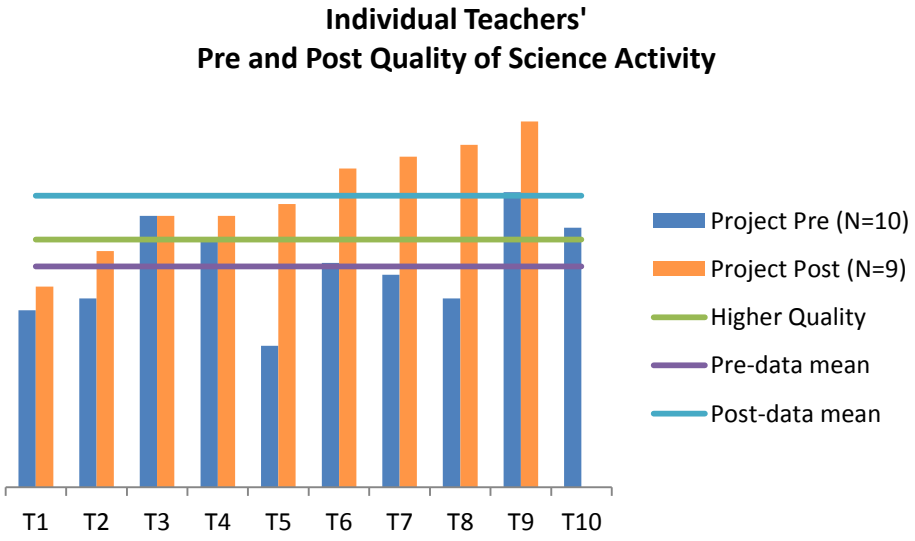
Teachers' sample activities included many elements of quality for early childhood science. At this time they are less likely to be based on the children's questions or to involve children in planning explorations, predicting or documenting results.

Key Results: [From Teacher Interviews] Pre N=10, Post N =9

There was an increase of 40 percentage points from pre to post in the number of project teachers providing examples of their classroom science activities that earned scores in the "higher quality" range. By year end, 80% of the project teachers' examples were in the "higher quality" range, while 100% of the comparison teacher's examples were in the "medium quality'" range, based on a 16 item, 32 point rubric.



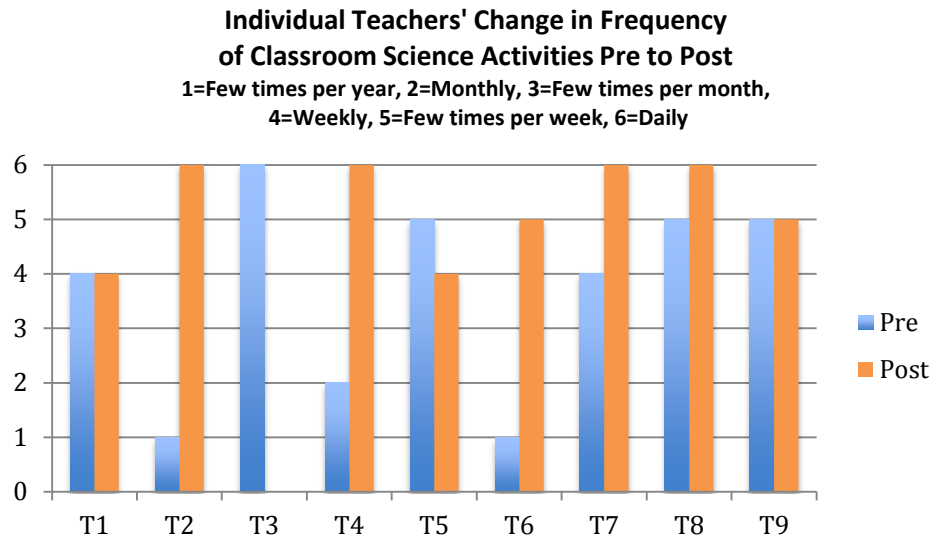
The average score for the teachers' reported activities increased from 18.7 to 24.7, moving into the "higher quality" range. Of the nine teachers interviewed at both pre and post, eight had increased scores for the quality of their science activity example at year end.



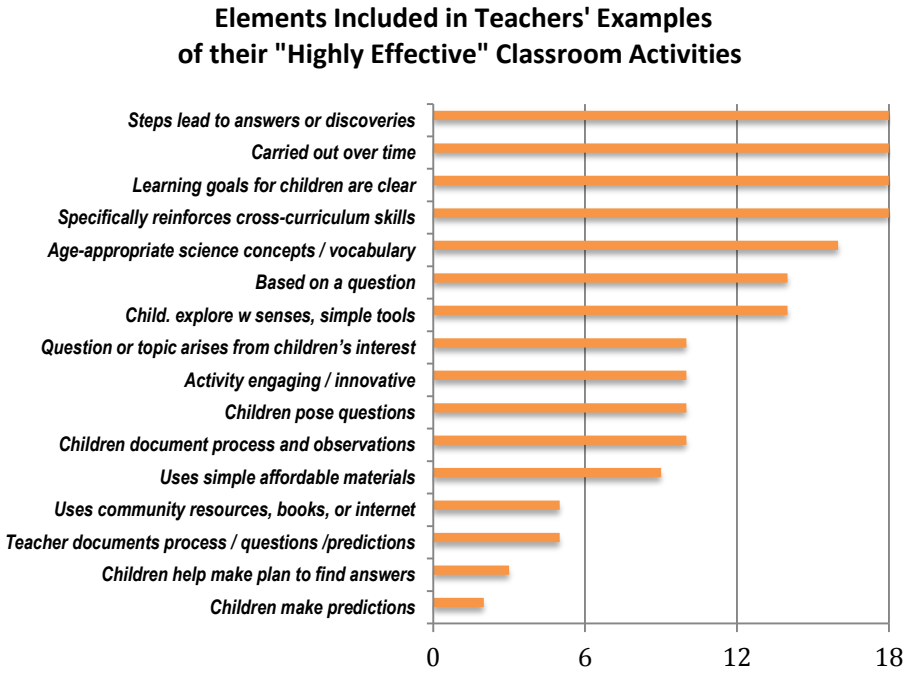
Eight teachers provided data pre and post on how often they offered classroom science activities similar in depth to the example activity they described. Five of the eight reported increased frequency, three with marked increases. All of the teachers reported offering these activities at least weekly.

"After reading "The Tiny Seed" by Eric Carle as part of the botanist investigation, children were wondering how things grew. The children used a straw and seed and blew the seed to simulate natural movement of seeds in nature. We varied seed size to observe difference and to try to draw conclusions. We related all the botany and seed work to spring, math counting and sorting seeds, graphing the distance traveled, worked on new vocabulary such as cross pollination, and fine motor skills as the children handled the seeds. I left materials in the science area so children examined seeds under the microscope, could see the books and use the plant puppet."

Participating Teacher Describing an "Effective" Classroom Science Activity



Teachers' examples of their classroom science activities that they felt were "highly effective" were rated using a 16 item, 32 point rubric developed with the input of the teachers and supervisors who participated in one of the earliest *Grow Up Great with Science* projects. Based on the well-structured ECHOS curriculum, most of the teachers' sample activities included many of the features of quality early science activities. At this stage, fewer of the activities evolved from the children's questions, and teachers did not usually report that the children made predictions, created a plan to find answers, or documented their observations for later reflection.



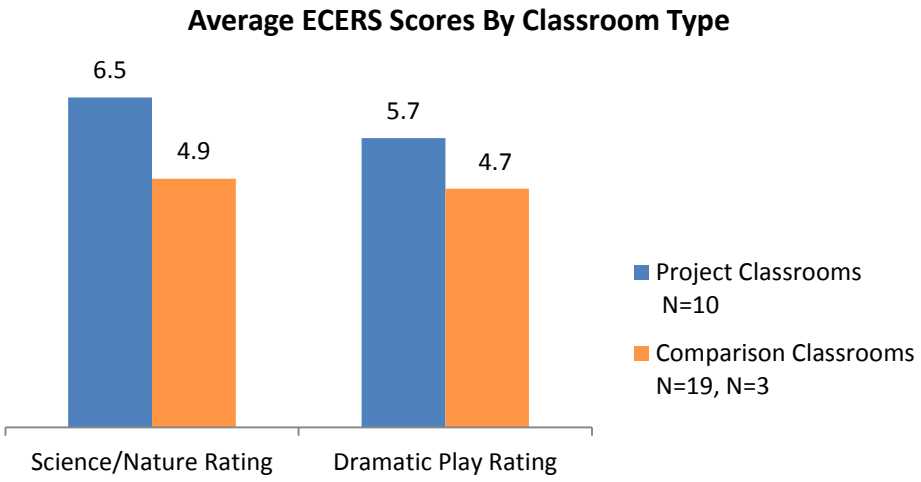
Each element in the 16 item rubric was scored as 0=no, 1=partial and 2=yes. A score of 18 means all nine teachers scored a "2."

3. How has the project had an impact on the quality of classroom science environments?

Conclusion: Project classrooms' scores for their science environment are higher than comparison classrooms' and higher than their own dramatic play scores. Participants' average classroom science score approached the "excellent" range.

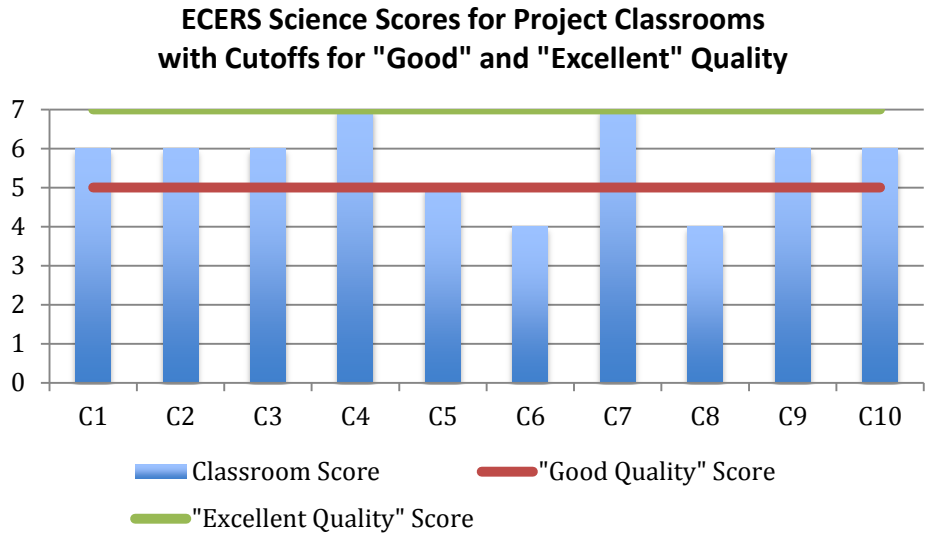
Key Result: [From Classroom Observations] N=10

The Early Childhood Environment Rating Scale (ECERS) was used during classroom visits to evaluate the quality of the learning environment related to science and, as a control measure, dramatic play. The CCHS classrooms participating in the project had higher scores than comparison classrooms in both areas, with the greatest difference in the area of science. Project classrooms' science scores were, on average, 1.6 points higher than comparison classrooms' scores, and 0.8 points higher than their own dramatic play scores.



For ECERS scores 5=good and 7=excellent.
80% of GLSC classrooms scored 7 on the Science/Nature scale compared to only 20% scored 7 on the Dramatic Play scale.

All but two of the classrooms had ECERS science scores at or above the "good" range, with two reaching the "excellent" range.



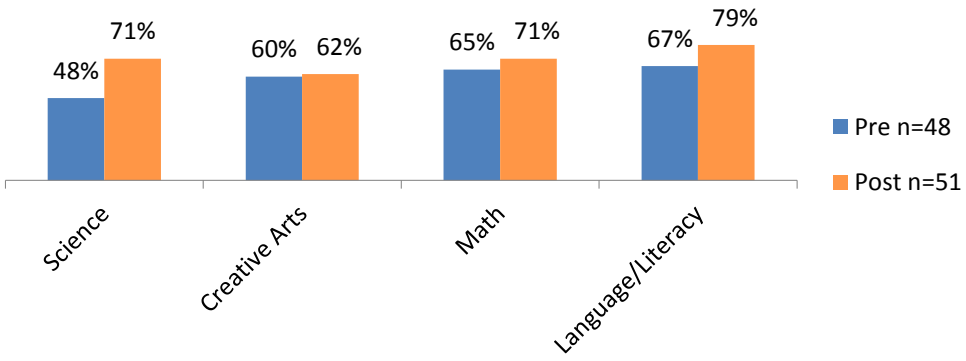
4. How have teachers' confidence and perception of their knowledge related to science teaching changed?

Conclusion: Teachers reported a greater increase in their confidence related to science teaching than any other curriculum area. They rated their knowledge higher at the end of the year in each of eight skills related to science teaching.

Key Results: [From Teacher Surveys]

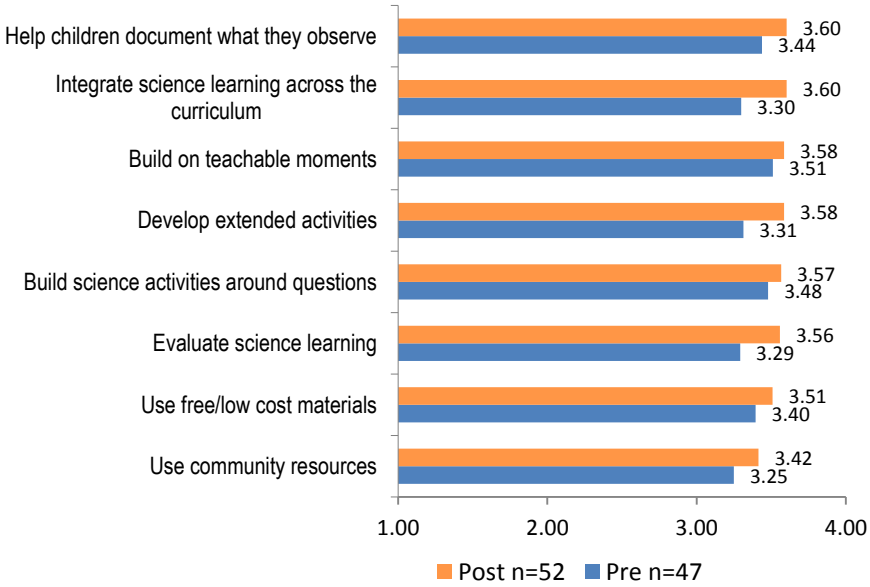
More teachers "strongly agreed" that they were confident to teach in all four curriculum areas on the survey. The greatest increase, 23 percentage points, was in the area of science.

Percentage of Teachers Who Strongly Agree that They Are Confident in Their Ability to Teach in Different Areas: Comparison of Pre and Post-Data



Project teachers rated the extent to which they knew how to do each of eight practices related to teaching science to young children. Their ratings for each practice was higher at the end of the year than at the beginning.

Average Ratings for Teachers' Knowledge of Different Teaching Activities: Comparison of Pre and Post-Data



4 point scale: 1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree.

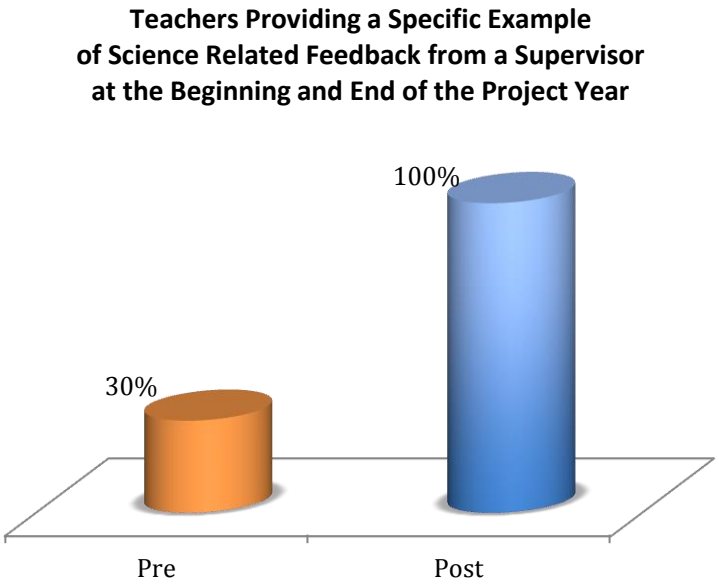
5. To what extent are science related mentoring and supervision changing?

Conclusion: By year-end teachers reported more frequent supervision related to science. 100% were able to provide specific examples of science related feedback by year end, compared to only 30% at the start of the year.

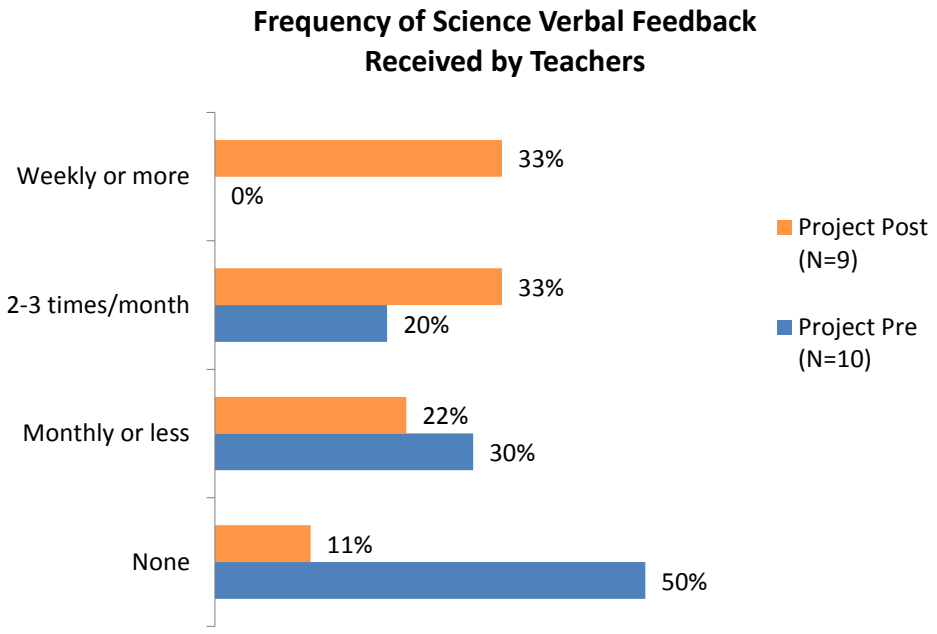
Half of the supervisors reported providing regular feedback (monthly or more) related to science. Supervision was related to improving science teaching practices but did not yet include suggestions for increased access to resources, greater integration of science in the curriculum or extension over time. Teachers gave the sources of support for their science teaching high scores. Some teachers have also begun to identify sources of support outside of the project.

Key Result: [From Teacher Interviews] Pre N=10, Post N=9

When teachers were asked to describe an example of feedback from a supervisor or peer that they had found especially helpful related to their science teaching, only 30% could do so at the beginning of the year. By the end of the year 100% of them provided an example, all from supervisors rather than from peers.



Teachers reported that the frequency with which they received verbal feedback increased over the course of the year. At the beginning of the year, 20% reported verbal feedback related to science two to three times per month or more. By year-end, 66% of teachers were reporting such regular verbal science feedback.

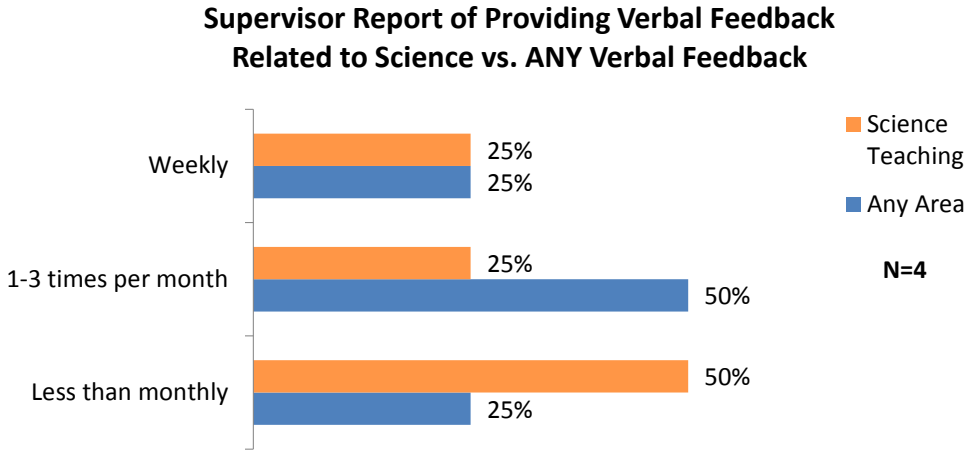


"We will continue using the curriculum and providing materials to support each unit."

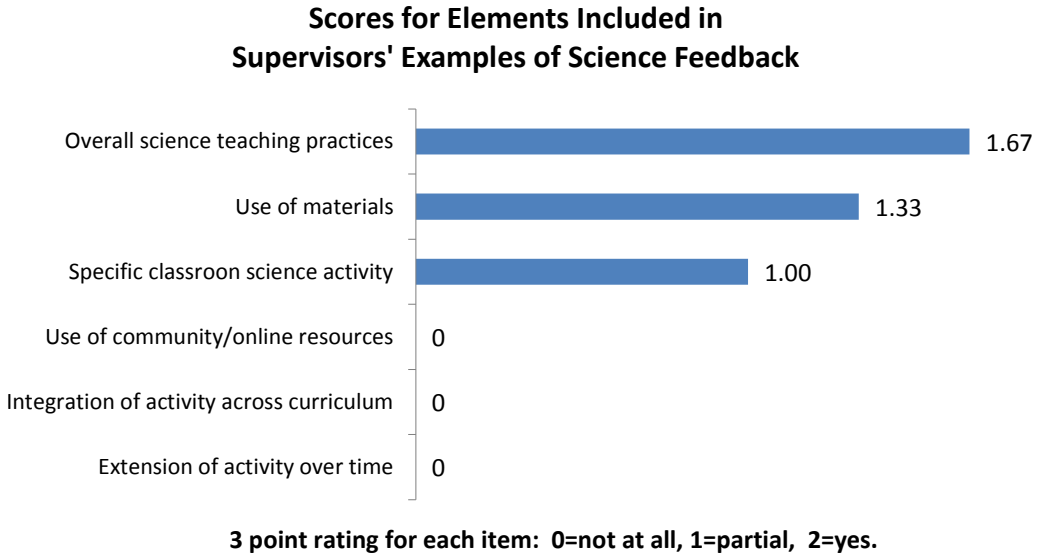
Supervisor describing plans to sustain the project

Key Results: [From Supervisor Surveys] N=4

Half of the four supervisors surveyed reported providing verbal feedback on science activities at least monthly and one reported providing weekly feedback. Verbal feedback on non-science topics was reported to be more frequent.



The specific examples provided by supervisors of the feedback they had given one of their teachers were rated for inclusion of various elements. The examples tended to include content related to science teaching practices overall (such as increased engagement of the children or implementation of the science curriculum), specific science activities, or the use of materials. The examples did not include accessing resources, integration of activities across the curriculum or extending activities over time.



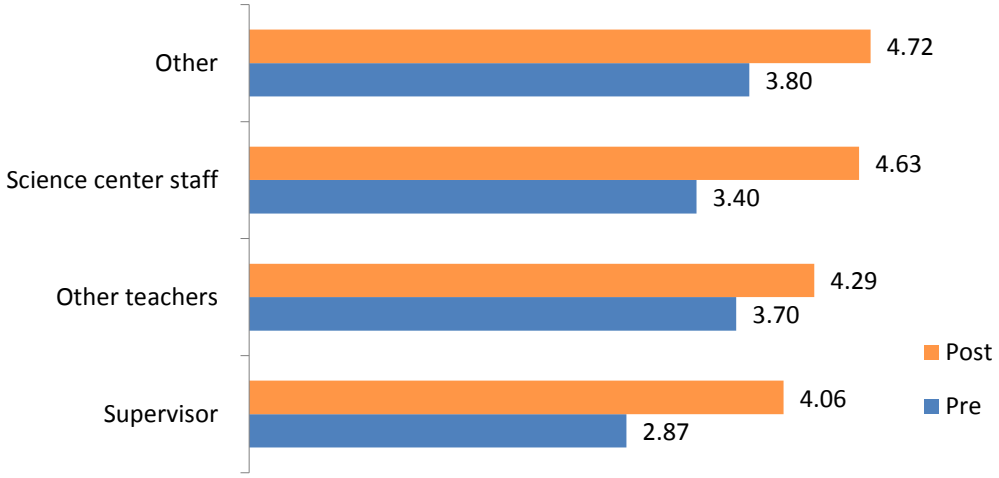
To model critical thinking through the use of self-talk (i.e. "This made a mess. How could I get this water from this bottle to this one without spilling it everywhere? What could I use? How could I get this marshmallow structure to not fall over?"

Participating teacher on advice for a brand new peer on things to think about in developing high quality science lessons

Key Result: [From Teacher Surveys] N=53

Teachers rated sources of feedback and support for their science teaching more highly at the end of the year than at the beginning. By the end of the project year, these sources were rated on average, above a four on a five point scale. Though the teachers rated their supervisors' feedback related to science as less valuable than other sources, the ratings for supervisors showed the greatest improvement over the year.

Average Teachers' Rating of How Valuable Different Sources of Support Are: Comparison of Pre and Post-Data



Score range: 1=Not at all valuable to 5=Extremely valuable
"Other" supports were identified by 18 of 52 teachers, and included librarians, parents, instructors from PD and college, and staff from Metro Parks and Botanical Gardens

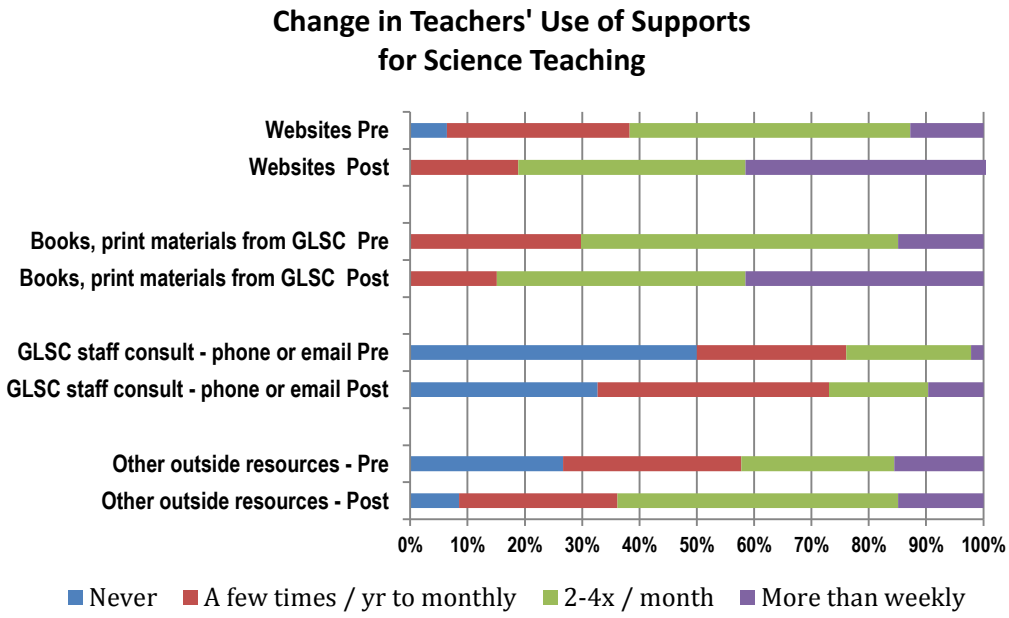
6. To what extent are teachers aware of and using resources developed through the project to support their science teaching?

Conclusion: Over the course of the year teachers began to use supports for their science teaching more frequently. Print materials from GLSC and websites were the sources of support that teachers reported using most often. Just over 40% of teachers reported using these supports weekly.

By the end of the year, there was an increase in the number of teachers who reported using resources for their science teaching beyond the project's resources.

Key Result: [From Teacher Surveys] N=53

Teachers reported using resources to support their science teaching more often at the end of the project year than at the beginning. The use of websites and of print materials from the Great Lakes Science Center increased markedly and by year-end, over 40% of the teachers reported using these resources more than weekly. The "other" outside resource identified most frequently was the library. A few teachers identified other community resources for their science teaching such as the Cleveland Metro Parks and the Botanical Gardens.



7. How are families engaging in science-related activities at home or in the community with their children, and how are they supported to do so?

Conclusion: 84% of project families attended a science event with their child. But even more comparison families attended and they reported attending more frequently.

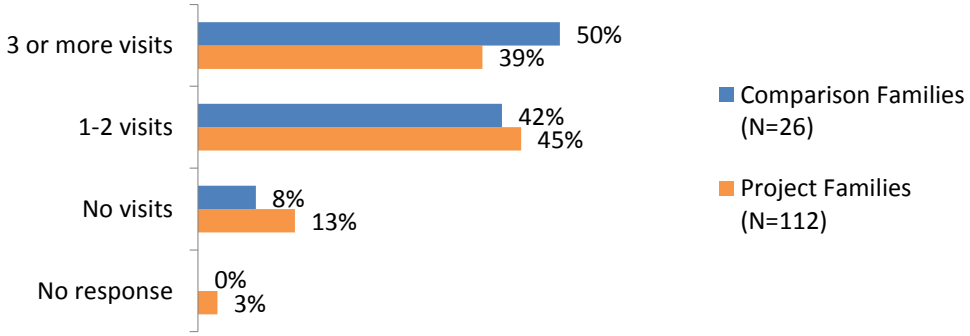
Project families were less likely than comparison families to report doing at-home science events with their child. Of the families who did report an at-home activity, project families were five times more likely to report frequent activities of twice a week or more.

Almost half of the project families reported that they got ideas for at-home science activities from their child's teachers.

Key Result: [From Family Surveys]

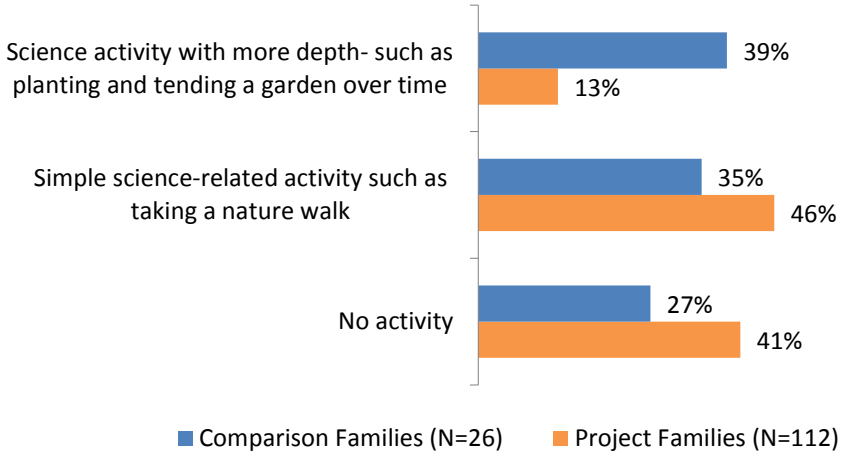
84% of project families visited the science center at least once during the past year. However, 93% of comparison families reported visited a science center and visiting more often than project families. More than half of the project families reported that they had visited a science center with their child's school, while only 38% of comparison families did so.

Number of Family Visits to a Science Organization or a Science Event at School



13% of project families reported an example of an at-home science activity that showed depth, while 39% of comparison families did so. A sizable portion (41%) of project families did not report an at-home activity.

Depth & Complexity of At-Home Science Activities Reported by Project and Comparison Families

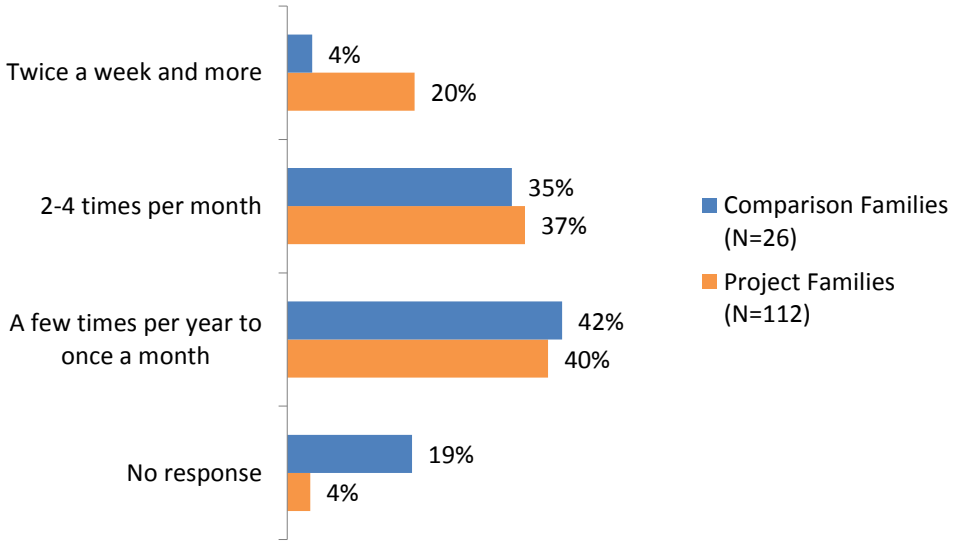


"We are able to visit the science center more often and my child is using new vocabulary and talking about science activities he has done or is doing at school."

Participating family member describing impact of the project

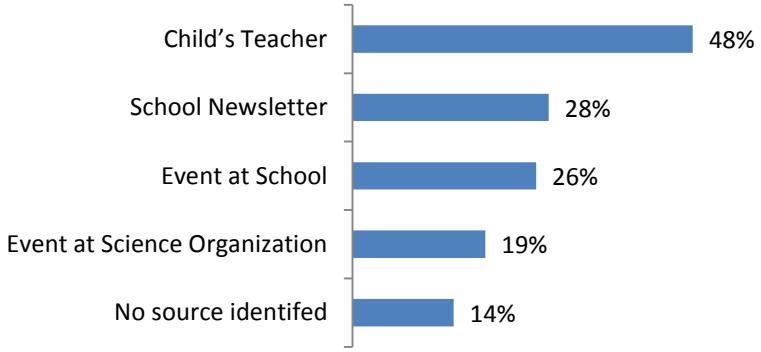
Of those families that reported doing at-home science activities, project families were five times as likely as comparison families to report doing the science activities twice per week or more. The majority of project families reported at-home science activities twice a month or more.

Families Reporting Frequency of Doing Science Activities at Home with their Child



Almost half of the families reported that they got ideas for at-home science activities from their child's teacher.

Families Reporting Sources of Ideas for At-Home Science Activities



Families reported multiple sources, so total percent exceeds 100.
N=111

Summary and Recommendations

Project Implementation

Summary

The project has been well implemented as Great Lakes Science Center staff has partnered with Catholic Charities Head Start on the *Grow Up Great* project for the first time this year. Services have focused on professional development and individual coaching for teachers and staff, special training for early childhood supervisors, classroom presentations and field trips for children and events for families. Factors that contributed to the projects' success were CCHS' buy-in from the top down, excellent communication between partners, alignment by CCHS supervisors of the well-structured ECHOS curriculum with the HighScope curriculum, training of site supervisors, transportation for families, and in-classroom coaching where teachers could discuss challenges and successes in implementation.

Recommendation

The project should retain their current approaches to regular communication, engagement of supervisors, transportation of families, and in-classroom coaching focused on implementation of the ECHOS curriculum. For future projects, strong consideration might be given to the extent to which the education partner is able, as CCHS did, to invest resources and staff time, plan for ongoing supervision and sustainability, and address any potential conflicts with existing curricula which might present a challenge for their teachers.

Classroom Science Activities

Summary

Teachers are regularly providing high quality science activiities in their classroom with the help of the well-structured ECHOS curriculum and GLSC materials. The percentage of teachers reporting activities rated as "higher quality" increased from 40% to 80% over the course of the year. Teachers' sample activities included many elements of quality for early childhood science such as including specific age-appropriate science concepts, clear learning goals, steps that allow children to discover, building concepts over time and reinforcing skills across the curriculum. At this time, the reported activities are less likely to be based on the children's questions or to involve children in planning explorations, predicting or documenting results.

Recommendation

As teachers become even more familiar with the design of quality science activities, they may be more ready to build activities around teachable moments related to children's questions and observations. It might be helpful to work with teachers on ways to create their own in-depth activities, and how to engage children in the full range of the "scientific method" – including posing questions, planning how to find an answer, predicting results, gathering information through observation and experimentation and comparing actual to predicted results.

Classroom Environments

Summary

Project classrooms' scores for their science environment are higher than comparison classrooms' and higher than their own dramatic play scores. Participants' average classroom science score approached the "excellent" range.

Recommendation

In future project years, it might be helpful to work with teachers and supervisors to discuss how they can sustain their high quality classroom environments for the long term. As materials and supplies that are provided through the project are used up or become worn, it might be helpful to have a plan in place to refurbish classroom science centers with low cost, high interest materials.

Teachers' Confidence and Perception of Knowledge

Summary

Teachers reported a greater increase in their confidence related to science teaching than any other curriculum area. They rated their knowledge higher at the end of the year in each of eight skills related to science teaching.

Recommendation

As teachers continue to learn more about available resources to support the quality of their classroom science activities, and as they access those resources over time, they will likely continue to grow even more confident about their knowledge and practices in this area. In the future, it might be helpful for teachers who are new to the project to have a chance to discuss with a supervisor or mentor, or at a PD session, any anxiety they might have regarding science teaching.

Mentoring and Supervision

Summary

By year-end, teachers reported more frequent supervision related to science. 100% were able to provide specific examples of science related feedback by year end, compared to only 30% at the start of the year. Half of the supervisors reported providing regular feedback (monthly or more) related to science. Supervision was related to improving science teaching practices but did not yet include increased access to resources, greater integration of science in the curriculum or extension over time. Teachers gave the sources of support for their science teaching, including peer teachers, higher scores in the spring than in the fall. Some teachers have begun to identify sources of support outside of the project.

Recommendation

If teachers and supervisors return for a second year of programming, they may benefit from additional training on how to evaluate science activities and provide feedback. The GLSC staff may be able to work with the CCHS staff to develop a Professional Learning Community (PLC) approach in which supervisors, teachers, and classroom staff can jointly review and brainstorm on how to enhance classroom science activities in anticipation of the time after the grant has been completed.

Use of Resources

Summary

By year-end, teachers reported more frequent use of print materials from GLSC, websites and outside resources beyond GLSC for sources of support for their teaching.

Recommendation

During PD and coaching sessions, GLSC staff can continue to encourage teachers' exploration and use of GLSC and outside resources by teaching skills on how to access and providing opportunities for sharing of resources among peer teachers.

Family Engagement

Summary

84% of project families reported attending an event and almost 40% attended three or more. Project families were still slightly less likely than comparison families to attend a science event or report doing at-home science events with their child. But of the families who did report an at-home activity, project families were five times more likely than comparisons to report frequent activities, twice a week or more.

Recommendation

It may help families who are currently not doing at-home science activities with their children to receive regular suggestions in easy-to-use formats. For example, if families can be sent an idea or two for at-home activities with each science unit that is presented in the classroom, they may be more able to reinforce and build on their child's learning.