# Summary of Evaluation Findings

## Project TRUE (Teens Researching Urban Ecology)

## Year 1

*Prepared for*

*Wildlife Conservation Society and Fordham University*

*Prepared by*

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*October 2015*

*This report is intended primarily for internal use, to be used as scaffolding for meaning making discussions and as a record of the work completed on this project. Outline format was chosen to make the presentation more concise.*

[1] *Suggested citation: PEER Associates, Becker-Klein, R., & Fox, T. (2015). Summary of Evaluation Findings: Project TRUE Year 1. Downloaded from PEERassociates.net.*

# Summary of Evaluation Findings

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### Description of Project TRUE

The primary goal of Project TRUE is to increase the interest of high school students in pursuing science, technology, engineering, and mathematics (STEM) majors, by increasing their exposure to urban ecology research conducted with college mentors. Through a $2.6 million dollar, five year, National Science Foundation (NSF) Grant (DRL: 1421019 & 1421017), Project TRUE establishes a research and education partnership between the Wildlife Conservation Society (WCS) and Fordham University, to implement and evaluate the effectiveness of a tiered mentorship educational model. The model leverages both formal (Fordham), and informal (WCS) educational practices and expertise.

In year one of this grant (June 5 - August 16, 2015), each of four New York City (NYC) zoos had a team of: Ph.D. candidate, WCS zoo instructor, undergraduate Field Research Leaders, and high school student Field Assistants. Collectively, the 76-person cohort (5 graduate students, 4 zoo instructors, 18 undergraduates, and 50 high school students) designed and conducted original research projects that explored the ecological dynamics of the NYC ecosystem.

### Why did we do this evaluation?

1. To collect baseline data on program activities and participant and staff experiences at each of the four sites and across sites.
2. To inform program improvement (formative evaluation) and begin to investigate program effectiveness (summative evaluation).

### What were we trying to learn?

1. Program Implementation.
    a. In what ways does program implementation correspond or not with program design?
    b. What are the primary challenges to implementation and how have they been resolved?
2. Participant Experiences. To what extent do Project TRUE participants show changes in...
    a. ... ability to communicate about research with public audiences?
    b. ... knowledge of urban ecology and science process?
3. Organizational Capacity Outcomes.
    a. In what ways has the tiered mentorship model impacted participants and the organization?
4. Project Scale-Up.
    a. What are the critical components of the Project TRUE experience that that are likely

to be necessary and/or sufficient for future replication?
    b. What are the best practices and obstacles to implementing this project?

## What data did we collect?

1. Mentor Interviews: Interviews were conducted by evaluators either by phone or in person at all levels of the tiered mentorship model, either individually or in groups.
    a. Program Staff (n=7): phone interviews individually with 2 professors from Fordham and 5 program staff from WCS.
    b. Graduate Students from Fordham (n=5): primarily in-person interviews (1 by phone) individually with all graduate students in Project TRUE.
    c. Zoo Instructors (n=4): primarily in-person interviews (1 by phone) individually with the zoo instructor at each of the 4 sites.
    d. Undergraduates (n=17): in-person focus groups with all undergraduates at each of the 4 sites.
2. Evaluator Observations*:* Evaluators (n=2) visited each of the zoo sites twice over the summer. At the first visit in mid-July, an evaluator accompanied Project TRUE participants on their field data collections at each site. Evaluators visited the same sites in mid-August during the presentations of the data and analysis.
3. High School Student Focus Groups: In-person focus groups with high school students were conducted by an evaluator at each site in mid-August at the end of the Project TRUE summer program. High school students were divided into two groups for the focus groups.
4. Weekly Project Tracking Logs: Mentors (graduate students, zoo instructors, and undergraduates) at all sites filled out weekly tracking logs while the high school students were in attendance at the zoos. 185 tracking logs were filled out (48 at Bronx Zoo, 34 at Central Park Zoo, 53 at Prospect Park Zoo, and 50 at Queens Zoo).

## What did we learn?

1. ***Program Implementation*. The tiered mentoring was quite successful, although there were several challenges that need to be addressed.**
    a. The tiered mentoring model allowed many more high school students to participate in this programming than would have been possible with only the top tier as mentors.
    b. High school students enthusiastically talked about how much they connected with each other and with their mentors (especially the undergraduates). Undergraduates had plans to continue friendships started in Project TRUE; indeed one group planned to participate in a mud run the week after the program ended.
    c. All mentors reported growth in their capacity and confidence as mentors. The undergraduates expanded their ability to provide mentoring and coaching beyond using powerpoint presentations to communicate ideas, showing signs of moving toward mentoring through less formal and more hands-on techniques. Graduate students gained experience teaching in diverse ways, practicing guiding hands-on and experiential learning with undergraduates and high school students in less formal venues than they had previously experienced. Although zoo instructors had considerable experience interacting with teens, they gained confidence in working with several undergraduates (all with different personalities and needs) simultaneously.

d. Many interviewees referred to a tension between WCS and Fordham in expectations for the format and structure of the mentoring. Fordham staff seemed to view Project TRUE as primarily a research experience in which they expected a high level of independent learning. WCS, on the other hand, was building on this program as an expansion of other teen programs at the zoos, which consisted primarily of planned out, experiential learning. There seemed to be some lack of respect and trust on both sides, including perceptions on the part of both parties that what the other organization did was not working, and that they were not valued by the other organization.
e. Mentoring activities for undergraduates followed an arc that was heavy in teaching at the beginning of the summer. The amount of teaching time gradually decreased, with a concurrent increase in responsibilities and expectations for the high school students. Eventually, undergraduates were more likely to provide tips and advice rather than direct instruction (see Figure 2 and Figure 3 in Appendix A).
f. Graduate students and zoo instructors reported fewer directive mentoring activities than the undergraduates mentioned. These older mentors often described their role as providing resources and guidance, with formal instruction happening only occasionally. Challenges to the tiered mentoring approach did occur at each level of the model:
    i. At one site, high school students felt frustrated by the lack of sharing of personal information from the undergraduates, while they felt they were expected to divulge a lot on their end. At the same site, the undergraduates were under the clear impression that they should not share anything about themselves beyond their college experiences.
    ii. Some of the undergraduates expressed that they did not feel the graduate students trusted them enough to allow them to truly lead the research project. They wanted more authority and responsibility.
    iii. Both graduate students and zoo instructors wished that there had been more collaboration between them in planning the research project.
    iv. Several graduate students requested more support from the Fordham PIs in planning their research projects. There were also several complaints about the amount of time required for the project (considerably more than for other graduate assistantships). The graduate students were concerned that the lack of time to focus on their dissertation work put them behind their colleagues, and could also be a source of challenge for recruitment in future years of the program.
    v. Several sites expressed some frustration at the inconsistent communication and last minute requests coming from Project TRUE staff. For instance, the poster session at Fordham necessitated additional work, and mentors would have liked notice of this event earlier. Furthermore, at times, the tone of these communications was perceived to be more terse than necessary.

2. ***Program Implementation*: There was considerable variation in the complexity, student participation, and number of logistical challenges in the research project by site, with the Bronx Zoo site considered to be the most successful model for a research project.**

a. *Bronx Zoo* (BZ). BZ was thought by many Project TRUE staff to have the best research project model. This model included a deep commitment to using the Socratic method with undergraduates and high school students, and giving them a high level of ownership in the research projects since they were allowed to develop their own research questions. Additionally, the BZ field research was conducted entirely at the site, which gave participants more time to conduct research rather than traveling. Mentor tracking logs indicated the highest levels of student engagement at BZ (see Figure 1 in Appendix A).
b. *Central Park Zoo* (CPZ): The research project at CPZ took participants far and wide throughout the city to conduct field research. The lack of dedicated storage and classroom space at the zoo was problematic at times. Other challenges centered around equipment: moving heavy equipment around the city, and occasional equipment malfunctioning (which necessitated repeating data collection days). At CPZ, there was a mentorship role for students who were more advanced in leading other students who needed extra help. Mentor tracking logs indicated consistently high levels of high school student engagement (see Figure 1 in Appendix A). However, there were some issues with inconsistent attendance by the high school students. Mentoring activities began as primarily teaching, but slowly changed to providing tips and advice rather than direct instruction.
c. *Prospect Park Zoo* (PPZ): The research project at PPZ may have been the most rigorous, with true experiments conducted (other sites primarily conducted correlational research). The graduate student primarily planned and directed the research, with undergraduates leading high school students in the data collection efforts in the field. Most of the data collection was conducted at the PPZ site. Mentor tracking logs indicated lowest levels of student engagement at PPZ (see Figure 1 in Appendix A). Tracking logs also showed that mentoring activities consistently had a supervisory/directive quality throughout the program.
d. *Queens Zoo (QZ)*: There were many logistical challenges at QZ, including lack of access to WiFi, lack of space (they ended up setting up under a tent outside, since there was no indoor space available), and the necessity of traveling around the city to conduct field research. Mentor tracking logs did indicate consistently high levels of high school student engagement (see Figure 1 in Appendix A). In the beginning, undergraduates primarily engaged in direct instruction and teaching, but gradually changed to providing tips and advice rather than direct instruction. Undergraduates admitted to low levels of comfort with and limited knowledge base about science and ecology, and it took them a little while to get comfortable with conducting and leading the research projects.
e. The variability in the implementation of research projects between sites was especially apparent in the extent to which undergraduates and high school students were encouraged to develop their own research questions. One Project TRUE staff pointed out that graduate students were “not used to thinking as a PI, and maybe we need to support them more in that...give them more examples rather than just say, ‘Go do it.’”

3. ***Participant Experiences:*** **Project TRUE had a meaningful and positive impact on**

**participants' knowledge of and capacity to do urban ecology research.**

a. Several of the zoo instructors talked about how Project TRUE increased their ability to do rigorous research.
b. Everyone agreed that Project TRUE had a huge impact on undergraduates' knowledge of and capacity to conduct urban ecology research. By the end of the summer, undergraduates were leading data collection, and helping out considerably with analysis and reporting.
c. Some undergraduates mentioned that they felt Project TRUE was more about teaching and mentoring than about conducting research, and suggested that the project be advertised as such.
d. High school students also gained confidence, knowledge, and skills in conducting urban ecology research. By the end of the summer, they had experience collecting field data, analyzing and interpreting that data, and communicating their research through posters as well as more interactive presentations.

4. ***Participant Experiences*: This project improved the mentors' ability to communicate about science with non-academic audiences.**
    a. Graduate students and undergraduates improved in their ability to teach concepts to high school students. Graduate students talked about improving their ability to explain scientific ideas to this younger age group than they were accustomed to teaching.
    b. Undergraduate students noted that by the end of the summer, they felt competent and at ease presenting their research projects. Most of the people who observed the presentations were impressed with their level of knowledge and expertise in communicating about the research.

5. ***Participant Experiences*: Even though many high school students came into this program with high levels of interest in STEM careers, their experiences in Project TRUE did seem to have some impact on how students thought about their careers.**
    a. For some high school students who already had an interest in a specific STEM career, participation in Project TRUE confirmed and reinforced their interest.
    b. For other high school students, Project TRUE helped them to narrow their focus from a broad interest in science/engineering to a more particular and specific area.
    c. Project TRUE also served to expand the focus of some high school students, who found ways to incorporate ecology into their prior STEM interests. For example, one student entered with an interest in architecture, and left wanting to do environmental engineering and design.
    d. Many high school students gained a better understanding of the college application process and the reality of getting into college. This was achieved through frank discussions with the mentors, especially the undergraduates.

6. ***Participant Experiences:* Project TRUE also positively impacted areas besides STEM career interest for many high school students.**
    a. Several high school students mentioned gaining experience and capacity in their collaboration skills.

b. The high school students were excited to meet people outside of their schools and regular social circles. They were able to connect to their "nerdy side" and many felt more comfortable being intellectual by the end of the program.
c. Mentors and high school students alike commented on the positive change in high school student comfort outdoors. For instance, many high school students overcame their fear of "bees and bugs", and were proud to say that they had made it through mud and other weather challenges.

7. ***Organizational Capacity Outcomes*: Project TRUE helped both WCS and Fordham achieve part of their organizational missions.**
    a. For both Fordham and WCS, Project TRUE served to expand organizational reach to serve more underrepresented teens throughout New York City. This outreach was both a goal of the project and an important part of the missions of both organizations.
    b. WCS project staff all mentioned that Project TRUE fit in well with the recently revised organization's strategic plan, especially "reaching out to new audiences that are underserved and giving them the opportunity to participate in robust science programs." Additionally, this project was said to have raised the profile and visibility of the educational department within WCS. It was seen as a real "feather in our cap" and a way of showcasing that the education department could also do "real science and have real impact on community members."
    c. For Fordham, Project TRUE helped the university to engage the local community more extensively, an important piece of Fordham's mission. Beyond the reach of the program, Project TRUE expanded the more traditional university pedagogy by moving "beyond the lab bench" and training undergraduate and graduate students for non-academic careers, which are becoming more and more common for Fordham graduates.

8. ***Project Scale-Up*: Early thoughts about program replication point to need for established trust and collaboration between the formal and informal institutions.**
    a. Project TRUE served to enhance the existing partnership between Fordham and WCS, allowing them both to leverage existing resources to greater effect.
    b. An established partnership between the formal and informal site, a history of trust and working together, was cited by all Project TRUE staff as essential to the success of the program.
    c. Having a dedicated full-time program coordinator was another key to the success of this project.
    d. The reputation of WCS and that organization's relationships with area high schools was important to the success of recruiting teens in this pilot year of the project.

## What does it mean?

This section is organized by the evaluation questions (detailed in the "What were we trying to learn?" section of this report), and considers ways in which the evaluation findings above provide answers to these questions:

1. **<u>Program Implementation</u>.** There was a high level of program fidelity, meaning that delivery of Project TRUE was well aligned with the program model in this first year of the program. Students at all levels were easily recruited, there were low levels of attrition, and the tiered mentoring model was very successfully implemented. Strong relationships developed both between and among undergraduates and high school students. Primary challenges to program implementation during the pilot year included:
    a. The vast majority of high school students recruited were already interested in STEM careers, so there may be a ceiling effect[2] at work in STEM career interest.
    b. The amount of time required for graduate students on this project was a challenge, and may even compromise recruitment of graduate students in future years.
    c. There is room for improvement in the tiered mentoring model, especially around collaboration between WCS and Fordham, and making roles and responsibilities for each tier more explicit.

2. **<u>Participant Experiences</u>.** Participants at every level of the model (from graduate students down to high school students) showed meaningful improvement in both their ability to communicate about science and their capacity to conduct urban ecology research. Other important participant outcomes include increased connections with others and to nature, and high school students' changes in STEM career interest.

3. **<u>Organizational Capacity Outcomes</u>.** The tiered mentoring model of Project TRUE allowed both WCS and Fordham to address many components of their organizational missions, including extending outreach to underserved audiences and providing more real world opportunities for mentors. Staff members at Fordham and WCS all expressed enthusiasm and excitement for this program, and could see a lot of promise for future directions of Project TRUE. Primary challenges to accomplishing these outcomes included tension in the relationship between the two organizations.

4. **<u>Scaling-Up</u>.** Although it is still quite early in the process to determine the critical components of the Project TRUE experience that are likely to be necessary for future replication, the success of the pilot year suggests that there is great promise for successful replication of the program. There are already some hints of what best practices could be, as well as obstacles:
    a. Having a strong and established partnership between a formal and informal science institution is key to project success and likely to be necessary for replication.
    b. Lack of resources (e.g. sufficient finances, space, and access to technology) may prove to be an obstacle to successful replication.

*NOTE: It could also be informative to consider the Project TRUE Logic Model (See Appendix B) and how the evaluation findings from the first year of the program relate back to that model. We will discuss this in the in-person meeting on October 28, 2015 at the Bronx Zoo.*

[2] A ceiling effect occurs when participants' scores are all bunched up at the highest end of the scale, so that there is no more room for any improvements or increases to occur.

## What do we recommend?

Project TRUE had a very strong launch in the pilot year of the program. The following recommendations can help to refine the program in upcoming years, and address some of the challenges experienced in the first year:

**Recommendations related to Program Implementation.**

1. *Consider tweaking the tiered mentoring model***.**
    a. Provide graduate students with more support for how to be "PI" on a project.
    b. Offer more emphasis on/examples of what mentors do and how to be a good mentor.
    c. Undergraduates may need more training in science and urban ecology research, since many of them were not science majors.
    d. Consider whether it is better for the model to target and recruit science majors, or if you want a broader range of majors for the undergraduate mentors.
2. *Make some improvements to the mentor training.*
    a. Some sites requested more time in the training to get to know each other and learn about their own site and research projects.
    b. Clarify roles and expectations for the mentors, specifically focused on mentoring activities beyond direct instruction, appropriate boundaries, and communication styles. Potentially emphasize the Socratic method as an effective strategy.
    c. Add in a regular time for mentors to meet and collaborate throughout the summer, possibly once a week.

**Recommendations related to Participant Experiences.**

3. *Revisit the research project.*
    a. Consider reusing/recreating successful research projects undertaken in the first year of Project TRUE.
    b. Explore the possibility of plugging into existing large scale students that are currently ongoing in New York City (such as NYC Parks).
    c. Start planning earlier, and include zoo instructors in planning the research project.
    d. Have graduate students work on umbrella questions rather than fully formed projects. Then provide high school students with more choice as to which question to work on.
    e. Discuss whether it is more important to focus on conducting rigorous research or having high levels of student ownership of the project.

**Recommendations related to Organizational Capacity Outcomes.**

4. *Make more explicit the roles and responsibilities for WCS and Fordham staff.*
    a. Clearly articulate the parts of the project that are considered to be structured experiential learning and what is more like a research experience for undergraduates.
    b. During the training, clarify who is leading which sections, and explicitly state when something will be lead more like a lecture/university experience versus an informal science experience.

**Recommendations related to Scaling Up.**

5. *Continue to monitor best practices and obstacles to project replication.* Project TRUE staff are quite attuned to reflecting on their experiences, but a more systematic space and time for reflection may be worth considering.

6. *Investigate pros and cons of conducting Project TRUE at fewer sites, or explicitly testing the model at more challenging sites.*

**Recommendations related to future evaluation.**

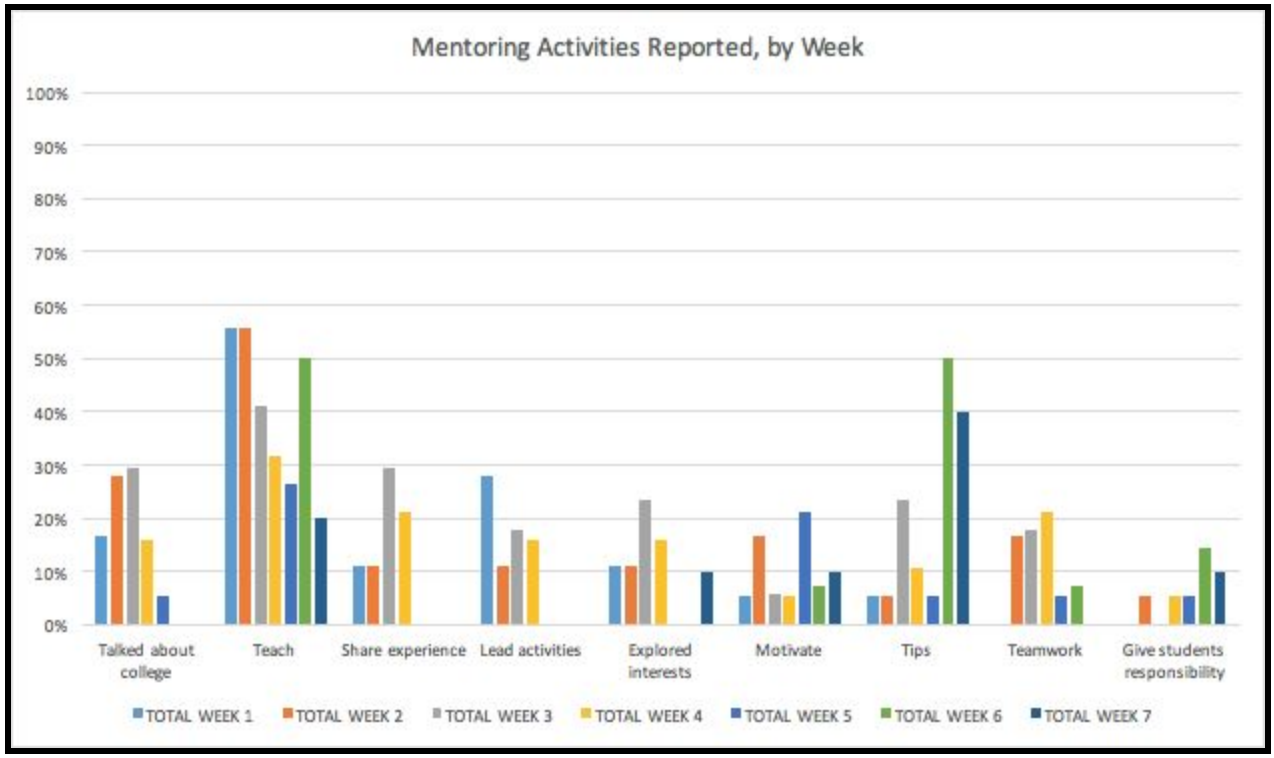
7. *Develop and pilot embedded assessment tools for high school student attitudes of self/science.*
8. *Develop and implement program rubric for assessing high school student science skills.*

# Appendix A. Information from Weekly Tracking Logs

**Figure 1. Student Engagement by Project TRUE Site**

**Figure 2. Word Cloud for Question:** In what ways did you act as a mentor this week to your team of high school students?


**Figure 3. In what ways did you act as a mentor, by week**


Mentoring Activities Reported, by Week
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Talked about college
Teach
Share experience
Lead activities
Explored interests
Motivate
Tips
Teamwork
Give students responsibility
TOTAL WEEK 1
TOTAL WEEK 2
TOTAL WEEK 3
TOTAL WEEK 4
TOTAL WEEK 5
TOTAL WEEK 6
TOTAL WEEK 7

Appendix B. Project TRUE Logic Model

# Project TRUE Logic Model

*Project TRUE aims to increase the participation of underrepresented audiences in STEM careers.*

## TRUE Inputs

*(resources and people that make the program possible)*

**Funding**
NSF funds

**Mentors**
WCS staff
Fordham staff
Fordham under/grad students

**Mentees**
High school students

**Field equipment**

**Facilities**
WCS Zoos
Fordham University campuses

## TRUE Activities (Outputs)

*(evaluated by counting the number, type, and amount of each of these activities, aka "outputs")*

**Participant Recruitment**
Recruit grad, undergrad, & high school students
(# of applicants, # participants recruited, # participants completing each year)

**Mentorship Model**
Develop curriculum for mentorship training
Conduct mentoring programs for TRUE
(Project TRUE curriculum developed, # hours mentorship training, # mentors, # mentees trained)

**Urban Ecology Research**
Research training
Conduct urban ecology research at park sites
Present research
(Urban ecology data sets, # final research presentations, other published research, # photos/videos/tweets posted online)

**College Preparation**
"College bootcamp" sessions
(# participants in "college bootcamp" sessions)

**Organizational Collaboration**
Strengthen partnership between WCS & Fordham
(# joint presentations/papers)

## What Changes

*(Short-term changes in participants,by autumn of each year, and long-term changes in participants within 3-5 yrs)*

**Mentees**
**Pursue college STEM study and careers**
*(Short-term: Increased intention to pursue and understanding of requirements; Long-term: increased pursuit)*
**Pursue science outside of formal study**
*(Short-term: Increased knowledge in urban ecology and science research skills; Increased confidence in ability to present research; Long-term: Active engagement with/appreciation for science outside of formal study and careers)*

**Mentors**
**Pursuit of urban ecology research**
*(Short-term: Increased knowledge of urban ecology and science processes)*
**Communicating scientific research**
*(Short-term: Able to communicate about research with public audiences; Long-term: Regular application of research communication skills)*
**Mentoring capacity**
*(Short-term: Increased confidence in mentoring; Long-term: Active mentoring on an ongoing basis)*

**Organizational Capacity**
WCS and Fordham have stronger institutional commitments to urban ecology research.
Fordham and WCS have a stronger relationship.

## Big Picture

*(aka "impact")*

**Broader Participation in STEM Careers**
Quantity
Variety

**Expanded Access**
to high-quality STEM learning experiences for underserved and underrepresented youth

**Advances in Research**
into strategies that advance informal STEM learning, and replicable model for advancing STEM learning

**Strong Mentoring Models**
incorporated into informal STEM learning models

*v1a, March 16, 2015*