Community STEM Outreach

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Community STEM Outreach
Second Annual Evaluation Report

Executive Summary

 This executive summary provides the overview of the story of the YES program at the Saint Louis Science Center (SLSC). The full evaluation report of this project, funded by the Office of Naval Research, gives more details to help stakeholders share the YES story and to help project staff continue to improve the program.

 The report addresses the following questions:

- Why conduct an evaluation?
- Who are the YES teens?
- What happens in YES?
- What are the program's outputs?
- What are the program's impacts?
- What are the different points-of-view that stakeholders have about YES?
- What areas are important to stakeholders and program success?
- What recommendations support program improvement?
- What are the plans for the future of the program?

Why Conduct a Program Evaluation?

 The evaluation team is documenting the program and articulating the program model to support dissemination of the model on a national level. Data sources include interviews, focus groups, observations, surveys, and program records. At this point, at the end of the second year of the three-year project, the evaluation provides a description of the program, overview of the project outputs to date, short-term impacts, differing points-of-view of stakeholders, areas important to stakeholders, and future plans for evaluation and dissemination. Each of these is summarized here.

Who Are the YES Teens?

 The full report provides the data to describe the YES (Youth Exploring Science) teens at the Saint Louis Science Center (SLSC). A "typical" YES teen wearing the red YES t-shirt can be described as African American, attending a public high school in Missouri in 9th or 10th grade, and taking the typical progression of science and math courses. Having been recruited through a community organization that serves children with multiple risk factors, the teen most likely joined the program in February 2011 because of the work experience the program provides.

What Happens in YES?

The YES program was built and continues to change through the process of *deliberate design*. By that, the program's founder means that each element of the program grows out of research and best practices in youth development, STEM (science, technology, engineering and math) education, and Out-of-School Time (OST) education. Elements of the program are deliberate; there is a rationale behind each feature of the program. The design process is intentional, such that each program element aims toward an intended impact. The evaluation is identifying and codifying the deliberate design.

An example of the deliberate design can be seen in the way teens are recruited from community-based organizations that serve youth. These organizations already serve the target population for YES – urban, low-income, underrepresented teenagers. These organizations also provide youth and their families with many resources that the YES program cannot, such as social services, referrals to health care providers, and other community resources.

Once recruited, YES teens begin in the spring semester, learning about the program and engaging in STEM-based activities to prepare them for a summer of working with younger children as facilitators of activities.

For all YES teens, the school year program differs from the summer program. Vignettes for each are provided in the full report. The typical activities of the Saturday Learning Labs during the school year are much like those of the summer weekdays. Teens arrive at the Taylor Community Science Resource Center, grab something to eat, sign in or clock in, join the other teens in their component's room, check the agenda posted, check out the Word to the Day and Quote of the Day, write in a personal journal, engage in STEM-based activities, participate in teambuilding activities, conduct science investigations, take a break for food, join other teens in their grade level for activities to support college and career readiness, clean up, and chat with friends and staff when leaving for the end of the day. In the summer, the STEM-based activities and science investigations give way to leading younger children in science activities.

Professional development (PD) for staff is another piece of the deliberate design of the YES program. In the summer, when part-time staff members are hired as summer interns to lead groups of teens, the PD focuses on orientation and curriculum planning prior to the arrival of the teens. As the summer progresses, the PD may involve outside experts or conversations about how to handle specific situations.

During the school year, PD for full-time senior educators also takes many forms. A vignette of one such PD opportunity is provided in the full report. In a focus group with senior educators, it became clear that the most helpful and beneficial PD is the PD that can be applied and used immediately. Other characteristics of helpful PD include PD that is intentionally constructed, occurs over time to reinforce learning and allows for "absorption", and includes follow-through by facilitators, managers, or educational leaders. One-shot, short workshops or activities, particularly those lacking careful planning, leave educators wondering what to do with the information. Helpful PD includes three perspectives: how it feels as learner, facilitator, and trainer. The senior educators in the focus group indicated that they would like more PD opportunities to continue to improve their practice and to incorporate best practices and research.

Partners from community-based organizations that serve youth participate in monthly PD as part of their involvement with YES. In addition to recruiting teens for the program and children for them to teach, community partners attend networking and PD meetings to explore STEM education in out-of-school time. A vignette of such an opportunity is provided in the full report.

Recent changes at the SLSC have affected what happens in YES. Most notably, over the past two years, the SLSC has seen three presidents and major budget cuts. Restructuring of YES after budget cuts led to the elimination of two YES components (defined as groups of about 20 YES teens working with one or more staff members on a STEM topic). Staff reductions included one YES director and six educators.

What Are the Program Outputs?

Program Outputs for the first two years of the Community STEM Outreach Project can be summarized in terms of patterns of the teens served through the various components. New teens arrived each spring. Each summer even more teens attended, including recent high school graduates. Each fall as those graduates left for college, lower attendance figures reflected the loss of the past year's seniors in anticipation of the new recruits for the next spring.

Since the beginning of the Community STEM Outreach project in 2010, the YES Program has served 385 individual teens through the STEM-focused "components". Table I gives an overview of the components offered each semester.   The reduced number of component offerings in Spring 2012 were a result of budget cuts.

Table I. Components Offer by Semester with Teen Participants

	Spring 2011	Summer 2011	Fall 2011	Spring 2012	Summer 2012
School Year Component Groups					
New Teens	105	-	-	61	-
Agriscience	-	21	34	35	24
Astronomy	-	-	28	34	23
Biofuels & Energy	-	-	22	35	28
C3 (Climate Change)	14	-	-	-	-
Design IT	18	-	-	-	-
Health	10	-	-	-	-
Learning Places	21	-	-	-	-
Neuroscience	-	-	24	3	-
Plant Biochemistry	-	-	25	-	-
Robotics	18	-	38	41	22
SciJourn	8	13	6	8	11
Science Corner	25	-	-	-	-
Sea Perch	18	-	-	-	-
Mystery of Matter	-	9	-	-	8
Summer Component Groups					
Summertime Science	-	96	-	-	60
Exhibit Lab	-	-	-	-	71
Main Building	-	67	-	-	-
Offsite	-	60	-	-	5
Science on the Go	-	10	-	-	-
Total	237	278	170	209	251

Attendance by YES teens is another program output to consider. Table II (Table 3 from the full report) provides a summary of program attendance.

Table II. Learning Lab Opportunities in and Percent Attendance from Spring 2010 through Summer 2012

Semester	Spring 2011	Summer 2011	Fall 2011	Spring 2012	Summer 2012
Days	15	36	11	14	32
Participating Teens	237	278	170	209	251
Percent Attendance	67.9%	82.4%	71.1%	52.6%	83.4%

Attendance in most semesters is affected by teens participating in sports, school and community-based extracurricular activities, and family emergencies. Allowing for these is part of the program's deliberate design. Typical semester averages range around 70% during the school year and 85% during the summer. The lower level of attendance in Spring 2012 appears to have been the result of layoffs of staff members; teens form relationships with individual staff members, and some had strong feelings when their component leader lost their job.

What Are the Program Impacts?

Program Impacts measured in the first two years of the project include post high school plans for the YES program graduates (most off to college) and career plans for all YES teens (most into STEM-related careers). Additional impacts to be assessed in the third year of the project include changes in teens' attitudes toward science and their understanding and appreciation for scientific inquiry. Surveys of alumni/alumnae will provide additional information on long-term impacts.

Data from seniors in the graduating class of 2012 (N=62) indicate that 55% plan to attend a four-year university, and another 21% plan to attend a two-year community college. When asked what career they were interested in pursuing, 84.1% of YES teens listed at least one STEM-related career in the spring of 2011 (N=182), and 76.3% listed a STEM-related career in Fall 2011 (N=118).

What Are the Differing Points-of-View Among Stakeholders?

Groups of stakeholders (i.e. groups of people associated with the program, groups with something to gain from the program or something at risk) hold differing views of staff roles and responsibilities, the nature and importance of STEM learning in out-of-school time, and the YES program's relationship with other areas of the SLSC. There are no right or wrong perspectives. They are simply different. Value can come from gaining an understanding of all the views.

Staff Roles and Responsibilities. Differences in perspectives are to be expected among staff members at different "levels" within any organization, and the YES program is no exception. Educators focus on day-to-day interactions with the teens and with program implementation. Managers focus on program logistics and community relationships. Support staff members focus on materials management, purchasing, and logistics. The vice president focuses on budget and overall program direction within the department and the SLSC as a whole. Sharing perspectives and ideas to clarify roles and responsibilities, particularly with the recent layoffs, will help with the YES program model dissemination.

STEM in Out-of-School Time. Science, technology, engineering and mathematics (STEM) learning and teaching are different in school settings and in non-school settings and programs. Differences result, in part, from contrasting ideas about how science should be taught and learned. These contrasting ideas appear to be tied to the various backgrounds and STEM experiences that stakeholders bring to the table.

One perspective comes from those who believe it is important for teens to acquire specific declarative knowledge in various STEM disciplines. Another comes from those who believe that engaging with STEM topics through inquiry-based approaches is better suited and more effective in preparing teens with risk factors in their lives to find ways to overcome the obstacles in school and in life. Bringing the national debate on this issue and the differing perspectives of stakeholders to the table for discussion will support the youth program and model dissemination.

YES Program Relationships with Other Areas of the SLSC. Though the YES program is part of the Saint Louis Science Center, a physical separation appears to have contributed to a psychological separation over the past 15 years. This year efforts have been made to reduce this separation, although different perceptions persist about the nature of specific efforts and their effectiveness. Bringing the two groups together appears to be a goal of administrators. To do so will require effort by both groups, as staff members from each building examine their own and each other's perspective and assumptions, and as they participate in each other's culture.

Emerging from the relationship of the YES program to the SLSC as a whole is the question of the future of the program. As staff members take on additional tasks and resources remain limited with recent budget cuts, YES staff begin to ask whether the YES program will continue beyond the ONR funding, whether there will ever be opportunities for career advancement at the SLSC, and how all the uncertainty will affect them personally. At the same time, administrators appear to focus on how to keep the program going, how to best manage the Community STEM Outreach project, and how to disseminate the YES program model nationally. These different perspectives are typical in situations like this, and discussions among the stakeholder will help clarify those perspectives.

What Areas are Important to Stakeholders and Program Success?

When the staff and teens adhere to the principle of *deliberate design*, and when they are informed by current research and best practices, the program improves. However, when deliberate design is lacking or ignored, the program (and the youth) suffers. The following areas of importance are explored in the full report. These areas of importance to stakeholders should be explored further by project leaders.

- Intentional debriefing and reflection of learning activities at all levels (with children, teens, and staff)
- Additional focus in staff PD on the facilitation process (train-the-trainer)
- Curriculum that is well planned and adheres to the intended learning goals and context
- Ability of all staff members to perform at peak levels when the teen population remains constant and staff size shrinks
- Absenteeism of YES teens and communication among staff and teens to maintain strong relationships
- A data tracking and management *system* to better meet the needs of program staff and the current and future funders and researchers

What Recommendations Support Program Improvement?

To understand the differing points-of-view and areas of importance described in the report, the following recommendations for the program are offered. Project leaders may have even better ideas.

- Set aside time to discuss (as a group) the forthcoming data on PD perspectives collected by the evaluation team, and use that to create a cohesive plan for staff PD to meet the needs of all staff and the institution.
- Review data collected by the evaluation team from forthcoming interactive interviews with teens to frame a discussion on the national debate regarding the nature of science education in out-of-school time.
- Develop opportunities for staff from the main building to experience and get to know the YES culture and for YES staff to experience and get to know the main building cultures.
- Devote time in a series of staff meetings for senior educators to share ways they have built debriefing and reflection into their work with the teens; establish a process to videotape examples during the school year; and share these examples with summer interns prior to their work with teens.
- Similarly, have teens in components brainstorm ways to help children debrief activities and reflect on their learning, establish a process to videotape examples with teens and children; and share the examples with new teens, new staff, and teens from other components.
- Devote some PD for senior educators and managers to curriculum and program planning by bringing in outside experts or reading and discussing books or articles.
- As the multimedia tool is developed, use the deliberate design aspects identified as points of discussion among staff at all levels.
- Involve all YES administrators in all PD to create a productive dialog among the PI, managers, senior educators, and part-time staff and to strengthen the community of learners.

- Revisit as an entire department the roles and responsibilities of department staff, perhaps by using the process from the Learning Places project.
- Establish a priority to have component leaders call teens each Tuesday if they missed on Saturday without prior warning – to create a sense of caring by staff and to create a workplace environment sense of responsibility and accountability.
- Revisit the rationale and workplace skills developed around teen absenteeism.

Where Does YES Go From Here?

Due to the current national economy and the recent budget cuts at the Saint Louis Science Center, the future of YES in the long-term is unknown. However, through the support of the ONR, the next year in YES will lead to additional understanding of the YES Program Model through the project evaluation, and to the dissemination of the model to the museum partners across the nation through the multimedia tool to be developed. Regardless of what happens to the program in St. Louis, the YES Program Model appears to have features that could provide substantial benefit as a foundation for STEM-based youth programs in museums and community organizations across the U.S.

Feedback on this report and questions about the evaluation can be sent to Christine (Kit) Klein, evaluation consultant, at ckleinconsutling@gmail.com.

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Community STEM Outreach
Second Annual Evaluation Report

Introduction

"What is the YES story?" Several people have asked that question recently. They want to share the story with others and need additional information. The evaluation of any program should facilitate the telling of the program story, and this formative evaluation report is no exception. It should fill in details of the YES story.

This second annual evaluation report of the Community STEM Outreach Project, funded by the US Office of Naval Research, is organized around the program theory of the Youth Exploring Science (YES) Program at the Saint Louis Science Center (SLSC).

- Why conduct an evaluation?
- Who are the YES teens?
- What happens in YES?
- What are the program's outputs?
- What are the program's impacts?
- What are the different points-of-view that stakeholders have about YES?
- What areas are important to stakeholders and program success?
- What recommendations support program improvement?
- What are the plans for the future of the program?

These and more questions will be addressed.

Why Conduct a Program Evaluation?

Since the Office of Naval Research (ONR) funded the Community STEM Outreach Project with taxpayer dollars, it makes sense to find out how well those dollars are being spent. Are the project leaders doing what they said they would do? Is the project producing the results it promised? The program evaluation answers these questions, and goes further.

The project focuses on clearly documenting and articulating the program model and on creating a plan to disseminate that model nationally. At this stage of the evaluation, the evaluation team focused on documenting and articulating to set the stage for disseminating. To do this, evaluators explored questions that went beyond "Did they do what they said they would?" Evaluators examined the YES program as a complex system of people, resources, and actions in a specific local environment to understand how others can adapt the model in their local settings.

Since this report comes midway through the project, not all questions can be answered at this point. Some will be answered in the final evaluation report. Other questions, involving long-term impacts, may require additional research to compare groups of teens over time.

Data sources for this report include interviews, focus groups, observations, surveys, and program records. (Evaluation activities to date are listed in Appendix A, and data sources are listed in Appendix B.)

Definitions

Since a few definitions are necessary when telling the YES story and describing the program to people outside of the program, they are provided here. First, a "component" is a group of about 20 YES teens working with one or more staff members on a STEM (science, technology, engineering and math) topic. "New Teens" is the term used to describe the YES teens during their first spring in the program as they learn the ropes. The group "New Teens" is generally referred to as a "component" even though it focuses on science in general rather than a specific STEM content area. Teens split program time between "components" and "College Prep." College Prep is for same-grade groups of teens to work with staff on aspects of college planning and preparation. This group of semester-long components and college prep sessions are collectively referred to as Learning Labs.

With that language at hand, we can describe the program theory and five important aspects of the program: teen recruitment and hiring; the school year teen program; the summer teen program; professional development of staff; and activities with community partners. Once these aspects of the program are understood, the story of the past year in the program can be told to others.

Program Theory

In taking a close look at the YES program, the evaluation team used the program theory logic model adapted from Weiss (1998) and the W.K. Kellogg Foundation (2003) in Figure 1 to guide the evaluation. Both these approaches help evaluators and program planners show not just the impact of a program but document and test which program elements have greater influences on specific impacts. This report follows the program theory logic model, with each report section addressing each element of the model.
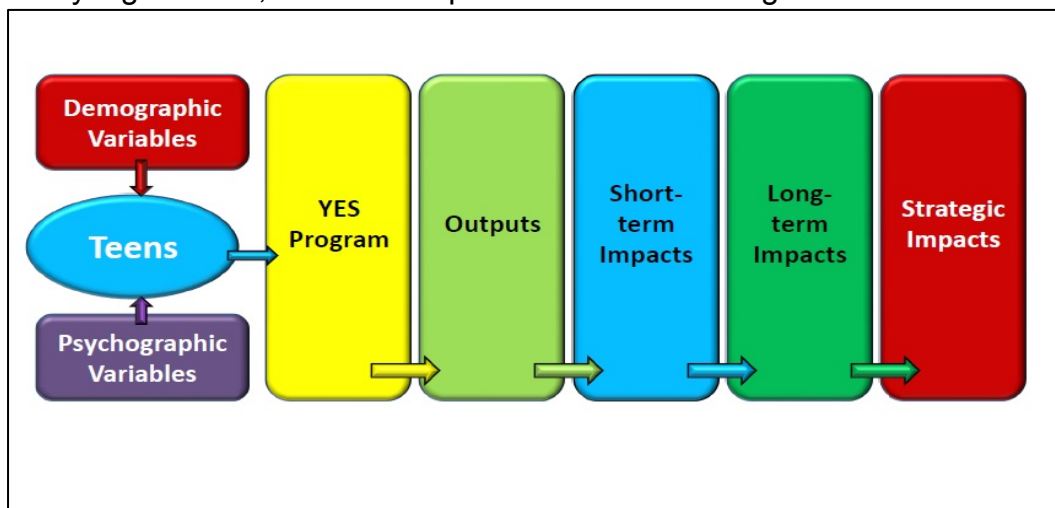
Figure 1. Program Theory Model

Elements in the program theory model need definitions because different people sometimes use different terms to mean the same thing. In this report, we are using definitions adapted from Friedman (2008, p. 28) as shown in Figure 2.

Hierarchy of Anticipated Outcomes

- Strategic Impacts— Individual, Community, Environmental, Economic — **Goals/ benefits**
- Long Term – retention and lasting changes in knowledge, attitude, and/or behaviors — **Outcomes/impacts**
- Short Term – comprehension and initial changes in knowledge, attitude, and/or behaviors
- People – number of people/visitors affected
  Programs – number of programs provided
  Products – number of products distributed — **Outputs**
- Psychographic data – motivations, interests, existing knowledge, expectations, perceptions, etc.
- Descriptive data – ages, ethnicity, gender, income, residence, distance traveled, group size, etc. — **Psychographics/ Demographics**

Figure 2. Hierarchy of Anticipated Outcomes Adapted from Friedman (2008)

Who Are the YES Teens?

The YES Story begins with the main characters – the teens. Who are they? Where do they come from? What do they bring to the program? Where do they want to go from here?

We examine two types of variables that answer these questions. The demographic data (left-most red box in Figure 1) gives us the basics – gender, grade level, ethnicity, cohort, type of school, and STEM courses taken. The psychometric data (purple box in Figure 1) tells us more about the teens' motivations and attitudes.

The Demographic Story

The data described in this report are based on the 385 teens participating the YES program over the past two years, since funding from the Office of Naval Research began. We define a participating teen as one who has attended at least two days in any

of the five semesters since the beginning of the ONR project (Spring, Summer and Fall 2011 plus Spring and Summer 2012). Throughout this report, unless stated otherwise, we use 385 as the number of teens (i.e. N = 385) in all tables and graphs. It should be noted that after an initial semester of participation, some teens may not participate for a semester or two to work another job or participate in other activities, and then return to the program at a later time. Unless a teen has officially withdrawn the YES program, staff members keep everyone as part of their database in order to communicate and maintain relationships. Relationship is a key element of the YES program. This means that there is a difference between the number of "all teens in the program" at any given time, and "participating teens" as discussed in the following section. (See Appendix C for additional details on the following figures.)

   What is the ratio of female to male YES teens? As you can see in Figure 3, there is a balance between the number of females and males.
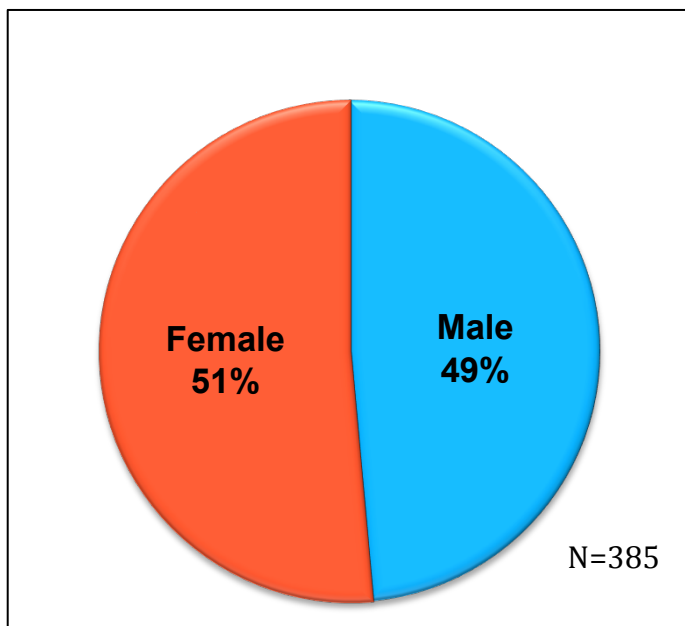
Figure 3. Gender of Participating YES Teens

   What grade levels are covered in YES? Youth can join YES as early as age fourteen, which means YES teens can be in grades 6-12. Figure 4 shows the number of teens participating by grade level over the past two years. Note that some participants are recent graduates taking part in the program the summer after they graduate from high school. Figure 4 also reflects teens who may have had another job, a family issue, or participated in school or community activities which prevented participation in a YES Learning Lab during 2010-2011 even though they returned to the program to participate in 2011-2012. For example, the higher number of seniors in 2011-12 does not reflect teens who started the program in their senior year, but teens who had participated as freshmen or sophomores and who "dropped back in" to the program their senior year. Allowing, and encouraging easy entry and exit to program participation is a strategy used by the YES program to maintain ongoing relationships with a population that may appropriately choose to take advantage of other

opportunities to reach their own goals (e.g, an internship, a retail job), or need to adapt to the circumstances of their sometimes challenging life events. By allowing easy entry and exit, the teens stay within the circle of support and relationship that the program provides even when they are not enrolled in a specific semester of Learning Labs. They can return easily to participate and take part of the program's opportunities.

Figure 4. Grade Levels of YES Teens in 2010-2011 (N = 237) and 2011-2012 (N = 352)
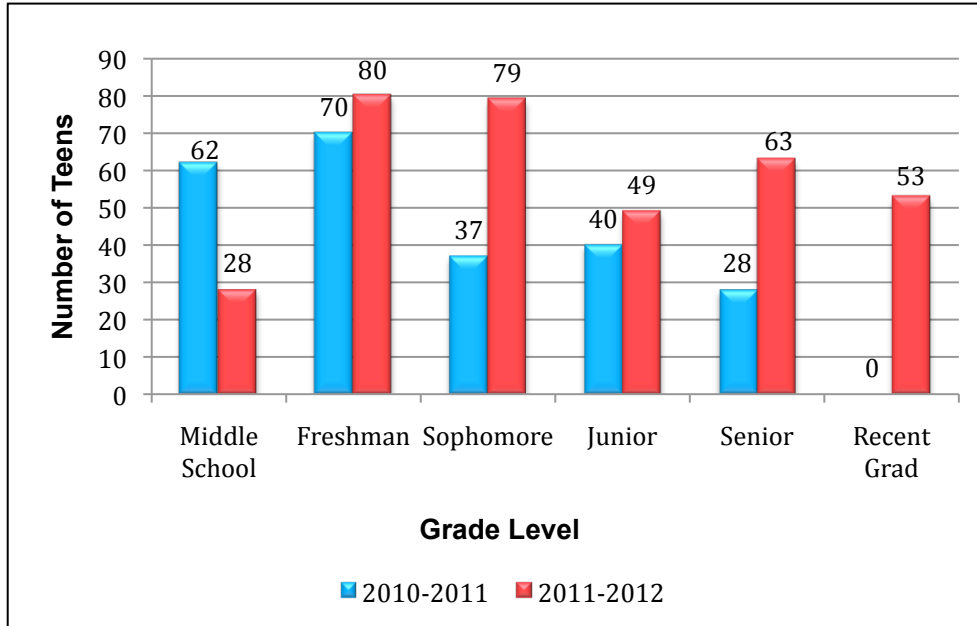
What is the ethnic mix of the YES teens? As seen in Figure 5, the vast majority is African American. As the program adds new community partners, the ethnic mix continues to increase.
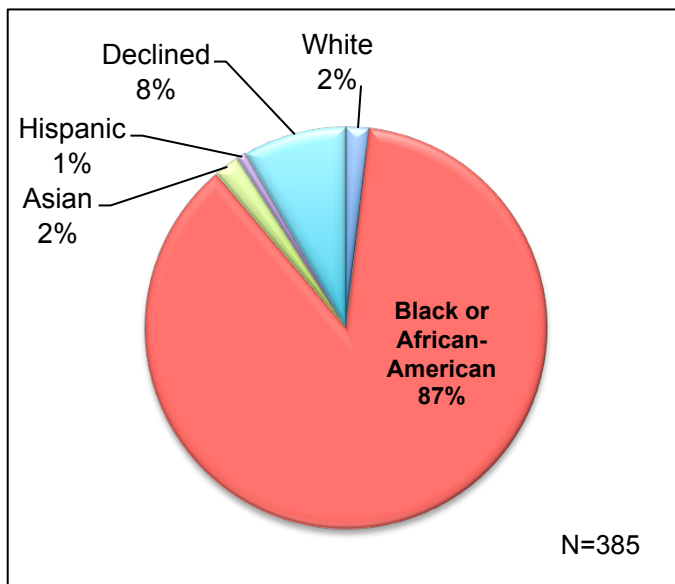
Figure 5. Ethnicity of YES teens

It should be noted that ethnicity data are collected by YES staff from the teens, some of whom decline to provide that information. Traditionally, teens self-report a variety of very specific ethnic groups if they are recent immigrants. To keep the data in Figure 5 simple and easy to read, the US Census categories are used. (See Appendix C for details.)

How many current YES teens are in each cohort? Figure 6 tells us that the group of teens entering the program in 2011 (Cohort 2011), when funding from the Office of Naval Research was received, is the largest group currently represented in YES. A few teens from the 2006 and 2007 cohorts continued with YES into 2010 and beyond, though most of their peers graduated or moved on to other activities.
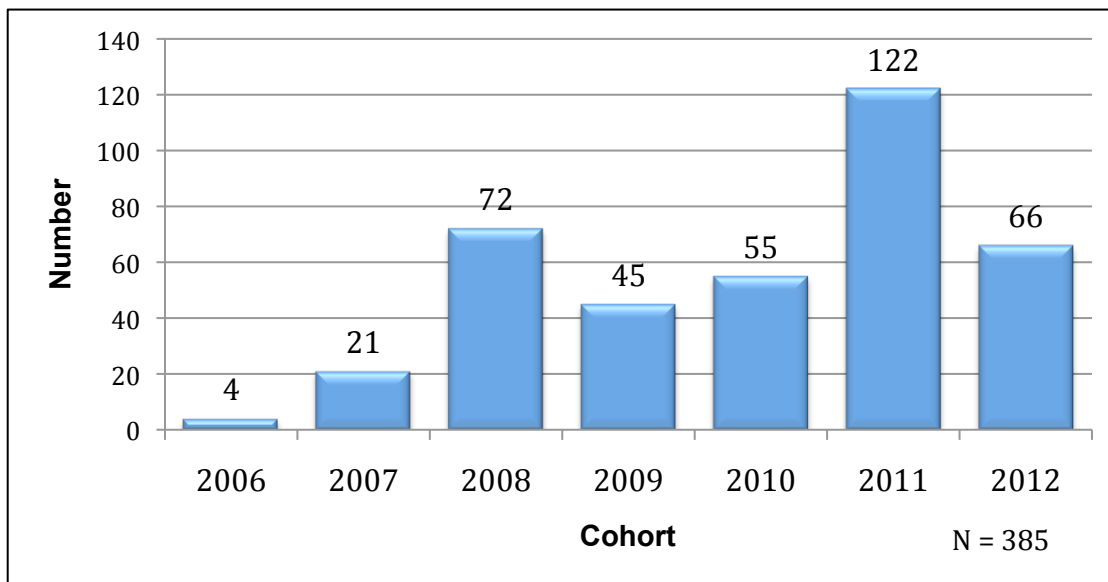
Figure 6. Number of Participating YES Teens by Cohort

What type of schools do YES teens attend? Rather than attending only public schools or only Missouri schools, Figure 7 shows the wide variety of schools attended by current YES teens – public, private, homeschool, and others. Since some of the teens change schools frequently, data here are based on the most recent high school or middle school attended. Of the 385 participants, only 364 provided information about the school they attended on their program application or on questionnaires.

While YES teens attend a wide variety of schools, the program draws substantially from several public school districts in the St. Louis area. Table 1 shows the six school districts from which over 50.0% of YES Participants are drawn. These percentages are based on the total number of participants.
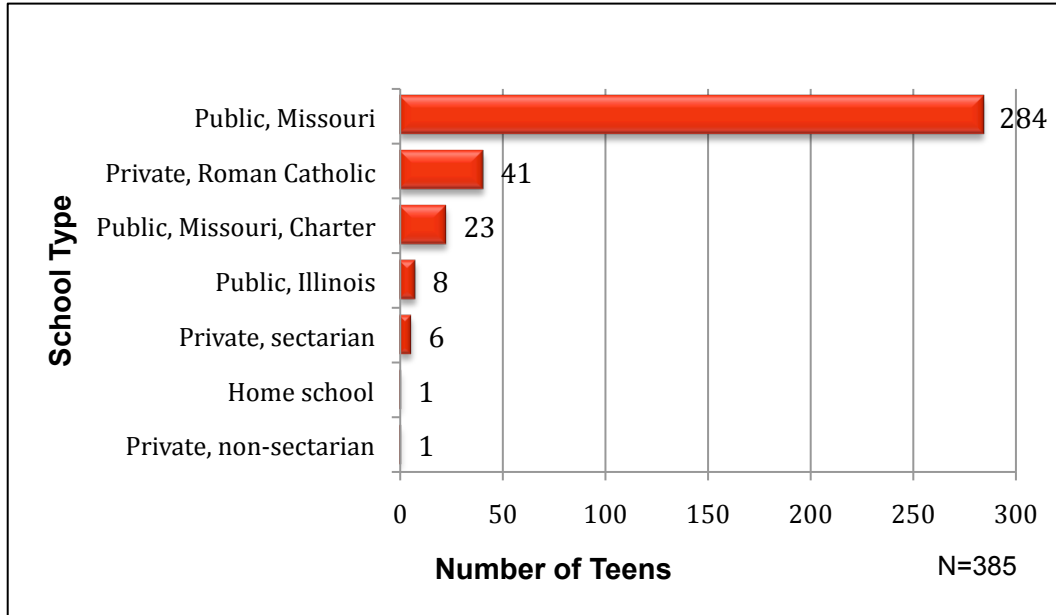
Figure 7. Percent of Participating YES Teens by School Type

Table 1. Six School Districts Totaling over 50.0% of Participating Teens (*N* = 385)

School District	Percent
St. Louis City	30.1%
Hazelwood	6.8%
Ferguson-Florissant R-II	5.5%
Normandy	3.9%
Parkway C-2	3.4%
Ritenour	3.1%

What STEM courses are YES teens taking? One aim of the YES program is to facilitate teens graduating from high school with a sufficient number of science and mathematics courses to have the choice to move into areas of the workforce and higher education where this background is required. Minority teens and teens from low-income backgrounds are sometimes guided into taking the "basic" math and science courses to meet the bare minimum requirements for graduation. Such courses include basic and practical application courses designed for students who are perceived and who perceive themselves as less capable. Others teens, who may have the capability to pursue advanced science and math courses in high school are guided to take only the typical set of math and science courses, leaving them behind some peers when and if they do enter college. While school types and systems offer curricula with differently named courses and tracks, these three options (basic, typical, and advanced) appear to be part of most school curricula.

In line with YES's conviction that teens enter the program with a blank slate, the program does not ask participants to provide copies of their transcripts or report cards. On surveys completed by teens each semester, teens were asked to provide lists of

science and math courses they were taking. These self-reported data were coded as basic, typical, or advanced courses, though some science courses (9%) were unclear from the course title provided by the teen. Eventually, the evaluation will track teen choices over time to look for patterns. Figures 8 and 9 provide a snapshot a single point in time for teens responding to the Spring 2012 survey (N=109). This snapshot along with data from previous semesters provides a baseline that will be used to assess impact and identify patterns in the Year 3 report. (See Appendix C for details.)

The YES program model seeks to move more teens out of the basic courses and into the regular high school tracks. For other students the aim is to move them from the typical high school tracks into more advanced math and sciences courses.
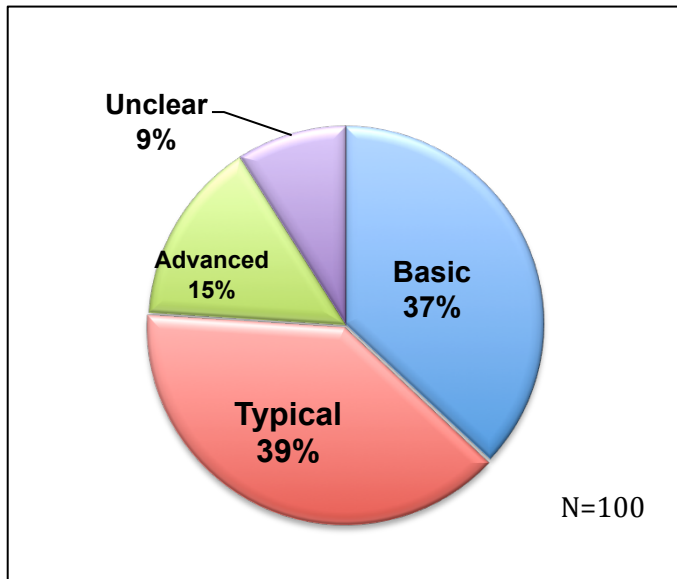
Figure 8. Types of Science courses taken by YES teens in Spring 2012
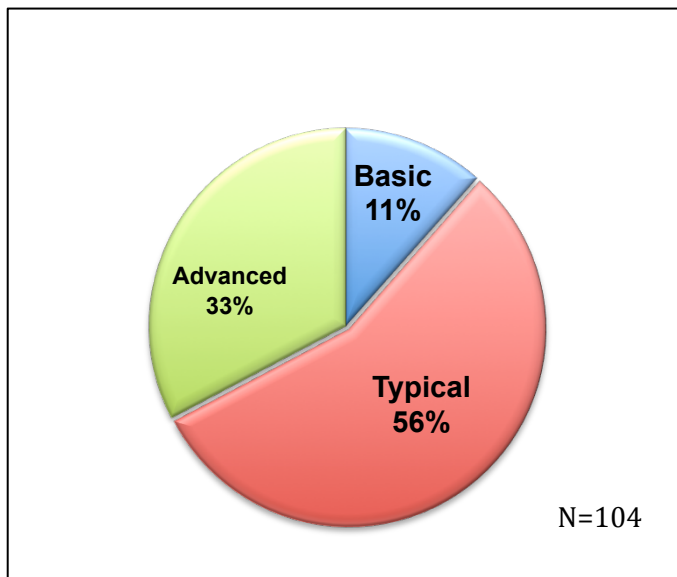
Figure 9. Types of Mathematics courses taken by YES teens in Spring 2012

The Psychometric Data

The data below provide a snapshot of the YES teens in the program. Comparisons over the three-year project in the summative evaluation report will provide answers to additional questions.

Why do teens join the YES program? As 109 New Teens entered the program in Spring 2011, they were asked why they joined the YES program. Ninety-five responded to the survey, though many indicated several reasons. These same teens will be asked why they have stayed with YES next spring. Responses from the teens in Figure 10 show that most were attracted to YES for the work experience, job, and paycheck. A much smaller percent joined because family, friends, and mentors suggested or insisted they join. Only 11% joined because they love science.
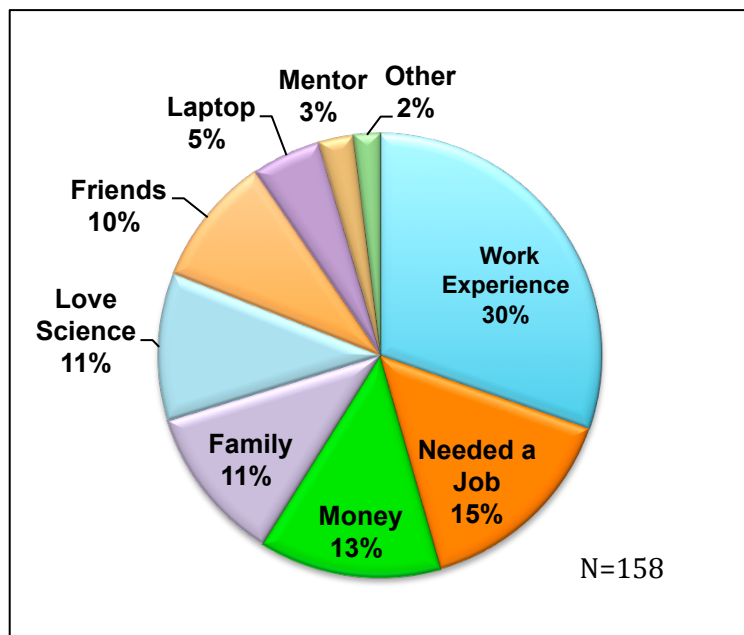
Figure 10. New Teens' reasons for joining YES

This section focused on the teens as the main characters in the YES story. However, the story must include the rest of the stakeholders – the YES educators, the management team, the support staff, the rest of the staff at the Saint Louis Science Center, the families of the YES teens, the community partners, and the funders. Even though this report does not describe these stakeholders in detail, they are essential to the story and are included the sections that follow.

What Happens in YES?

We now turn to the program description – the yellow Program section of the program model in Figure 1 on page 2. What is the YES program? What do the teens, staff, and other characters in the story do?

The YES program grows by *deliberate design*. By that, the program's founder means that each element of the program grows out of research and best practices in youth development, STEM education, and Out-of-School Time (OST) education. Elements of the program are deliberate; there is a rationale behind each feature of the program. The design process is intentional; such that each program element aims toward an intended impact. The evaluation is identifying and codifying the deliberate design.

How are YES teens recruited and hired?

As part of the program's deliberate design, YES teens are recruited through community-based organizations that serve urban youth. (See Appendix D for a list.) These organizations already serve the target population for YES – urban, low-income, underrepresented, teenagers. These organizations also provide youth and their families with many resources that the YES program cannot, such as social services, referrals to health care providers, and other resources. This recruiting strategy is embedded in the program design and is not expected to change substantially over the life of this grant. Figure 11 summarizes how YES teens participating since the beginning of ONR funding reported finding out about the YES program. Note that some of the teens represented by the blue "Pre-ONR Funding" in Figure 11 joined the program prior to the funding provided by the grant but continued to participate during the period of ONR funding. All were recruited through this community-based strategy.

Figure 11. How current YES teens reported finding out about the program

Each year each partnering organization is given a limited number of applications and spots for which they can recruit teens. They know the program and they know the

teens. Thus, they recommend teens that are a good match. Sometimes they refer teens that are interested in STEM. Perhaps more frequently, according to on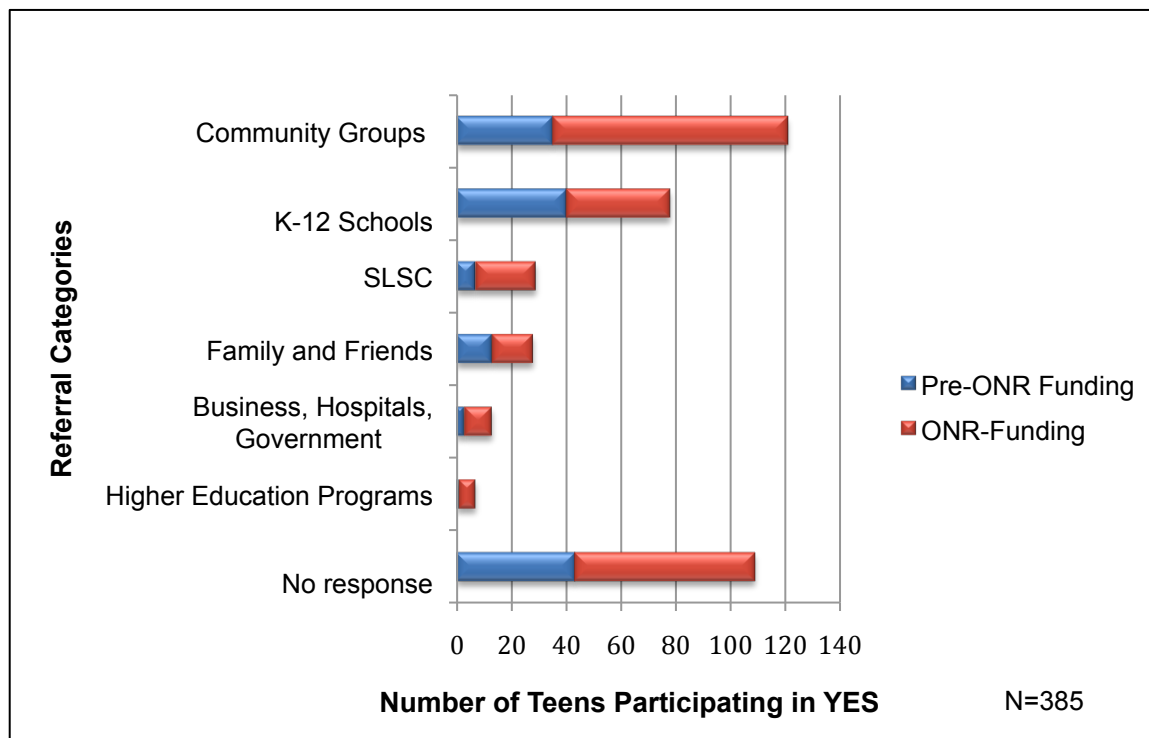e manager, community partners refer teens that they believe will most benefit from what they perceive are the program's strengths. Of the 276 participating teens with known recruitment data, 121 (43.8%) teens come from community partnering organizations. When asked on the program application or contact forms, some teens did not know or did not remember what group recruited them for the program; 109 teens did not provide this information on their application.

When the YES teens and staff wanted to create a more diverse group of YES teens and expand the number of teens in the program, they turned to the International Studies Program for the St. Louis Public Schools (SLPS) district, a program that serves recent immigrants among other youth. Like the original community organizations, the SLPS program provides resources to both families and teens – English language support, translators, and social services, among others. In effect, this program is a community-based program operated by the St. Louis Public Schools. Of the 276 participating teens with known recruitment data, 18 teens come from the SLPS program. An additional 6 teens, reported learning about the YES program from a community organization formed by new immigrant groups (e.g. The Korean Academy of St. Louis, Bosnian Community Cultural Center) which the SLPS program also serves.

In addition to the above sources, some teens have learned of the program through other school connections, businesses, university-based programs, family and friends, staff at the Science Center, and through other organizations. These teens apply to become a YES teen and fill the remaining openings. Of the 276 participating teens with known recruitment data, 131 (47.5%) have come from these other sources.

Each year there is a waiting list. Knowing that some teens will come the first week or two (often under pressure from family or friends) and then stop coming, the YES staff accept more in the program than will stay long-term. Even though these teens' names remain in the database, only teens who attended at least twice in any of one of the five semesters since ONR funding began are included in the data and analyses throughout this report.

What happens on a typical Saturday during the school year?

Saturdays were busy days at the Taylor Community Science Resource Center (TCSRC) during the past school year. With the larger number of YES teens, the returning teens were divided into morning and afternoon groups. In Fall 2011, 170 returning teens met in component and college prep groups with an average daily attendance of 124. In Spring 2012, 175 returning teens (average daily attendance of 97) were joined by 61 new teens (average daily attendance of 41) that met separately to develop a basic understanding of STEM and the YES program.

At 8:30, the morning group of teens moved into their component groups to work on STEM activities. At 11:30, all returning teens (morning and afternoon component groups) met with staff by grade level to focus on college prep and skill building activities after a mid-morning break. At 1:00, the morning teens ate lunch in the lobby or left for the day, while the afternoon teens worked in their component groups.

On seven Saturdays in the spring, new teens arrived at 10:00 to gather, after the returning teens had moved into their classrooms. At 10:15 this group of teens met in the Jolly meeting room for large group team building activities, journaling, skill building, and STEM activities. From 10:00 to 2:00 each day, with a 30 minute lunch break, these new teens developed an awareness and understanding of the YES program, strengthened 21st century skills, and began to build an appreciation for STEM through large group and small group activities.

Following the *deliberate design* strategy of YES, timing of all activities was carefully chosen to minimize the number of teens moving around the TCSRC at one time. Because providing food to teens is critical to the success of most youth programs, breaks for snacks and light meals (breakfast and lunch) were carefully planned such that the last teens to arrive had the same opportunities to eat as the first to arrive.

What happens in a typical component during the school year?

The following story comes from one morning component group on a cool, sunny Saturday in October 2011. George[1], with a social work background, and Doug, with a background in engineering, lead the teens through a series of activities.

School Year Component Experience Vignette

The YES teens slowly arrive in their red YES t-shirts and gather in the lobby of the TCSRC. Most struggle to look professional, though others prefer to dress and act more casual. Many take advantage of the cereal, milk, and fruit the staff laid out for them in the kitchen. At 8:30, nine members of the astronomy group sign an attendance sheet as they enter their classroom. They grab their journals from a milk crate and take a seat at a table. George and Doug greet them individually as they enter. George reviews the Word of the Day – apogee, and then discusses the Fact of the Day regarding Newton and the reflector telescope. A brainteaser follows with "H, I, J, K, L, M, N, O" written on the board.

Once everyone catches on, "H to O, oh I get it!", the group covers a few announcements and begins writing in their journals as George turns on the CD player. "For your journaling pleasure, we have a continuation of the Soulard Blues Band."

After they've written about experiences in their lives, their personal reflections, for about 10 minutes, George leads them through a review of previous activities on the angle of the sun. Today they will view sunspots he tells them. Once George has shown them the homemade tool they will use, the teens visit the supply table where Doug and George have laid out cardboard, foil, and tape. They work easily in pairs, chatting and teasing each other in a manner that demonstrates comfort.

By 9:00, with tools in hand, the group heads to the parking lot. The wind and chill in the air catch some off guard, and they don't hesitate to point it out. They quickly draw

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[1] Pseudonyms are used for all characters even though most of the YES staff will recognize themselves and each other. Since other members of the learning community may read this report, and since we promised the Institutional Review Board (IRB), anonymity is maintained.

the sun's reflection on white paper and clipboards with the guidance of George and Doug, and then return to their classroom. George explains that they are prototyping activities they will use later with Science Center visitors, and they will collect data over time.

They shift quickly to another activity. Doug begins with a discussion about rockets – what are they, how do they work, what is inertia? He explains to the teens that this discussion is an assessment to learn what the teens know. He follows the discussion with a short article teens are asked to read from the netbook computers on each table. In their discussion, it is clear that most read the article. Equally clear are a few misconceptions held by the teens. One teen asks if people really went to the moon, and another says, "I think we need to do it again [go to the moon] so I can go and then I'd know [if they really went]."

Soon Doug reintroduces the Word of the Day as he and George tell the teens they will design, build, and launch their own rockets, and will measure the apogee. By 9:30, pairs of teens are creating rockets from colored paper, PVC tubes, and masking tape. George demonstrates how to make a nose out of the paper, but the teens design the rest of their rockets on their own. As they work, George and Doug move around the room asking questions about the science involved ("What is the point of sealing the top of the rocket?") and inquiring about their designs ("Why did you decide to use four fins?").

Once the rockets are ready to test, the teens walk across a busy intersection to Science Corner, a large lot owned by the science center and used by YES. In pairs, one teen holds their rocket while the other stomps on a two-liter plastic bottle to send their rocket soaring. George walks among the pairs asking about design features and suggesting they test other ideas. As teens compete to see which rocket will go highest and furthest, they try different ideas such as the angle of the launch.

Upon return to their classroom, George asks what design features worked and what didn't work, making lists on the board. After discussing many ideas, George tells the teens that this activity will engage multiple ages, thus bringing them back to the idea of testing these activities for use with visitors later.

Keeping the teens moving, Doug and George have the teens shift gears to focus on review of science articles with half of the group reading an article on a pee-recycling system used by NASA and half reading another regarding iPhones and the space shuttle. Each group reads and discusses their article, and then summarizes the article for the rest of the teens. George challenges their thinking and asks questions to generate conversation around details in the articles.

At the request of one science center executive, components use the Khan Academy online to support teens in developing math skills. George has the teens individually log into the site on the netbooks provided. The attention of most of the teens appears to wander as they look around the room and at cell phones and occasionally talk with each other. They appear bored with this "school-like" activity, though George and Doug offer individual encouragement. Soon George has the group exit Khan Academy and begin to blog about the rocket activity and the articles they read.

After a 15-minute break, the teens go to their college prep groups and sign in. The freshman/sophomore groups are meeting together in the Jolly meeting room to play College Jeopardy. Projected on the screen are the categories Colleges, College Sports, $ for College, Fun Trivia, and Where Am I? A surprising number of teams know (or guess) the oldest college in the US, though one team suggests it is Harris-Stowe. Five teams know that Mizzou (the University of Missouri) "invented" homecoming.

Once the game ends, the morning group of teens leaves as the afternoon group goes to their component groups. It's been a busy day for the teens, and a long one for the staff.

What happens during a typical day in the summer?

YES teens worked in several different locations during the summer of 2012, yielding several different stories. Three stories are told here: one for the new teens working with community groups at the TCSRC (the Summertime Science component), one for the teens in the main SLSC building working with community groups and visitors (the Astronomy component), and a third story for the teens developing exhibit prototypes first at Compton-Drew and then in the exhibit galleries (Exhibit Lab component).

Summertime Science

Summertime Science Vignette

By 8:45 on this June Wednesday, teens fill the lobby of the TCSRC as they wait to clock in at an electronic time clock. By 9:00, everyone is moving to their classroom to sign in and put on their official black YES aprons. Today is a big day, the first day that children from community organizations will participate in activities led by the YES teens.

In one classroom, Cheryl has 12 teens set up their activities. Each of three groups of teens has prepared an activity to share with the younger children, and the teens run through their plans before the children arrive. They begin their "rehearsal" with an introduction by a teen that hasn't had the opportunity to give one yet. They discuss how they will separate the children into three groups to rotate through three different activities.

When Cheryl has to leave the room, the teens continue without her, preparing for the activities. The leaders for a
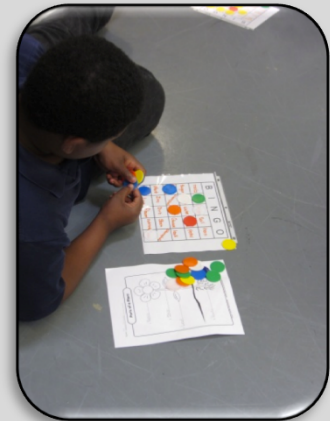
bingo activity focusing on plants have the other teens line up and move into the hall just as they plan to do with the children. Back in the classroom, they quickly review the balloon and journal-creation activities as it approaches 10:00.

Soon the building is filled with children, including middle school students from nearby Compton-Drew and two day camps with elementary school aged children. Twenty-one of the middle school students join Cheryl's teens who divide them into three groups after explaining the rotations.
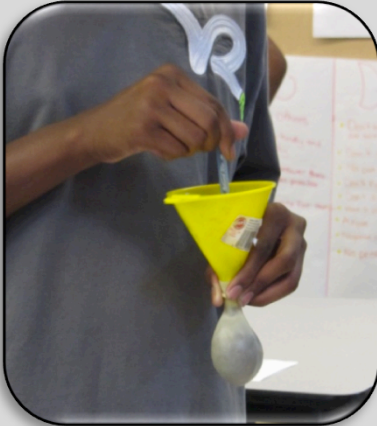
One group of seven students gathers around three tables to create balloon terrariums by filling balloons with soil, water, and seeds. The students struggle with blowing up the balloons and tying them off, but the YES teens offer help as needed. At another group of tables, seven more students work with YES teens to create a booklet about plants. In the hallway, the remaining seven students play a game of plant bingo using terms from botany.

After moving this group of middle school students through three rotations, the community groups move to a new room and Cheryl's teens repeat their three activities with another community group. Once the children leave, the YES teens take a much needed lunch break.

After lunch, Cheryl facilitates a debriefing of the morning's activities. Much like George did during the school year story above, Cheryl leads the teens in a discussion of what worked and what didn't work before they begin to prepare for tomorrow's groups of children. Since this was their first day working with children, the teens are full of ideas for improvements to the activities and their introduction.

After they wrap up their discussion and take a short break, the teens write in their journals, saving their "Word of the Day" and "Quote of the Day" for tomorrow when they plan to have a little more time. Cheryl offers a writing prompt for their journaling, "Where would you like to go if you could go anywhere in the world and why

After putting their journals away, the teens clean the room and set it up for the next day, when they will repeat their three activities with two new groups of children.

It should be noted with journaling that part-time summer staff, and occasionally full-time staff, have their teens journal at the end of the session and use writing prompts. However, the deliberate design builds on experience indicating that when teens journal at the beginning of the session without prompts, teens give more insights into who they are, how they see themselves in the world, and what they need from the program. The following vignette provides an example of journaling as the group gathers.

Astronomy

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Astronomy Summer Component Vignette

Inside the new Boeing Hall of the main SLSC building, 19 YES teens gather. Promptly at 9:00, George has them start writing in their journals for 10 minutes. Music is playing over the drilling from construction workers putting the finishing touches on the new exhibit hall. The teens are fortunate to have the otherwise empty hall for their summer activities, even though the large space is occasionally shared with the Exhibit Lab teens and with children in the SLSC's summer camp.

With journals remaining out, George turns off the music and spells out brainteasers for the teens to add to their journals. (They have adapted to the space and the lack of white boards.) They write "MEREPEAT" and "COTAXME", and George asks them what the words say. The teens discuss possible meanings at their tables, while three summer interns look on. George walks among the tables, encouraging a few teens that seem to have given up quickly. He finally gives them the first answer (repeat after me), and then several say they have the second (income tax). After additional brainteasers, now that they understand the concept, they stop and return their journals to the milk crate that serves as their storage.

Unlike the teens in Summertime Science who work with a different community group each day, the astronomy group sees the same children from the same community centers throughout the summer. Today the teens prepare for thirty of these younger children, which they will divide into three rotations. Teens are divided into four groups, one to lead each rotation with the younger children and one to go into the Planetarium to lead activities with visitors.

At 10:00, the teens wrap up preparations for the morning groups as George enters the large hall saying "show time!" The children from the one community organization follow him in. Half sit with YES teens at tables for "What is Life" activities, and half sit on the floor with their YES teen leaders for a "Lunar Lander" activity from NASA curriculum. A third group of YES teens wait for their group of children to arrive by van from their community center so they can lead the Life Science Lab rotation, and a fourth group of YES teens heads outside to Forest Park for outdoor inquiry activities with one of the interns.

After the community groups leave and the teens finish a lunch break, the teens leading the three morning rotations debrief and plan for the next day's activities. At the same time, about 12:15 PM, the fourth group of five teens goes to the Planetarium with an intern to lead activities with visitors. One teen helps a SLSC volunteer facilitate Mission Control activities. Another uses an iPad with a Mars rover simulation/game app to engage visitors in the Planetarium lobby and encourage them to see the actual rover tucked back beside the shop.

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The three remaining teens take over space in the hallway between Mission Control and the Planetarium lobby with demonstrations they developed themselves. One stands along the east wall with two suitcases, one as it would weigh on earth and the other demonstrating its weight on the moon. The other two teens demonstrate earth/moon/sun relationships.

"I'm the moon," says Delaney holding up a tennis ball as a family starts down the hallway. "I'm the earth," shouts Kelly. Without missing a beat, Delaney says, "We need a sun!" as she holds up a yellow balloon and looks right at the family. The little boy holds the balloon as the two YES teens demonstrate eclipses. Once finished, Delaney says, "Enjoy your visit!" As the family leaves, the mother says to the little boy, "You were the sun!" He replies, "Yes!" She then says, "You are our son."

At 12:45, the teen from Mission Control and the

teen from the rover meet in the lobby to help visitors make paper airplanes and rockets. With supplies on a cart, the teens start to get organized as a large group from a YMCA summer camp walk up and ask to make paper airplanes. Darian and two YMCA counselors help the group of 10 elementary school aged children make the planes. Within a few minutes the children are flying planes across the lobby before the counselors can get them to write their names on the planes and move to a safe flying space.

Exhibit Lab

New in Summer 2012 was the Exhibit Lab component, which was designed to bring exhibit developers, production staff, and evaluators from the SLSC together with teens to design and prototype exhibits. The teens were divided into four groups, each led by three to four interns, many of whom were former YES teens. Teens began working in four classrooms at Compton-Drew Middle School, next door to the science center main building. Once the school had to focus on preparing the building for the school year, the Exhibit Lab teens moved in to the large exhibit hall to share space with the Astronomy component. The following story picks up as the teens actually begin to test their prototypes in the Human Adventure Gallery, and follows one group of teens led by Cheryl, Raymond, and Jim.

Exhibit Lab Component Vignette

After a morning of last minute preparations, at 1:10 PM on this typically crowded science center summer Tuesday, Andrea tells the group of YES teens to get ready to move their prototypes onto the gallery floor. Soon the four small groups move their carts into the gallery and prepare for visitors, consisting primarily of families with children and a few summer camp groups.

As visitors walk into the Human Adventure gallery, they are greeted by three teens standing in front of their prototype of a car simulator. They greet visitors and ask if they would like to try their demonstration.

One teen has a father hit his fist on the cart in a specific, yet complex pattern, and then explains the brain's response to multitasking. She concludes by pointing to the dangers of texting while driving.

A basketball exhibit prototype attracts a brother and sister who want to try for a basket.

At a music exhibit prototype, parents and children listen to music with headphones then discuss their experience with the YES teens as they explain the relationship between music, emotions, and the brain.

At a puzzle exhibit prototype, visitors walk up to try their hand at several puzzles.

Throughout the prototyping process, the teens ask for visitor feedback using surveys they created with the help of the science center's evaluation staff. Andrea, Raymond and Jim walk from exhibit to exhibit to offer support, but play a minimal role and let the teens take the lead.

Each of these vignettes shows staff members engaging teens through strategies and tactics that are part of the deliberate design of the YES program. These range from scaffolding the engineering design process in the construction of rockets, using journaling to start the day, providing familiar frameworks such a "Word of the Day", and supporting clear understanding of activities and inquiry through one-on-one

conversions. These types of behaviors require staff members who understand the YES program design and have developed the skills and expertise to facilitate teen experiences in the Learning Labs. The program's quality, as well as consistency over time, depends on a group of staff members who recognize the rationale and can implement the program. For this reason, professional development appears to be an essential element.

How are staff members supported through professional development?

Professional development (PD) takes many forms in the YES program. At times, staff members refer to meetings and individual reading of articles as PD; however, for the YES story in this report, only facilitated learning opportunities are described. Thus, PD in YES includes:

- Workshops led by outside experts, whether onsite or offsite
- Workshops led by managers or the project PI
- Workshops led by senior educators
- Discussion groups led by staff, often after viewing a video or reading an article
- Attendance at meetings and conferences of professional organizations

One goal for PD of staff, according to the project PI, is to create a community of learners, a community that learns from emerging research and new resources and then applies the lessons learned. The complex nature of the YES program requires constant learning, much like any field of science. The community of learners feature of the YES *deliberate design* allows staff to become part of the discussion, and the solution, surrounding the national issues of STEM learning, OST learning, youth development, and diversifying STEM-related careers.

Part-time Staffs' PD

Professional development differs between full-time year-round educators and part-time summer interns. Full-time educators interact with YES teens, community partners, and family members on an in-depth, sustained basis that allows staff multiple opportunities to apply lessons from the community of learners. Part-time staffs focus on the summer work of the teens as teens engage children from community organizations on a short-term basis.

Due to the time restraints in summer sessions, PD for interns takes a backseat to orientation and curriculum planning needed prior to the teens' first day. In 2012, the director's position responsible for PD was eliminated during budget cuts. Thus, the remaining managers, PI, and some senior educators led the summer's PD, when there was PD.

One notable exception was PD with Eric Jolly, President of the Science Museum of Minnesota, early in the summer. One summer intern from the University of Missouri – Columbia who plans to join Teach For America (TFA) after college graduation said his PD inspired her to go even further.

On a weekly basis after the teens began in Summer 2012, Fridays were set aside for staff PD. Interns expected PD to be times when they could learn how to handle difficult situations with the teens. However, after the first few weeks, Fridays became a time for preparation individually or in small groups rather than whole group PD, in part due to requests by staff. For example, interns in Summertime Science wanted Fridays for curriculum development and materials preparation. On the other hand, some interns in a focus group reported frustration with this lack of PD. They believed PD was unavailable unless they requested a meeting to discuss important issues. One intern said teens' use of cell phones became an issue. Eventually, this was discussed in a whole group meeting where she heard strategies that others used. After this, using the ideas from her colleagues, she resolved the problem with her group of teens.

> "Mr. Jolly, that was the best PD experience ever because that showed diversity…. Like he was amazing. And he was, like everything he was saying it just made me realize like how much further I wanted to go beyond just those two years of TFA. How much further I wanted to give back to not just my community but people that are like having it worse than my community. Like it was just awesome. And he was such an inspiration." – Summer Intern 2012, Focus Group 8/2/12.

From a different perspective, some interns viewed their entire summer as PD rather than a job. For these part-time staff members, the experience of working with YES teens was PD whether they learned on their own or with support from others.

Full-Time Educators' PD

During the school year, scheduled time for PD of staff varies. One manager suggested that staff PD address the educators' concerns and apply the YES program philosophy to make the deliberate design more explicit. After one senior educator attended NPASS (National Partnerships for After School Science) training, he scheduled regular workshops for the other senior educators. The following vignette gives a picture of one of his workshops in April.

> "When it comes to the actual PD, we should address real life situations and apply the philosophy to them. … I think we [should] actually take the staff's concerns and say, okay, according to your concerns this is our philosophy and this is how we would actually handle these situations." Manager, Interview 9/5/12

Professional Development Vignette

   As the educators enter the wet lab at the Taylor Community Science Resource Center, they see a table with a variety of supplies – yardsticks, masking tape, empty gallon jugs, washers, paper, and dowel rods. On the whiteboard is written "Trebuchets". The educators spread out and take seats at tables. The facilitator, Charles, moves a few to form three groups at three tables.
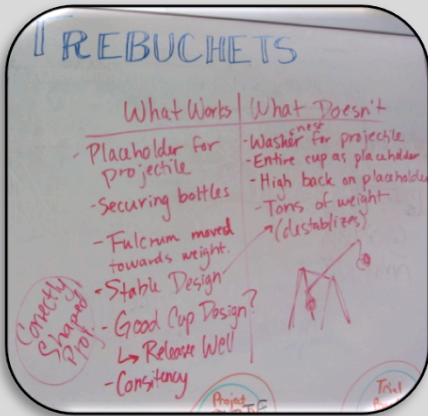
   Charles asks the educators to focus on themselves as learners. He then begins the activity as he would with any group of learners, discussing terms and writing them on the board. He has one educator draw a trebuchet as they explore the difference between a trebuchet and a catapult.

   Soon the challenge is presented – design a trebuchet using the materials provided. One educator accuses Charles of stifling creativity by limiting what can be thrown from the trebuchets, after some talk of flaming paper. Without following that tangent, Charles suggests each group assign a supply person and an ambassador (to check out the work at the other tables). Each table begins a cycle of testing, debriefing, redesigning, and retesting as Charles turns on music.

   Throughout the initial phase, Charles walks around from table to table working with each group. As trials begin, paper balls fly across the room. After 15 minutes, Charles leads a discussion on what works and what doesn't, taking notes on the board. New terms are added to board and are reviewed so everyone is on the same page.

   After a chance to redesign and test models, Charles sets out baskets labeled with different point values. "Take 10 to 15 minutes for target practice." Soon, the trebuchets are pointed toward the baskets and paper balls are soaring. Once the competition begins, each team keeps their own score punctuated with loud shouts as they make a basket.

   Toward the end of the second hour of the workshop, Charles calls the competition to a close and leads another debriefing on what works and doesn't work. The staff then put away supplies and clean up.

Throughout the workshop described in the vignette, managers came in and out for brief periods of time, occasionally to participate though most often to talk to an educator about a particular teen or situation. This appeared to indicate that managers perceived this PD as intended for senior educators with the managers not playing a role in this part of the community of learners.

YES staff members have experienced PD from experts and peers in a variety of settings and formats. In a focus group with senior educators, it became clear that they perceive the most helpful and beneficial PD as that which can be applied and used immediately, like the NPASS model shared by Charles. Other characteristics of helpful PD, according to senior educators, include PD that is intentionally constructed, occurs over time to reinforce learning and allow for "absorption", and includes follow-through by facilitators, managers, or educational leaders. One-shot short workshops or activities, particularly those lacking careful planning, leave educators wondering what to do with the information. Helpful PD includes three perspectives: how it feels as learner, facilitator, and trainer. The senior educators in the focus group indicated that they would like more PD opportunities to continue to improve their practice and to incorporate best practices and research.

How are community partners involved in the YES program?

Partnering community groups participate in YES in one or more ways: recruitment and support of YES teens, participation by their organization's children in activities led by YES teens (such as in Summertime Science), attendance at SLSC events such as Minority Scientist Showcase, and attendance at monthly PD for community partners. The recruitment of teens and participation by children in teen-led activities are critical to the YES program, offering support for teens and providing the program with children eager to learn what the teens have to share. Attendance at SLSC events adds additional opportunities for the science center to support the community as the partner organizations bring staff and youth to explore and learn.

It is the story of the monthly PD for community partners that is told here. Throughout the school year, directors and other leaders of community organizations attend monthly workshops that allow for exploration of science education in out-of-school time and networking with peers. Supporting the community partners with PD and networking opportunities over lunch is a key part of the YES *deliberate design*.

Community Partner Monthly Meeting Vignette

On a Wednesday in May, 21 community partners gather in the Jolly room at the Taylor Community Science Resource Center at 11:00 AM. Seated at six tables, the partners and YES staff members chat and begin their networking. Soon, the senior educator facilitating this month's workshop gets their attention and has them close their eyes with pencil in hand. By listening to his instructions, each participant draws a detailed island scene complete with palm tree, boat, fish, and more. After exchanging papers, he leads them through a scoring rubric and has them tally their scores.

After that icebreaker, and without debriefing, the group moves into announcements. Each partner has an opportunity to share information about upcoming events and opportunities. "Upward Bound is accepting applications for its summer program for students grades 8-11." There is a women's luncheon on May 19. YES staff members also make announcements. YES teens in the Biofuels component are presenting their projects this Saturday and all are welcome to attend. Slots for Summertime Science are filling up fast, so book a spot soon.

By 11:30, the group shifts attention to the Pinball Machine activity. With a similar design to the Trebuchet workshop above, participants design, test, debrief, redesign, and retest a pinball machine made from a large pegboard, straws, masking tape, and balls. As the music plays, the groups work on their designs and the facilitating senior educator moves from group to group to ask design questions and keep groups on track. When asked to repeat the goals, he tells them it needs to be fun, and it needs to do what you want it to do.

Different designs abound. Following the first debriefing, new materials are introduced, dowel rods and rubber bands. By 12:30 PM, the music is stopped for the last time. Representatives from tables describe what worked and what didn't. They are encouraged to show off their designs, though none do. After putting away extra supplies, participants are asked to walk around to see the designs of the other tables on their way to lunch. Copies of the instructions for the activity are made available.

A buffet lunch of fried chicken, salad, juice, and cake awaits the participants in the lobby. With plates full, the partners sit to enjoy the meal and network until they must return to work.

These monthly PD events for community partners build a network of relationships in the community, which allows the benefits from the YES program to ripple out to a variety of additional audiences. In addition, all these relationships provide a support network for YES teens, some of whom face challenging issues which community partners may be better equipped to handle than the YES program itself.

What recent changes may have affected YES programming?

In telling the YES program's story, it is important to include major events that may have affected programming. Most notably, over the past two years, the SLSC has seen three presidents and major budget cuts. The long-tenured president that oversaw the initial negotiations with the ONR left early in the project's first year to be replaced by an interim president. The interim president's influence on the YES program included the addition of the use of Khan Academy for math skills and the review of scientific articles by teens. During his tenure, restructuring and budget cuts began. After a year with the interim, a new president came on board early in the second year of this project, and additional budget cuts followed. Restructuring of YES led to the elimination of two components. Staff reductions included one YES director and six educators. The impact of this is discussed in the Differing Points-of-View and the Areas of Importance sections beginning on page 30 below.

What Are the Program's Outputs?

The Outputs of the program (the light green area in Figure 1 on page 2) are the direct results of the program activities. For this report, we include data on the YES teens and components. Program staff members keep additional data on staff professional development, community partner meetings, and special events and programs in which staff and teens participate, such as SciFest, a community science event hosted at the SLSC, and the Brain Bee, a competition similar to a spelling bee sponsored by a professional group of researchers.

Table 2 provides a list of components and the number of participating teens per component. (Participating teens are defined as those who attended more than one day in that semester.)

Table 2. Components Offer by Semester with Teen Participants

	Spring 2011	Summer 2011	Fall 2011	Spring 2012	Summer 2012
School Year Component Groups					
New Teens	105	-	-	61	-
Agriscience	-	21	34	35	24
Astronomy	-	-	28	34	23
Biofuels & Energy	-	-	22	35	28
C3 (Climate Change)	14	-	-	-	-
Design IT	18	-	-	-	-
Health	10	-	-	-	-
Learning Places	21	-	-	-	-
Neuroscience	-	-	24	3	-
Plant Biochemistry	-	-	25	-	-
Robotics	18	-	38	41	22
SciJourn	8	13	6	8	11
Science Corner	25	-	-	-	-
Sea Perch	18	-	-	-	-
Mystery of Matter	-	9	-	-	8
Summer Component Groups					
Summertime Science	-	96	-	-	60
Exhibit Lab	-	-	-	-	71
Main Building	-	67	-	-	-
Offsite	-	60	-	-	5
Science on the Go	-	10	-	-	-
Total	237	278	170	209	251

Neuroscience was added in Fall 2011, then no longer offered in Spring 2012 after one educator position was eliminated with budget cuts and the other educator resigned to attend medical school. Three teens attended the first few weekends before the reorganization and then never returned or joined another component. A new senior educator was hired to offer the component in Fall 2012. Plant Biochemistry was added in Fall 2011, then no longer offered in Spring 2012 due to staff layoffs. SciJourn was a NSF-funded program through the University of Missouri-St. Louis that served as a separate component in the school year and supported all components in the summer. Mystery of Matter was a NSF-funded program through AAAS that supported the other components during the 2011-2012 academic year, though was a separate component in previous sessions.

YES Teen Attendance

Table 3 provides an overview of YES attendance since the evaluation began in Fall 2011. Row 1 shows the number of Learning Lab opportunities (number of days sessions were held in each semester). Row 2 shows the total number of participating teens in each of these semesters, and row three shows the percentage of attendance for each semester.

Table 3. Learning Lab Opportunities in and Percent Attendance from Spring 2010 through Summer 2012

Semester	Spring 2011	Summer 2011	Fall 2011	Spring 2012	Summer 2012
Days	15	36	11	14	32
Participating Teens	237	278	170	209	251
Percent Attendance	67.9%	82.4%	71.1%	52.6%	83.4%

Attendance in most semesters is affected by teens participating in sports, school and community-based extracurricular activities, and family emergencies. Typical semester averages range around 70.0% during the school year and 85.0% during the summer.

The lower level of attendance in Spring 2012 may have been due to layoffs of staff. Teens form relationships with individual staff members, and some had strong feelings when their component leader lost her/his job. When two components were cancelled only two teens immediately left the program; however, lower levels of attendance throughout the semester and conversations with teens indicate that budget cuts with associated staff layoffs disrupted the staff-teen relationships which underlie regular program attendance.

What Are the Program's Impacts?

When talking about the impacts of the YES program, it's important to think about all three types of impacts as shown in Figure 1: Short-term, Long-term, and Strategic. Each of these is addressed below. Even though measuring Long-term Impacts and Strategic Impacts are beyond the scope of this short-term evaluation, they are discussed in terms of possible measures and additional research.

In September 2012, the evaluation team met with staff to generate a list of impact statements by category and audience. We are still honing this list to align it with the goals and outcomes identified in the *YES Program Education Plan 2012* developed by YES staff and to clearly identify measurable impacts. Each impact (short-term, long-term and strategic) will be discussed further in the final evaluation report next year. Those impacts for which data and analysis are currently available are presented below.

What are the short-term impacts?

Over the past two years of the project, surveys of teens and data collected by staff give an indication of the impact of the program on teens' college and career choices.

What are the plans of YES teens after high school graduation? As Figure 12 shows, over half of the seniors in the graduating class of 2012 plan to attend a 4-year college. Only 3% ("other") have yet to graduate high school. YES staff members were unable to reach 12% ("unknown") of the graduating seniors in the summer of 2012.
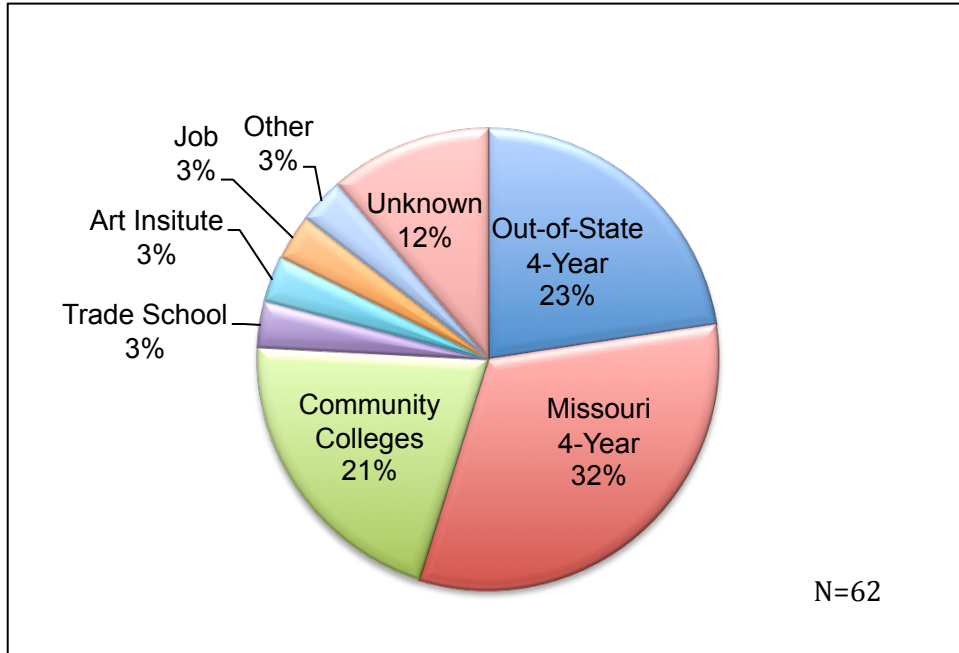
Figure 12. Post-High School Plans of Seniors in May 2012

Comparable data from 2011 was collected by the program director who was laid off in Spring 2012, and data are no longer available. Survey data from a sample of the graduating class of 2011 in Summer 2011 indicate: 94% of respondents to the question from the class of 2011 applied to a trade school, college or university (though 2 had not heard back yet); 3% (1 teen) joined the US Navy; and, 3% joined the Job Corps.

What careers interest YES teens? Each year we survey teens to determine their career interests. Figure 13 summarizes the responses from Spring 2011 (N=182) and Fall 2011 (N=118) surveys into STEM related and non-related careers. Those teens listing at least one career in a STEM related field were coded as "STEM" and those listing other careers that were not STEM related were coded as "non-STEM". (See Appendix C for details.)
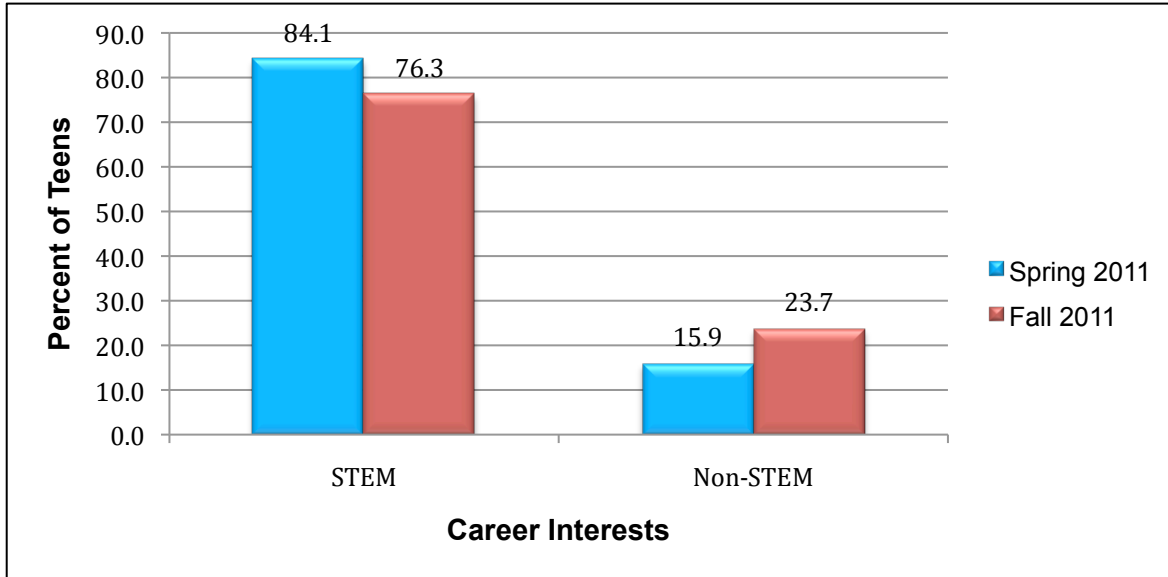
Figure 13. YES Teen Career Interests by STEM and Non-STEM Related Choices in Spring and Fall 2011

Figures 14 and 15 divide the results into grade levels. In the spring, the number of responses were greater (N=182) versus the fall (N=118), though the actual number of teens who were interested in non-STEM careers was larger in the fall. The most frequent non-STEM career interests were education, journalism, law, and performing arts. (See Appendix C for additional details.)
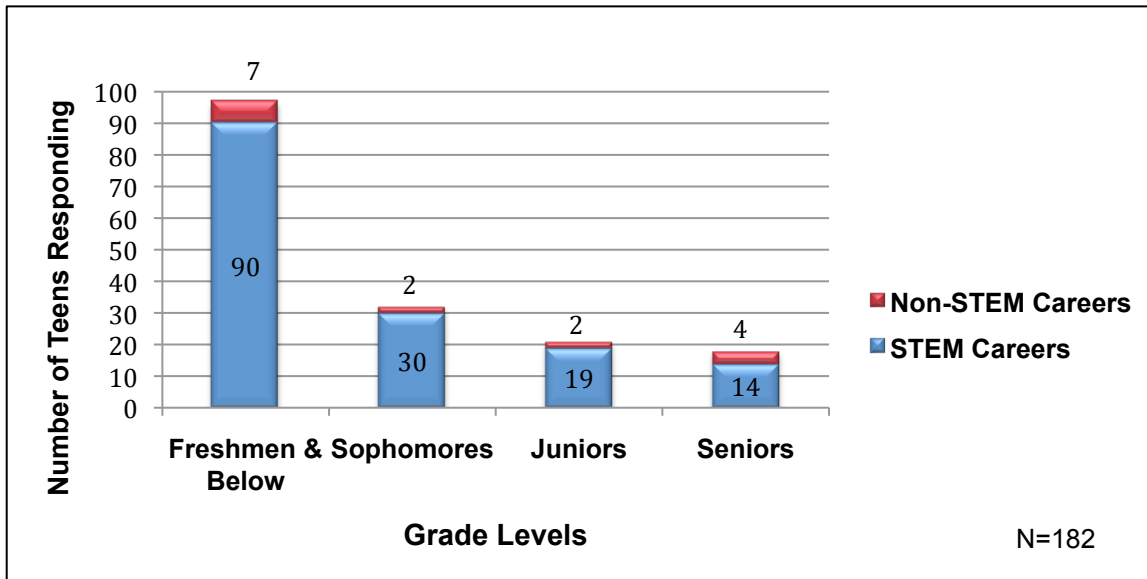
Figure 14. YES Teen Career Interests in STEM and Non-STEM related Careers by Grade Level in Spring 2011
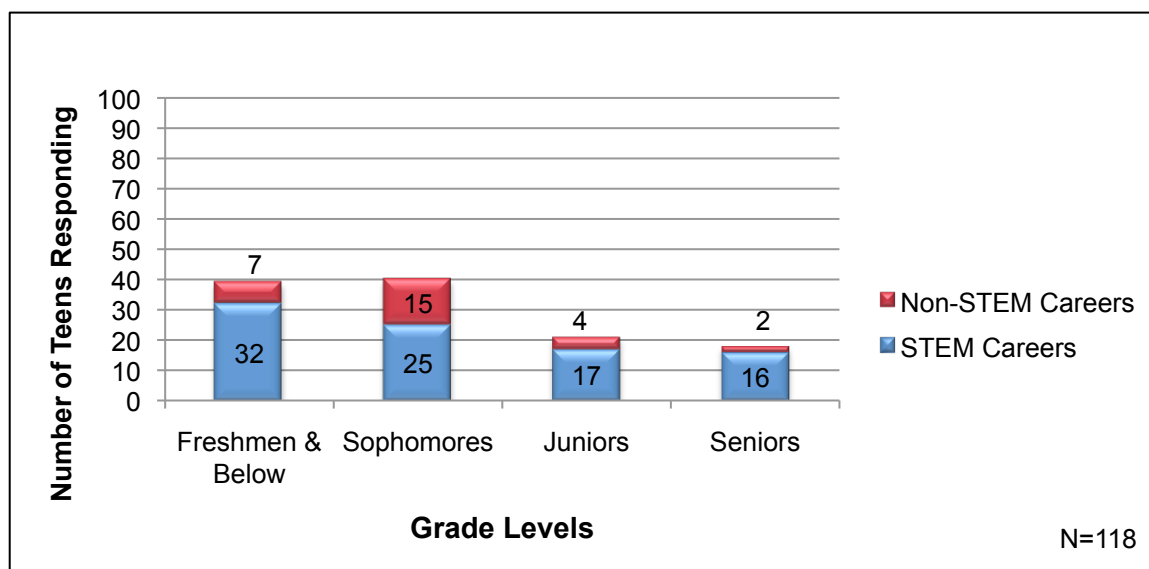
Figure 15. YES Teen Career Interests in STEM and Non-STEM related Careers by Grade Level in Fall 2011

Do teens' attitudes toward science and scientists change? To answer this question we searched for an appropriate, existing instrument and found the Test of Science-Related Attitudes (TOSRA) (Fraser 1981) and a shorter version (TOSRA2) (Ledbetter & Nix 2002). (See details in Appendix B.) In March 2012, 133 teens completed the 35-item pre-test. In July 2012, 195 completed a 35-item post-test. Analysis of the 89 matched pairs (i.e. tests from teens that took both the pre and the post tests) resulted in results which led us to question whether the TOSRA2 instrument actually worked as intended for this population of urban youth in an economic downturn. On some of the survey scales, there were apparent increases, with higher increases for female participants. Yet on other scales, scores were lower the second time teens took the survey. Focus group data does not support the finding that teens' attitudes toward science were actually lower after attending the program. Evaluators noted that many constructs in the survey assessed attitudes by asking respondents whether or not government funds should be spent on specific science-based efforts. Additional analyses are needed to look at specific items to determine if the measure is valid for the YES population (e.g. was the wording of some questions confusing to Midwest, urban youth during an economic downturn?) or if perhaps the time between measures was simply too short to yield conclusive results.

Do teens develop an understanding of and appreciation for scientific inquiry? To measure this toward the end of the project, the evaluation team will conduct focus group interviews and individual interactive interviews with a sample of YES teens. The focus groups will explore an overall understanding and appreciation on the part of the teens. In the individual interviews, teens will conduct simple inquiries to demonstrate the degree to which they understand the inquiry process of science.

What are the long-term impacts?

YES staff members are working with the evaluation team to locate former YES teens, using social media, social networks, and numerous phone calls. YES alumni/alumnae include all teens who participated in YES at any point prior to graduating or leaving high school, not just those who completed four years of the program. Once a large enough pool of these former YES teen have been found, we will collect survey data from the population to determine high school graduation, college attendance, and college graduation rates by cohort over time. Through the survey, additional data will give a picture of career choices.

This alumni survey is only one way to determine long-term impacts. The external evaluator will work with YES leaders to develop a research agenda to explore long-term impacts in much more depth. For example, what elements of the program have the greatest impact? What styles of component facilitation lead to what impacts? How does the amount of participation as indicated by attendance impact teen outcomes? The current evaluation is putting into place the data collection tools that will allow such research to occur in the future.

What are the strategic impacts?

The YES leaders plan to bring together a group of ten museum partners, with presidents and directors to meet in St. Louis this winter. The goal is to share the YES program model with these museums to take back to the youth programs at their institutions. This strategic impact will be supported by the development of a multimedia tool.

The tool is underdevelopment, building on the findings of the evaluation. Through stories, photos, videos, and text, partners in the ten museums will be able to learn about the YES program strategy, deliberate design, and process so that they can adapt these elements to their local community environments.

Measuring strategic impact is beyond the scope of this evaluation since museum partners will not begin using the tool until after the data collection phase of the evaluation ends. Once funding for further dissemination is obtained, evaluation and measures of strategic impact will be included.

What Are the Different Points-of-view that Stakeholders Have About the Program?

One task of an evaluation team is to collect a wide range of observations, ideas, and opinions from different groups of people associated with a program, note the differences, and help these groups understand each others' points-of-view (Guba & Lincoln 1989). If these varying perspectives are not identified and clarified, then decision-making can be difficult. Sometimes, groups with less power or official authority, such as parents, teens, or staff members, go unheard, leaving them out of important discussions about their own benefit and wellbeing.

We use the term *stakeholders* for the groups of people associated with the program, groups with something to gain from the program or something at risk. The term for areas where people hold different views is an *issue*. An issue is not necessarily a problem, but it can become a problem if not clarified. For example, if one important stakeholding group, staff members, value lively, active, and loud participation while institutional administrators value quiet and obedient behavior, and if the reasons underlying these points-of-view are not clearly understood, then institutional support for the program may erode or key teaching/learning strategies may be abandoned depending on which group "wins." Reasonable people can disagree about issues, and generally there are good, but contrasting, reasons underlying their beliefs.

Stakeholding groups for YES include the program funder, administrators (current and past) at the SLSC, YES program managers, YES educators, community partners, and YES teens. Points-of-view were collected through in-depth interviews, focus groups, and meeting observations. (See Appendix E for details on the naturalistic evaluation methodology and process, and Appendix B for data sources.)

In this section of the report, we identify and discuss three key issues among the stakeholding groups. These issues need clarification in this particular program at this particular time to strengthen the program; yet these issues are not, in the experience of the evaluation team, atypical among youth programs. Identifying and clarifying them provides a firm foundation for understanding youth programs in other contexts as the dissemination of the YES program model goes forward.

Three overarching issues have emerged as most salient as focus shifts toward dissemination of a national model: 1) staff roles and responsibilities, 2) STEM in out-of-school time, and 3) relationships between the YES program and other SLSC areas.

In discussing each issue below, the interrelations and interdependence of these three become more visible. No one issue is more critical or important than another.

Staff Roles and Responsibilities

Five general staff positions exist in the current YES organizational structure: the vice president (also the project PI), managers, senior educators, interns (summer part-time staff), and support staff. Differences in perspectives arise between educators and the management team regarding roles and responsibilities. All staff members have unique skills, talents, and perspectives. It is the different views of *groups* of staff we address here.

Changes in staffing frame this issue. One support staff position, executive administrative assistant, existed in past years, though when the person filling that role passed away the position was eliminated and tasks were disbursed, until an administrative assistant position was shared between YES and another department. During the recent series of budget cuts at the SLSC, the shared administrative assistant position, several YES educators, a director, and other positions were eliminated and not replaced.

Overall there are fewer administrators and administrative assistants in the YES program now, yet all the management functions still exist (curriculum development, staff

professional development and support, data management, grants management, and administrative roles within the larger SLSC organization). Many administrative responsibilities have been distributed, primarily among the senior educators, but some of these responsibilities appear not to have been specifically assigned to any one

"For me it was quite positive because immediately I see a difference. I see a more serious staff, a staff that is really wanting to do it. Professionalism has really risen quite a lot." Manager, Interview 9/5/12

staff member or group of staff members. In interviews and focus groups, evaluators found that administrators in the YES program saw the staff layoffs as primarily positive actions, providing the opportunity to keep the more highly skilled senior educators and remove those employees with less positive work ethics. In contrast, senior educators saw the layoffs as increasing their workload, responsibilities, and leaving important work for the wellbeing of the program undone. In response, some senior educators perceive managers are not filling their assigned roles, and in other instances administrators and managers perceive senior educators not following through on directions to accomplish work. The roles of managers in developing curriculum. providing professional development, and supervising teaching and learning activities along with the roles of senior educators in strategic planning and grants management need clarification and further conversation.

One example where clarification is needed is the professional development (PD) of staff. In the first year of the project, the director was clearly responsible for PD of part-time and full-time staff. After that position was eliminated, responsibility was dispersed and different points-of-view became evident. Differences come from varying staff needs. Summer interns approach their work with one of two agendas – to learn about engaging youth in STEM learning activities or to earn a salary for the summer. Some, but not all, have both agendas with one taking priority. These staff members have different expectations for PD in terms of content, frequency, and structure than the senior educators or administrative team. Senior educators want to continue to improve in their roles as facilitators, mentors, and curriculum developers. They want to improve their existing skills and develop new skills to support career advancement. The administrative team sees the need for PD of all staff, including themselves, as critical to the success of the program and the dissemination of the program, yet they rely on the senior educators to take the initiative since the administrators place other program activities as a higher priority. At the institutional level, priority for PD remains unclear.

Differences in perspectives are to be expected among staff members at different "levels" within any organization, and the YES program is no exception. Educators focus on day-to-day interactions with the teens and with program implementation. Managers focus on program logistics and community relationships. Support staff members focus on materials management, purchasing, and logistics. The vice president focuses on budget and overall program direction within the department and the SLSC as a whole. Sharing perspectives and ideas to clarify roles and responsibilities will help with the YES program model dissemination. To support this clarification, the evaluation team will collect additional information through staff

interviews and present the various views for discussion among the educators and managers.

STEM in Out-of-School Time

Science, technology, engineering and mathematics (STEM) learning and teaching are different in school settings and in non-school settings and programs. Differences result, in part, based on contrasting ideas about how science should be taught and learned. These contrasting ideas appear to be tied to the various backgrounds and STEM experiences that stakeholders bring to the table to the table.

All stakeholders agree that encouraging and preparing youth to be successful in STEM academic courses, to have the choice to pursue STEM careers, and to be scientifically literate are important for the youth and for the society of which they are a part. Yet, mirroring the debate in the Informal Science Education field as a whole, evaluators identified that YES program stakeholders hold one of two perspectives about how these long-term goals can be accomplished.

One perspective comes from those who believe it is important for teens to acquire specific declarative knowledge in various STEM disciplines. They see the lower academic performance of teens with risk factors in their lives as a lack of specific knowledge in various disciplinary areas. For example, they believe that the YES program should provide specific instruction in concepts such as mass and gravity, and students should be able to reproduce these ideas in consistent standardized ways. According to this group, if this gap were filled, then teens will be successful in school and life. Having teens develop math skills through the Khan Academy is one example. Generally, people with this belief tend to have academic degrees and little or no experience in youth out-of-school time (OST) programming. They also tend to be people who did not themselves come from situations with risk factors in their lives. In interviews and focus groups we found this perspective among institutional administrators (current and past), some senior educators with STEM discipline degrees, and funders.

A contrasting example comes from people who believe that engaging with STEM topics through inquiry-based approaches is better suited and more effective in preparing teens with risk factors in their lives to find ways to overcome the obstacles in school and in life. They see most obstacles as external to the teens, necessitating the development of skills and techniques more so than discrete knowledge. In the YES program, we found this perspective among program managers, senior educators with youth development expertise, and community partners. These individuals see the role of programs such as YES as helping teens overcome the obstacles that prevent them from succeeding.

"I've learned that I can trust myself … because I've always [thought] I wasn't good enough … and hands-on work has really helped me. … It inspired me to pursue my [STEM] career… Just learning about all this new material at once and knowing that there's a lot more down the road, and I couldn't pass up the opportunity to figure that out." YES Female Sophomore, Focus Group 7/17/12

Bringing the national debate and differing perspectives of stakeholders to

the table for discussion will support the youth program and model dissemination. To add to the discussion, the evaluation team will conduct interactive interviews with a sample of teens in Fall 2012 to explore teens' understanding of the inquiry process, a consistent goal across all YES components.

YES Program Relationships with Other Areas of the SLSC

Though the YES program is part of the Saint Louis Science Center, a physical separation appears to have contributed to a psychological separation over the past 15 years. This year efforts have been made to reduce this separation, although different perceptions persist about the nature of specific efforts and their effectiveness.

As budgets were cut and the new president arrived, opportunities for the YES staff to work with staff in the "main building" grew. The president met with YES staff at the Taylor Community Science Resource Center to open new dialog. A new summer component emerged, Exhibit Lab, which brought exhibit development, production, and evaluation staff together with YES educators to support teens in creating exhibit prototypes.

Even as doors for collaboration opened, differences between the culture in some areas of the SLSC and the YES culture created tension. This became apparent as some security and visitor services staff expressed negative attitudes toward YES teens, as observed directly in the galleries by the evaluation team and in comments made about interactions between main building staff and teens. YES program staff members were highly aware of these negative perceptions and prepared teens for main building visits or interactions. Security and visitor services staff with seemingly negative ideas about the teens had not been part of ongoing conversations about the YES program or youth programming in general, and had not participated in the YES culture. Instead, their attitudes toward the YES teens appeared to be based on previous experiences with a few YES teens or perhaps with groups of teenagers of color in general, most likely negative ones, or based on what they had heard about YES teens from other staff.

Observations of teens during their components and of staff in meetings found assumptions and negative attitudes toward main building staff, most likely based on prior negative experiences with main building staff or on what they had heard about the staff from others. Bringing the two groups together appears to be a goal of administrators. To do so will require effort by both groups, as staff members from each building examine their own and each other's perspective and assumptions, and as they participate in each other's cultures.

To help facilitate conversations, the evaluation team will interview staff members from the main building and the TCSRC, draw examples from data, summarize situations in a manner that maintains confidentiality, and present the situations to staffs for discussion.

Emerging from the relationship of the YES program to the SLSC as a whole is the question of the future of the program. The budget cuts continue as this report is finalized. As staff members take on additional tasks and resources remain limited, YES staff begin to ask whether the YES program will continue beyond the ONR funding,

whether there will ever be opportunities for career advancement at the SLSC, and how all the uncertainty will affect them personally. At the same time, administrators appear to focus on how to keep the program going, how to best manage the Community STEM Outreach project, and how to disseminate the YES program model nationally. These different perspectives are typical in situations like this.

To address each group's concerns and goals, both groups must understand the other's needs. For example, if the administration wants to continue the program's success, staff's needs for advancement must be understood and addressed. If YES staff members want to continue to develop their careers in STEM education in OST, they must understand the budgeting and grants management processes.

What Areas Are Important to Stakeholders and to Program Success?

The issues presented above are areas of differing perceptions. There is no good or bad, right or wrong, to an issue, merely different perceptions among stakeholders that need to be acknowledged by project leaders. At the same time, there are areas of importance to stakeholders that need to be addressed to move the YES program from "good to great", a goal of the PI. These *concerns* arise from areas in which the program and the research no longer match or from unfavorable assertions made by one or more stakeholders. Addressing these concerns will lead to a stronger program.

Facilitating Learning

Stakeholders are generally very positive when describing the learning – the learning of teens in the YES program, of the children they teach from different schools and community groups, and of the staff from the community groups who attend the monthly inquiry workshops. Concerns arise regarding the extent to which debriefing and reflection occur on the part of teens, staff, and managers. All too often observations note movement from one activity to another without taking time to debrief or make the learning explicit and transparent. For example, an observation from this summer noted a group of teens leading an activity on living versus nonliving with children from a community center, only to have the children go through the steps in the activity and shift abruptly to another activity without time even to raise questions or explore the materials. By contrast, an outdoor inquiry led by one intern with five teens from the same component demonstrated the value of reflection as the intern guided teen discussion of a wide range of observations and "Aha!" moments.

Whether it is teens working with children or senior educators with teens, closer adherence to the *deliberate design* and the literature on reflection as a means of learning should result in more activities ending with discussions of learning concepts and reviews of what did and did not work in designs and inquiries (as seen in the stories above).

On a different level, whether staff PD is facilitated by members of the YES community or external experts, reflections of what did or did not work or particular

concepts should be accompanied more often by discussions of the facilitation process using a train-the-trainer process. This will allow staff the opportunity to learn how to apply the PD to their practice as they train teens to facilitate learning activities with children. Additionally, project leaders need the time and additional PD to develop the skills needed to provide ongoing support of reflective practice.

This concern is one of degree. Observations of successful debriefing and reflection occur, setting the bar high for the rest of the learning facilitation. The evaluator believes more consistent reflection built into the program would increase the professional expertise of senior educators, increase the level of learning of YES Teens, and provide a strong model for dissemination.

Curriculum Planning

Curriculum planning requires specific skills. The concern regarding curriculum emerges from research literature on the development and implementation of complex curriculum. In informal science education, we talk about programs rather than curriculum. "An educational *program,* as opposed to a collection of activities, should be a non-random, cumulative sequence of learning experiences focused on specific outcomes. And almost by definition it should be synergistic, that is, the whole should be more than the sum of its parts," writes Steve Van Matre in *Earth Education: A New Beginning* (1990). Unfortunately, some staff members focus on curriculum as the collection of activities and lessons, rather than curriculum for a long-term program or component.

Summer 2012 interns reported that they were handed binders of activities with little to no training at the beginning of the summer. For this group, particularly the Summertime Science staff, the curriculum was the binder full of individual activities rather than a program for teens. Additionally, teens were expected to develop "curriculum" following the pattern of pulling activities from the binders or other sources. Common usage among many YES

The supervisor "started us off, but just kind of threw us the binder. But then we were left by ourselves to figure it out. And this was all of our first year in Summertime Science, so we didn't know what to do. So we basically leaned on one another to get through it." Summer Intern, Focus Group 8/2/12

program staff is to refer to specific activities (what might be called a lesson in formal education) as "curriculum." This indicates there may be a lack of focus and understanding of the importance of the overall scope and sequence of learning activities toward specific goals, an idea defined as *curriculum* by many educational professionals.

When working with visitors in the galleries, the short interactions call for short activities or carefully crafted exhibits rather than an extensive program. In observations, it was clear from demonstrations created by the Astronomy teens for Planetarium visitors and by some of the exhibits prototyped by the Exhibit Lab teens this summer that YES teens are capable of developing well-planned activities and exhibits. However, some summer interns indicated that some floor and Summertime Science activities were provided by program managers and supervisors about 48 hours before teens were

expected to deliver them and these activities had little to do with the topic or goals of their specific component. This does not support the learning to teach and teaching to learn principle of the YES program. In summary, the concern is with planning and implementing a coherent curriculum for teens where each activity supports the other in the appropriate sequence. In other words, an activity may be good in itself, but not support the overall goals of a specific component.   The concern lies not in the types of activities and learning opportunities for visitors and community groups, but rather in the planning and implementation of a coherent curriculum for the teens.

When considering the activities within a deliberately designed curriculum or program, Ann Brown (Brown & Campione, 1996) coined the term *lethal mutations* to describe activities taken out of context and changed from the original curriculum to the extent that learning did not occur as intended. One example of this is the modification of cooperative games created by the New Games Foundation to support teambuilding and problem solving skills. Changes by staff resulted in competitive games with no learning goals, that at times ran counter to the goals for youth development. The use of teen-led activities for the public and inquiry activities for teens that were disconnected from component or program goals appear to be further examples of lethal mutations.

While some of the curriculum and some of the activities used in the YES program are outstanding, others lose track of the *deliberate* aspect of the deliberate design process for the program.

Staffing

Staff members remaining in the department after the layoffs took on additional tasks when asked and even when not asked. Based on Learning Lab and staff meeting observations, the skill levels and commitment of these staff members appeared high. Yet, can this staff continue to perform well when they are over-extended? This is the concern raised.

Staff members at all levels are taking on more and more tasks, and this could eventually lead to a less effective program. It was clear from interviews, focus groups, and observations that many of the staff members cut from the budget were not effective and were not significantly missed. However, senior educators are now asked to keep track of and support larger numbers of teens, to remain focused on applying the core philosophy of the YES program, to facilitate learning at schools and other organizations in the evenings, and to perform many tasks once performed by managers, directors, and other staff. Managers are taking on roles that were once assigned to support staff, like purchasing and tracking supplies and equipment, in addition to expectations that they supervise and mentor staff, maintain program budgets, and manage grants. As

staff members are stretched thin, there is a growing concern that the goal of moving "from good to great" is slipping away.

On a positive note, the attitude of most staff toward supporting each other and doing whatever it takes to get the work done remains high.

Youth Participation

Meeting the needs of youth in the program requires compromise. To keep youth in the program attending as often as possible sometimes means allowing youth to take off for extended periods of time to participate in sports, focus on schoolwork, take care of family needs, etc. This freedom by youth to choose their level of participation can create challenges.

Once in the program, teens enrolled are considered YES teens until they graduate and become alumni/alumnae. Program records often include teens listed as absent who have good reasons to be elsewhere (e.g. a semester off for summer school) and teens who have essentially decided to drop out of YES to pursue other employment. Keeping youth in the program is critical for program success. Sometimes staff contact teens assigned to their component to find out why the teen is absent, but when this is not consistently done teens with problems or issues that could be address by the program or program partners slip through the cracks. Maintaining regular contact with teens when absent will further the youth development goals of the program.

Data Management

Data management is one core aspect of the program that has remained a challenge for the over-extended staff. Administrators and the evaluation team require accurate data to guide their work and to provide information to the funder. In the original proposal to the ONR, a data management staff position was created for this reason. However, the task of data management of current and former YES teens has passed from staff member to staff member over time.

To address this concern, a part-time staff member has been assigned to locate former YES teens and improve the alumni/alumnae database. Database management for information on current teens has been assigned to one senior educator. The evaluation team will continue to work with staff to create a better data tracking and maintenance system.

Summary

To summarize the areas of concern, we can say that when the staff and teens adhere to the principle of deliberate design, and when they are informed by current research and best practices, the program improves. However, when deliberate design is lacking or ignored, the program (and the youth) suffers. By bringing the concerns to the attention of the project leaders as the project enters its third year, leaders have the opportunity to strengthen the program model and its dissemination.

What Recommendations Will Support Program Improvement?

To better understand the differing points-of-view and each area of concern described above, we offer the following recommendations for the program. Project leaders may have even better ideas.

- Develop opportunities for staff from the main building to experience and get to know the YES culture and for YES staff to experience and get to know the main building cultures. Recent suggestions from conversations include:
    - Invite managers from the main building to lunch and a tour, treating them much like a community partner and perhaps using strategies used with community partners.
    - Have older individual or groups of teens personally invite a staff member for a day of "job shadowing" with an invitation, agenda, and follow-up communication (which would also promote development of 21st Century and networking skills among teens).
- Devote time in a series of staff meetings for senior educators to share ways they have built debriefing and reflection into their work with the teens; establish a process to videotape examples during the school year; and share these examples with summer interns prior to their work with teens.
- Similarly, have teens in components brainstorm ways to help children debrief activities and reflect on their learning, establish a process to videotape examples with teens and children; and share the examples with new teens, new staff, and teens from other components.
- Devote some PD for senior educators and managers on curriculum and program planning by bringing in outside experts or reading and discussing books or articles.
- As the multimedia tool is developed, use the deliberate design aspects identified as points of discussion among staff at all levels.
- Involve all YES administrators in all PD to create a productive dialog among the PI, managers, senior educators, and part-time staff and to strengthen the community of learners.
- Revisit as an entire department the roles and responsibilities of department staff, perhaps by using the process from the Learning Places project as the collaborative players in that project shifted (e.g. having each person or position write on poster paper the strengths they bring to the group and their understanding of their responsibilities, and then having the others read and edit the lists as a group).
- Establish a priority to have component leaders call teens each Tuesday if they missed on Saturday without prior warning – to create a sense of caring by staff and to create a workplace environment sense of responsibility and accountability.
- Revisit the rationale and workplace skills developed around teen absenteeism.
- Set aside time to discuss (as a group) the forthcoming data on PD perspectives collected by the evaluation team, and use that to create a cohesive plan for staff PD to meet the needs of all staff and the institution.

- Review data collected by the evaluation team from forthcoming interactive interviews with teens to frame a discussion on the national debate regarding the nature of science education in out-of-school time.

What Are the Plans for the Future of the Program?

Funding issues continuously raise questions about the future of the YES program beyond the current ONR-funded project that ends September 2013. In this section, we describe the plans for the third year in terms of evaluation, dissemination, and research.

Plans for year 3 evaluation

As the project draws to a close, the evaluation team will focus on impacts. The descriptions of the program and the identification of stakeholder issues and areas of concern are complete. Those identified issues and concerns will be clarified in year 3 and presented to the stakeholders.

Data collection will continue for possible use by future research and evaluation projects. However, only data collected through Summer 2013 will be analyzed for inclusion in the final summative evaluation report to allow sufficient time for analysis.

The evaluation team will use the data and analysis to frame the dissemination tool and to support the research agenda planning. The evaluation team will also put systems in place where possible to support ongoing data collection for that future research.

Plans for year 3 dissemination

The external evaluator, Christine Klein of Klein Consulting, has teamed up with Carey Tisdal of Tisdal Consulting to create a multimedia tool designed to share the YES program model with other museums and science centers across the nation. Carey brings expertise in developing projects focused on the development of guidelines and materials to support nation-wide dissemination efforts along with experience in the development and testing of technology-based learning products. Her evaluation experience provides a sound foundation for translating evaluation findings into these efforts.

The tool will build on the findings of the evaluation to share stories, philosophy, and underlying rationale for the deliberate design of YES through video, audio, photos, written narratives, documents, and links to resources. Staff from YES and partnering museums will help guide the development of the tool. Funding of the Community STEM Outreach project does not include full scale testing or distribution of the tool; however, it does include the tool's initial development. The evaluation team will develop recommendations for the evaluation, full-scale production, and dissemination of the tool.

Research Agenda Planning

With the multimedia tool for dissemination and the group of partnering museums, the YES program will be ready for a large research project to study the long-term impacts of YES in St. Louis and the impacts of the dissemination to other sites nationally. As the evaluation team develops the tool and interacts with the museum partners, the team will develop research questions. From these questions, the team will outline a research plan, which if funded will provide answers.

Summary

This report attempts to answer the question "What is the YES story?" through graphics and narrative. To summarize the story told in this second annual evaluation report, we can say the following: the YES program has engaged 385 teens during the two-year project in a wide range of activities that involve science investigations, teaching science to others, and exploring college and career options. Over the two years the program has changed due to budget cuts at the SLSC, changes in administration at the SLSC, and a smaller yet perhaps more dedicated group of educators and managers.

A typical YES teen, based on the data presented, would be African American, attend a public high school in Missouri in 9th or 10th grade, and take the typical progression of science and math courses. This teen could be either female or male. Having been recruited through a community organization that serves children with multiple risk factors, the teen would most likely have joined the program to take advantage of the work experience the program provides. This teen would be wearing a red YES shirt and would struggle with the idea of looking professional.

To say there is a typical day in the YES program would not acknowledge the flexibility of the program and the constant changes. There are, however, typical activities. Teens arrive at the Taylor Community Science Resource Center, grab something to eat, sign in or clock in, join the other teens in their component's room, check the agenda posted, check out the Word of the Day and Quote of the Day, write in a personal journal, engage in STEM-based activities, participate in teambuilding activities, conduct investigations, take a break for food, join other teens in their grade level for activities to support college and career readiness, clean up, and chat with friends and staff when leaving for the end of the day. In the summer, the STEM-based activities and science investigations give way to leading younger children in science activities.

Program Outputs for the first two years of the Community STEM Outreach Project can be summarized in terms of patterns of the teens served through the various components. New teens arrived each spring. Each summer even more teens attended, including recent high school graduates. Each fall as those graduates left for college, lower attendance figures reflected the loss of the past year's seniors in anticipation of the new recruits for the next spring.

Program Impacts measured in the first two years of the project include post high school plans for the YES program graduates (most off to college) and career plans for all YES teens (most into STEM-related careers). Additional impacts to be assessed in the third year of the project include changes in teens' attitudes toward science and their understanding and appreciation for scientific inquiry. Surveys of alumni/alumnae will provide additional information on long-term impacts.

Groups of stakeholders hold differing views of staff roles and responsibilities, the nature and importance of STEM learning in OST, and the relationship of the YES program and other areas of the SLSC. There are no right or wrong perspectives. They are simply different. Value can come from gaining an understanding of all the views.

Areas of concern have emerged from disconnects with current research and best practices and should be explored further. The program would benefit from more intentional debriefing and reflection of learning activities. Curriculum planning and implementation with a focus on a cohesive curriculum to avoid lethal mutations will strengthen the program. Revisiting staffing levels and the roles and responsibilities of staff in light of budget changes is necessary. Maintaining contact with teens when absent will further support the goals of the program. Continuing to improve the data management process is critical to serving current and future research needs.

Recommendations were provided to support the program moving "from good to great" as project leaders and YES staff members explore the issues and concerns discussed in this report.

The future of YES in the long-term is unknown. However, through the support of the ONR, the next year in YES can lead to additional understanding of the YES Program Model through the project evaluation, and to the dissemination of the model to the museum partners across the nation through the multimedia tool to be developed.

Feedback on this report and questions about the evaluation can be sent to Christine (Kit) Klein, evaluation consultant, at ckleinconsutling@gmail.com.

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Appendix A – Evaluation Activities

Evaluation Activities to Date

2010
- December – YES alumnae/alumni survey
- December – February 2011 – Evaluation team planning

2011
- January - November – Information interviews with stakeholders
- January - December – Observations of staff meetings
- January - December – Meetings with PI
- January - March – Observations of staff training & PD
- February - April – Observations of spring YES program
- April – Spring YES teen survey
- June - July – Observations of summer YES program
- June – Summer YES teen survey
- March - August – IRB application, meetings, and approval
- October – Observations of fall YES program
- November – Fall YES teen survey

2012
- January - April – Observations of spring YES program
- January – July – Observations of staff meetings
- January - March – Information interviews with stakeholders
- January - September – Meetings with PI
- April – Spring YES teen survey (with TOSRA2)
- April – Observations of staff PD
- May – Focus group with community partners
- June - July – Observations of summer YES program
- July – Summer YES teen survey (with TOSRA2)
- July – Focus groups with teens and staff
- September – Information interviews with managers

Evaluation Reports Submitted

- March 2011 – Evaluation Progress Report
- April 2011 – Summary of Spring YES Teen Surveys
- August 2011 – Summary of Summer YES Teen Surveys
- September 2011 – Evaluation Progress Report
- November 2011 – Summary of fall YES Teen Surveys
- April 2012 – Summary of Spring YES Teen Surveys

Appendix B – Data Sources

This appendix discusses the sources for data presented in this report. Data sources include surveys, observations, interviews (in-depth interviews and focus groups), and program records.

Evaluators used two types of surveys to collect data from YES teens participating in the program. Both types of surveys involved population samples. The population number for each survey is the number of participating YES teens for the semester in which the survey was administered. We defined participating teens as those who attended at least twice during the semester. Printed surveys were distributed to respondents during YES program Learning Labs. Since attendance was not 100.0% on any one day, evaluators distributed surveys on at least two days; however, teens who attended less frequently may not have been present on any occasion. Table B.1 shows the response rate for each survey. Except for Fall 2011, in our experience, these return rates are relatively high for youth programs where attendance is often intermittent as teens participate in sports and other extracurricular activities and have family issues that may preclude regular attendance. The Fall 2011 response rate was lower due to field trips by components and lower attendance on the days of the surveys.

Teen Surveys administered were developed by the External Evaluator. Several items were consistent from semester to semester to allow comparison and other items provided snapshots about specific topics relevant to ongoing evaluation issues and concerns.

The Test of Science Related Attitudes (TOSRA) survey is a standardized instrument developed by Fraser (1981) and used internationally. The instrument is designed to measure secondary science students' attitudes toward science, consists of 70 statements with seven subscales using a 5-point Lickert Scale (strongly agree, agree, not sure, disagree, and strongly disagree). TOSRA has been used with youth around the world, and has been shown to be valid and reliable for American teens. A modified version (TOSRA2) developed by Ledbetter and Nix (2002) is used in this study, consisting of 35 pre-test items and 35 post-test items with negatively and positively phrased items balanced on each test.

The seven subscales are as follows:

- Social Implications of Science – Do youth recognize the benefits and drawbacks of scientific advances to society?
- Normality of Scientists – Do youth see scientists as real people rather than media-produced stereotypes?
- Attitude toward Scientific Inquiry – Do youth view experimentation and inquiry as a way to gain understanding of the natural world?
- Adoption of Scientific Attitudes – Have youth adopted the attitudes of scientists, such as open-mindedness and self-assessment?
- Enjoyment of Science Lessons – To what degree do youth enjoy their lessons in school science classes?

- Leisure Interest in Science – To what degree are youth interested in science out of school, and outside of the YES program?
- Career Interest in Science – Do youth have an interest in pursuing a science related career?

This science attitude survey was administered twice during the timeframe covered by this report.

The population for surveys, as shown in Table B.1, was all teens attending the program at least once. A few teens who attended only one time were present on days when the survey was conducted. Readers should note that this population definition is different from that used to figure attendance. In figuring attendance, participating teens were defined as those who attended at least two times.

Table B.1. Surveys

Surveys	Name of Data Set	Respondent Group(s)	Population N	Respondent N	Response Rate	Date
Teen Surveys	Teen Survey Data-Spring 2011	Semester Participants	246	186	75.6%	Spring 2011
	Teen Survey Data-Summer 2011	Semester Participants	280	220	78.5%	Summer 2011
	Teen Survey Data-Fall 2011	Semester Participants	176	122	69.3%	Fall 2011
	Teen Survey Data-Spring 2012	Semester Participants	216	109	50.4%	Spring 2012
	Teen Survey Data-Summer 2012	Semester Participants	251	194	77.3%	Summer 2012
Test of Science Related Attitudes (TOSRA)	TOSRA, April 2012	Semester Participants	216	128	59.2%	April, 2012
	TOSRA, July 2012	Semester Participants	251	194	77.3%	July, 2012
	TOSRA April and July 2012 Match	Semester Participants	176	89	50.6%	April and July, 2012

Observations were conducted by the evaluation team and by the documenters hired for the Summer 2011 program. Only those by the evaluation team (KK and CT) were included in analysis for this report, as reported in Table B.2.

Table B.2. Observations

Observations	Name of Data Set	Respondent Group(s)	Respondent N	Observer	Date
Evaluator Observations of Staff Meetings and PD	Staff Meeting 032912	Staff Members	11	KK	3/29/12
	Community Partner Meeting 050812	Staff Members and Community Partners	27	KK	5/8/12
	Staff Meeting 030212	Stakeholder and Staff Members	16	KK	3/2/12
	Staff Professional Development 042512	Staff Members	8	KK	4/25/12
	Staff Storyboarding Meeting 051412	Staff Members and Stakeholders	15	KK & CT	5/14/12
	Staff Meeting 062012	Staff Members	55	KK	6/20/12
	Staff Meeting 090712	Staff Members and Stakeholders	13	KK	9/7/12
Evaluator Observations of Learning Labs	College Prep Learning Lab 031712	YES Teens, Staff Members, Interns	17	CT	3/17/12
	Astronomy Learning Lab 031712	YES Teens and Staff Members	17	CT	3/17/12
	Robotics Learning Lab Summer 2012 062112 & 062212	YES Teens and Staff Members	18	CT	6/20-22/12
	Astronomy Learning Lab 062612	YES Teens and Staff Members	~18	KK	6/26/12
	Summertime Science Learning Lab 062012	YES Teens and Community Group Youth	27	KK	6/20/12

In-depth interviews and focus group interviews were conducted by evaluation team members and were transcribed for analysis.

Table B.3. Interviews

Interviews	Name of Data Set	Respondent Group(s)	Respondent N	Interviewer(s)
In-depth Interviews	Principal Investigator Interview 01/04/11	Staff Member--Education VP and Grant PI	1	KK
	Office of Naval Research Program Officer 1/25/11	Stakeholder--Funder	1	KK
	Manager Interview 03/18/11	Staff Member--Manager	1	KK, CT
	St. Louis Science Center Administrator 04/06/11	Stakeholder--Institutional Administration	1	KK
	St. Louis Science Center Board of Trustees Member 11/15/2011	Stakeholder--Board of Trustees Member	1	KK
	St. Louis Science Center President 03/06/12	Stakeholder--Institutional Administration	1	KK
	Staff Member Interview 03/21/11	Program Staff Member	1	KK, CT
	Staff Member Interview 07/19/11	Program Staff Member	1	KK, CT
	Manager Interview 07/19/11	Staff Member--Manager	1	KK, CT
	Manager Interview 09/05/12	Staff Member--Manager	1	KK, CT
	Manager Interview 09/15/12	Staff Member--Manager	1	KK, CT
Focus Groups	Community Partner Focus Group 05/09/12	Community Partners	8	CT, KK
	Teen Focus Group 07/17/12	YES Teens	9	CT, KK
	Teen Focus Group 07/18/12	YES Teens	10	CT, KK
	Summer Staff Focus Group 08/02/12	Summer Staff Members	10	CT, KK
	Senior Educator Focus Group 08/21/12	Senior Educators	7	CT, KK

Program records were collected from staff members by the evaluators. Records included attendance data, demographic and other details on individual teens, and documents shared. The Career/College Readiness Interview was conducted by a Senior Educator by phone with recent graduating seniors.

Table B.4. Program Records

Program Records	Name of Data Set	Respondent Group(s)	Population N	Respondent N	Response Rate	Date
Career/College Readiness Interview	Career-College Readiness Plan	YES Teens-Seniors 2012	62	57	91.9%	Spring 2012
Teen Database	ALL FORMER TEENS copy	YES Teens through 2010		627		4/21/12
	2010 Current Teen Information	YES Teens Full Roster		235		6/8/11
	2011 Current Teen Information	YES Teens Full Roster		333		7/27/12
	2012 Current Teen Information	YES Teens Full Roster		262		8/29/12
Attendance	YES Attendance Fall 2010	YES Teens Assigned to Learning Labs		218		12/13/10
	YES Program Summer 2010 Attendance	YES Teens Assigned to Learning Labs		209		10/7/10
	YES Attendance Spring 2011	YES Teens Assigned to Learning Labs		234		5/4/11
	YES Attendance Summer 2011	YES Teens Assigned to Learning Labs		301		8/15/11
	YES Attendance Fall 2011	YES Teens Assigned to Learning Labs		193		1/2/12
	YES Attendance Spring 2012	YES Returning Teens Assigned to Learning Labs		252		5/3/12
	NEW TEEN YES Attendance Spring 2012	YES Teens Assigned to Learning Labs		63		9/27/12

Appendix C – Data Analysis Details

The following information adds details to the figures and tables used throughout the report. We used the population of the YES teens in the program since the funding from the Office of Naval Research began in Fall 2010. By taking the program's database of participating teens, the program's attendance figures, and the results of the surveys each semester, we were able to identify 385 teens who participated at least twice in at least one semester. This number, 385, provides the N for most of the analysis presented in the Demographic Story section.

Figure 3 - Gender of Participating YES Teens - Page 4

The actual numbers were 198 females and 187 males. Data are based on program records.

Figure 4 - Grade Levels of YES Teens in 2010-2011 and 2011-2012 - Page 5

Since students can join the YES program at age 14, they may begin as a middle school student, occasionally as young as 6th grade. In Figure 4 we combined the middle school students since numbers of 6th and 7th graders were very low compared to 8th graders.

Data used to create Figure 4 are provided in Table C.1. The total number of individual teens remains 385, though the N for each year is smaller (N= 237 and N=352).

Table C.1. Grade Levels of YES Teens in 2010-2011 and 2011-2012

	2010-2011	2011-2012
Middle School	62	28
Freshman	70	80
Sophomore	37	79
Junior	40	49
Senior	28	63
Recent Graduate	0	53
Total	237	352

Figure 5 - Ethnicity of YES teens - Page 5

The US Census categories were used to keep the data in simple and easy to read form; however, the details come from additional program records. The 2010 US Census includes six categories for race and defines Hispanic as a separate item. Since some teens self-report Hispanic without also indicating a "race" category, we have added this category to the standard groups reported by the census rather than listing it separately. All seven categories are used to define ethnicity for this report. For those teens identifying as Hispanic, we cannot determine whether they are also "White" or "Black" according to census definitions.

US Census 2010 Definitions of Race (downloaded from
http://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf on 11/6/12):

- "White" refers to a person having origins in any of the original peoples of Europe, the Middle East, or North Africa.
- "Black or African American" refers to a person having origins in any of the Black racial groups of Africa.
- "American Indian or Alaska Native" refers to a person having origins in any of the original peoples of North and South America (including Central America) and who maintains tribal affiliation or community attachment.
- "Asian" refers to a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.
- "Native Hawaiian or Other Pacific Islander" refers to a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
- "Some Other Race" includes all other responses not included in the White, Black or African American, American Indian or Alaska Native, Asian, and Native Hawaiian or Other Pacific Islander race categories described above. Respondents reporting entries such as multiracial, mixed, interracial, or a Hispanic or Latino group (for example, Mexican, Puerto Rican, Cuban, or Spanish) in response to the race question are included in this category.

For purposes of this report, Nepali (2 teens) is included in the "Asian" total, and Ogoni African (1 teen) is included in "Black or African American" even though their life experiences may differ from those of their peers in the same category. Bosnian (1) and Albanian (1) teens are grouped with "White", again with different experiences based on their recent immigrant status.

Data used to create Figure 5 are listed in Table C.2.

Table C.2. Ethnicity of YES Teens

Ethnicity	Frequency	Percent
White	7	1.8%
Black or African America	335	87.0%
American Indian or Alaska Native	0	0.0%
Asian	8	2.1%
Some Other Race	0	0.0%
Hispanic	3	0.8%
Declined	32	8.3%
Total	385	100%

One useful piece of data not currently keep by the YES staff is the number of teens in the program who are first or second generation immigrants.

Figure 6 - Number of Participating YES Teens by Cohort - Page 6

Data provided in Figure 6 are from teens in the program during the ONR funding period. Evaluators will attempt to determine the number of individuals joining YES in each cohort since the beginning of the YES program to report patterns in the final summative evaluation report.

Figure 7 - Percent of Participating YES Teens by School Type - Page 7

The number of teens without schools listed in the teen database (21, or 5.5%) demonstrates the transient nature of the teen population. On summer surveys, when asked for the name of the school they plan to attend in the fall, several respond with IDK – I don't know. A similar percent of teens (4.4%) have attended more than one high school since joining the YES program.

If school data becomes important for future research, Senior Educators will need to ask the teens in their component for the names of schools each semester and provide that information to the staff member maintaining the database.

Figures 8 & 9 - Types of Science and Math Courses Taken by YES Teens in Spring 2012 - Page 8

The YES program has never collected transcript data from participants because they want YES teens to participate free from any stigma associated with their grades in school. In YES, a teen who is failing science can become an expert at chemical reactions or cloning vegetables. As the program grows and interest in studying the results of the program increases, there may eventually develop a need for transcript data. Until then, we must rely on self-report from teens who don't always know the names of the courses they are taking or whether or not those courses are required for graduation.

Courses were coded as basic, typical, and advanced courses. In the future we will be able to look at all the courses taken by an individual teen over time to determine if the individual took a basic, typical, or advanced *track* of courses throughout high school. It should be noted that the category for the typical course in math or science may include teens who only take the minimum number of course hours required to graduate. Figures 8 and 9 include data from middle school YES teens, who take typical science courses with no advanced options though some are able to take Algebra 1 (considered an advanced math option in middle school).

The low N of 109 for the Spring 2012 survey is a reflection of the number of YES teens responding to the survey. Each course name provided by a teen was coded as (1) an introductory or basic level course (e.g. survey courses or introductory courses for juniors and seniors), (2) typical for high school students, (3) advanced courses (e.g. honors, AP, and other advanced courses), or unclear. Those teens who did not respond to the question were not included in Figures 8 and 9, thus for science N=100 and for math N-104 rather than the full 109 for the survey. The unclear category in science includes those responses that included a course title, but it was impossible to determine

from the title alone if the course was basic, typical, or advanced. Data used in Figures 8 and 9 are summarized in Table C.3.

Table C.3. Science and Math Courses by Category for Spring 2012

	Science	Math
Basic	37	12
Typical	39	58
Advanced	15	34
Unclear	9	0
Total	100	104

Data for Fall 2011 are summarized in Table C.4. Since different teens completed each survey, data should not be compared over time.

Table C.4. Science and Math Courses by Category for Fall 2011

	Science	Math
Basic	35	14
Typical	59	55
Advanced	15	47
Unclear	10	0
Total	119	116

Figure 10 – New Teens' Reasons for Joining YES - Page 9

The N of 95 represents those new teens joining in Spring 2011 (as the ONR funding enabled the SLSC to bring in a larger pool of participants) who completed the survey. The total used in this figure, however, is 158 since many teens listed more than one reason for joining.

The survey asked new teens: What is your <u>main</u> reason for wanting to join the YES program? They were asked to check one of the following, or to write in something under "other".

☐ My family wanted me to   ☐ The laptop
☐ My mentors wanted me to   ☐ I wanted work experience
☐ I love science   ☐ My friends said it was fun
☐ I needed a job   ☐ Other
☐ The money

Since it was difficult to tell which one category was most important, all responses were counted. Data collected from the new teens are summarized in Table C.5.

Table C.5. New Teens' Reasons for Joining YES in 2011

Response	Actual	Percent
I Wanted Work Experience	48	30.4
I Needed a Job	24	15.2
The Money	21	13.3
Family Wanted Me to Join	18	11.4
I Love Science	17	10.8
My Friends Said It Was Fun	15	9.5

The Laptop	8	5.1
My Mentors Wanted Me To	4	2.5
Other	3	1.9

The three teens checking "other" had these reasons (in their own words):
- For future career
- I felt like it was an opportunity to better myself
- It was something I never heard of and wanted to try

Figure 11 – How Current YES Teens Reported Finding Out About YES - Page 10

Data used in Figure 11 are summarized in Table C.6. It is hoped that program staff will be able to reduce the number of unknowns in the future.

See Appendix D for a list of specific institutions and organizations in each category. "SLSC" includes teens who come to the YES program from referrals by SLSC employees. "Family and Friends" includes teens who have siblings or other family members in the program.

Table C.6. Current Teen Referrals to YES Program

Referring Group	Pre-ONR Funding	During ONR Funding	Total
Community Groups	35	86	121
K-12 School	40	38	78
SLSC	7	22	19
Family and Friends	13	15	28
Business, Hospitals, Government	3	10	13
Higher Education Programs	1	6	7
No Response	43	66	109
Total	142	243	385

Figure 12 – Post-High School Plans of Seniors in May 2012 – Page 26

Data used in Figure 12 are summarized in Table C.7. YES staff members attempted to contact the 62 seniors and were able to reach all but 7. Once again, it is hoped that program staff will be able to reduce the number of unknowns in the future; however, with a transient population this may be difficult.

Table C.7. Seniors' Post-High School Plans in May 2012

Plan	Frequency	Percent
Missouri 4-Year Institution	20	32.3
Out-of-State 4-Year Institution	14	22.6
Missouri Community College (2-year)	13	21.0
Trade School	2	3.2
Art Institute	2	3.2
Job (No Post-High School Education)	2	3.2
Other	2	3.2
Unknown	7	11.3
Total	62	100.0

The two "other" seniors include teens who had not yet graduated by the summer date when contacted. One was in the process of completing requirements to graduate and the other was incarcerated. It was unclear if this second teen was planning to graduate, take the GED, or not graduate from high school.

Figures 13-15 – YES Teen Career Interests by STEM and Non-STEM Related Career Choices in Spring and Fall 2011 – Pages 27-28

Responses from teens listing at least one career in a STEM related field were coded as "STEM" and those listing other careers that were not STEM related were coded as "non-STEM". Data used in Figure 13 are summarized in Table C.8. The percent by semester are given in parentheses. In Spring 2011, N= 182, and in Fall 2011 N=118. Additional information can be found in the survey summary reports for each semester.

Table C.8. YES Teen Career Interests in STEM and non-STEM Related Careers

Year	STEM Careers	Non-STEM Careers
Spring 2011	153 (84.1%)	29 (15.9%)
Fall 2011	90 (76.3%)	28 (23.7%)

Figures 14 and 15 provide the results by grade level, grouping middle school youth and high school freshmen together. The large number of new teens in Spring 2011 are reflected in the large number of middle school and high school underclassmen. Tables C.9 and C.10 provide the data in table form. Additional information can be found in the survey summary reports.

Table C.9. YES Teen Career Interests in STEM and non-STEM Related Careers by Grade Level – Spring 2011

Career Interest	Middle School & Freshman	Sophomore	Junior	Senior
STEM Careers	90	30	19	14
Non-STEM	7	2	2	4

Table C.10. YES Teen Career Interests in STEM and non-STEM Related Careers by Grade Level – Fall 2011

Career Interest	Middle School & Freshman	Sophomore	Junior	Senior
STEM Careers	32	25	17	16
Non-STEM	7	15	4	2

Appendix D – Community Partner Organizations

The following community groups have recruited teenagers for the YES program in recent years. This list is based on information known by YES staff at the end of the 2011-2012 academic year.

Community Groups

100 Black Men of Metropolitan St. Louis
Albanian Community
Annie Malone Children and Family Service Center
Beyond Housing
Boys and Girls Clubs of Greater St. Louis
- Adams Park Club
- Herbert Hoover Club

Boys Hope Girls Hope
Castlepoint Community Resource Center
COPS Outreach Program
Delta
Dignity House
Family Resource Center
Gateway Homeless Services, formerly Christian Service Center
Girls Inc.
IMPACT St. Louis
Jackie Joyner-Kersee Center
Matthews-Dickey Boys' and Girls' Club
Neighborhood Houses
New Life Christian Community Center
Northside Community Center
Science Gone Mad through the YMCA
St. James Center
St. Paul Missionary
Top Teens of America
Trio Foundation of St. Louis
Urban League
Women's Safe House
Youth and Family Center
Youth Learning Center
Unidentified Churches

K-12 Schools

St. Louis Public Schools
- Compton-Drew Investigative Learning Center Middle School
- Yeatman Middle School
- International Studies Program

Korea Academy of St. Louis
Storman Academy

Wellston School District
Unidentified Schools, Teachers, and School Counselors

Businesses, Hospitals and Government Agencies

ABNA Engineering
Boeing
Census Bureau
EMD Consulting Group
Gia Community Development Corporation
Human Development Corporation of St. Louis (no longer in business)
St. Louis Mental Health Board

Higher Education Institutions and Programs

GEAR-UP (UM-St. Louis)
St. Louis College of Health Careers
St. Louis Talent Search (SLU)

Appendix E – Naturalistic Inquiry and the YES Evaluation

In the identification and clarification of issues and concerns this evaluation employs a naturalistic evaluation methodology to compare multiple perspectives among various stakeholders. Guba & Lincoln (1989) define stakeholding audiences as follows:

> *A group of persons having some common characteristics (for example, administrators, teachers, parents, students, sponsor, clients, and the like) that have some stake in the performance (or outcome or impact) of the evaluand, evaluated (p. 304).*

In naturalistic evaluation, organizing elements used to focus the evaluation are issues and concerns. This contrasts to the other approach used in this study, outcome-based evaluation, where the organizing elements are impacts, outcomes, or project goals.

> *A concern is any matter of interest to one or more parties about which they feel threatened, that they think will lead to an undesirable consequence, or that they are anxious to substantiate a claim requiring empirical verification (Guba & Lincoln, 1989, p. 304).*

Issues may be identified from comparisons with and between stakeholding audiences:

> *An issue is any statement, proposition, or focus that allows for different, often conflicting, points of view; any proposition about which reasonable persons may disagree; any point of contention (Guba & Lincoln, 1989, p. 304).*

As discussed in the evaluation plan, we are working through five phases (Wolf & Tymitz, 1979) in a cyclical fashion:

1. ***Conceptual/Preparation*** to describe and define the Community STEM Outreach Program
2. ***Issue Generation***, using information interviews with representatives of stakeholder groups, to collect a wide range of perceptions and opinions about the Community STEM Outreach Program, and noting differences among perceptions as issues
3. ***Issue Selection*** to identify and select the most critical issues, those of high priority to stakeholders and with the greatest impact on the Community STEM Outreach Program
4. ***Issue Clarification*** to identify patterns and explanations for differences in perception among the people involved

5. ***Presentation*** to report patterns and explanations for differences in perception to stakeholders and others involved and interested in the situation using natural language and organized in a way that will be useful to making decisions related to the Community STEM Outreach Program and the creation of a national model
6. **Repeat** phases two through five, building on previous work, to identify the next stage of issues for clarification and presentation with a focus on creation of the national model