Transforming Teaching and Learning Practices in After School Time Focusing on the Teaching of Science

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TRANSFORMING TEACHING AND LEARNING PRACTICES

IN

AFTER SCHOOL TIME FOCUSING ON THE TEACHING OF SCIENCE

Dissertation

by

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Abstract

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Over the past decade, demands and expectations placed on after school programming have changed dramatically. In the new standards based culture of accountability, after school time is seen as an opportunity to provide additional time to learn and demonstrate learning to standards. Professional development opportunities offered has not kept pace with demands being placed on after school programs. After school programs must have protocols in place to evaluate and implement professional development plans in the most effective manner possible. This study was conducted to support programs with planning professional development by assessing the impact of prevalent forms of professional development available on teaching practice and perception. The research questions were:

What are teachers' perceptions of how involvement in teaching a new science program affected teaching practice in the after school program?

How do teachers' perceive the three models of professional development – intervention, self-initiated, and district directed - contributed to teacher learning?

Data was collected in the form of journals, interviews and observations utilizing a pool of five teachers who implemented a new set of science classes during after school time. Findings included a positive increase in perceptions of practice and teacher learning. The level of increase was a function of accurately identifying teacher needs and mapping the best forms of professional development while taking into account teacher's learning/working style.

The literature review stated clearly the impact of properly aligned professional development. It underscored the need for professional learning to take place in the context of a collaborative environment that supports teacher change.

The study indicates that, irrespective of the form, professional development completed in the context of a collaborative learning community has the ability to create sustainable change. It is the collaborative discussion that serves as the basis for the ongoing professional development. Each form has a particular audience for whom the impact will be the most direct, however, professional development in any form will have an impact on teacher perception and practice.

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DEDICATION

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Introduction

Extended time offers struggling students additional opportunities to learn. It also affords students an opportunity to demonstrate personal progress. It is not simply a matter of more time to learn subject matter through standard methods of delivery, but represents the possibility of introducing alternative methods of curriculum delivery and student assessment.

One of the main problems plaguing after school programs is that they often focus on being a place where children can congregate safely, rather than a place offering a genuine opportunity to explore a variety of activities that promote learning (Fashola, 2002). Traditional after school programming tends to use "more of the same" pedagogical approaches. The same pedagogy remains in place, but with the addition of extended time. This type of approach exposes students, who in many cases are already unsuccessful, to a curriculum delivery method that proved to be ineffective in the past. These conditions only provide more time for students to feel incompetent, instead of providing them with an opportunity to demonstrate learning in a different way. There has to be a radical rethinking of the manner in which after-school time is structured and how learning itself is approached in order to better support the learning needs of a diverse community of learners.

During the last decade, after school time has become more popular among both suburban and urban families. This rise in popularity is due, in part, to a need for . supervision during a time when children may become exposed to or perhaps engage in antisocial or destructive behaviors (Fashola, 2002). Because of this rise in popularity, there has been a shift away from simply providing supervision. Added emphasis is now placed on adding opportunities to learn and improving learning in fun and creative ways.

In addition, during this time there has been a push to increase learning time. "On average, children spend only 20 percent of their waking hours in school" (Afterschool Alliance, 2007 pg. 1). Students who were often left unattended after school are being given the opportunity to become integrated into an after school teaching community that reaches beyond the scope of their regular day classrooms. A student's circle of influence can be expanded to include different teachers and curricula not offered during the regular school day. Hands-on learning, project-based activities and field trips specifically designed to reinforce the day school curriculum can strengthen after school time. If this transition is made effectively, after-school time will represent a unique opportunity for all learners. "A carefully planned and executed academic component of an afterschool program is one way to ensure success, but it is not guaranteed if quality materials and well-trained staff members are not used" (Fashola, 2002, p. 60).

In the United States, student achievement in science is alarmingly low. According to United States Department of Education's National Assessment of Education Progress (NEAP), assessment of science knowledge showed alarming results. Less than twenty percent of all students tested at the 12^{th} grade level during the year 2005 fell into the

category of proficient or advanced proficient. Thirty-nine percent of all students in large urban areas person at or above the NAEP basic level (NAEP Assessment Results, 2005). This is a dismal showing of basic student competencies in science.

Focus of the Study

During the past eight years, the Progressive After School program (PAS) has grown to be the largest, academically based, after school program in the district. The program presently lists over fifty academically based after school opportunities for participating students. PAS has over three hundred full and part-time members. Through parent participation, grants and vouchers, the Progressive After School program offers out-of-school time not only to students enrolled in the host school, but to students from local parochial and public schools throughout the city. To date, tutorial, enrichment and support programs are available in English language arts, mathematics, fine arts, computer technology and physical fitness. Support services are also offered.

This year, the Progressive After School Program, (PAS), will expand to include science instruction through the use of present after school teachers. This addition is one of many that generate more flexible programming necessary to provide a variety of activities and services for young people (Lombardi, 2003). "Afterschool programs give the time to investigate topics more deeply and participate in hands-on projects" (Afterschool Alliance, 2007, p. 1). The addition of this subject should introduce students to increased opportunities to study science in a different way. Afterschool teachers are often asked to teach a subject for the first time, to be supported by different models of professional development or to receive no support at all. Appropriate professional

development is essential to the development and implementation of effective programming. Olatokunbo Fashola states "regardless of the goals of the afterschool program, if the staff members are not properly trained to implement the program well, it is doomed to failure" (Fashola, 2002, p.64). The menu of professional development items offered to teachers in the PAS program differs not only in the content, but the method of delivery as well. This will allow the researcher to examine the impact of each of the different forms of professional development on the instruction of science in after school. Participants in the study will use intervention, self–initiated or district-based professional development.

To date, the PAS program has been a successful addition to the Morning View School. Since 1999, the program has grown from a participation rate of less than five percent of the student population to more than forty percent of all students registered at the school. Although the PAS program has a significant number of activities and services, little time and energy has been devoted to science. According to the Nation's Report Card – Trial Urban District Assessment Report, "The percentage of students in Boston who performed at or above the NAEP Proficiency level was 10 percent in 2005" (Statistics, N. C. F. E., 2005, p. 1).

The Massachusetts Department of Education reported that more than twenty-five percent of all Massachusetts high school students did not pass the most recent MCAS science exam (MADOE, 2007). The Massachusetts Department of Education further indicates that the class of 2010, needing to pass one of four science tests, struggled with new requirements. Since the inception of state mandated tests in science, its instruction

has become more important. Therefore, in Massachusetts, additional science instruction, particularly during extended learning time is more necessary than ever before. This perceived need for further science instruction is one of many reasons for the focus of this study.

This study records and reviews the responses of the teaching staff to the new after school science program, and reviews whether changes will lead to making and implementing changes in their own instructional practice. It will specifically look at why and how teachers' instruction was affected by teaching within the new science program. Teachers will explore new and different methods of teaching science by utilizing available technology and by accessing the human resources found in community specialists. They will then look for opportunities to incorporate new methods of delivery into how they teach science during after school time.

Significance of the Study

The development of meaningful academic instruction in PAS has been an evolutionary process. This study is the first attempt at adding science to the after school academic program in both a creative and new way. Hands on instruction, field trips, discussion and journaling are just some of the opportunities students will have to express their interest in and demonstrate their knowledge of science. This study seeks to actively engage students in multiple learning experiences through supporting teachers to examine and use new practices.

Different kinds of supports are needed for strong extended day learning programs where students of all ages can not only succeed academically, but also grow physically, socially and emotionally (NIOST, 2005). Children, learn in many different ways and from many different experiences. After school programs offer additional opportunities to learn that may not be found in regular classroom experiences. These learning opportunities may attract students that are currently unsuccessful in school as well as those students who presently flourish.

Research conducted by Wellesley Centers for Women indicate that project-based activities focused on science instruction peak human curiosity (NIOST, 2005). Through exploring different scientific topics, students can have the opportunity to use various instruments, plan experiments, observe and record findings and communicate their newly acquired knowledge to others. Soon, the greater recognition that science is all around them will further enhance their own inquiry process.

Another reason lending to the importance of science education through out of school time (OST), is the dismal progress students have made within the United States on the National Assessment of Student Progress, 2005 Science Report. "Most states showed no improvement at grades 4 and 8" (Statistics, N. C. F. E., 2008, p. 2).

A third reason is growing need for engaging students in hands on experimentation. Through participation, students should be able to carry out "scientific investigation, including asking questions, deciding what to measure, developing measures, collecting data from the measures, structuring the data, interpreting and

evaluating the data, and using the empirical results to develop and refine arguments, models and theories" (Duschl, 2007 p. 39).

There is a wealth of research that indicates the necessity of changes in the current practices involved in science instruction. This kind of change in practice can only come from focused and ongoing professional development. Each of the elements of purposeful science instruction stated above underscore the need for careful evaluation of and possible changes in the methods of delivery used in professional development.

Theoretical Rationale

The theoretical rationale for this study is based on historical concepts and current best practices in after school programming. This study will focus on how the role of after school programs have changed over time, as well as the question how after school re-design can better meet the needs of students. It will also look at both professional development and strong instructional practices in after school time. More specifically, this study will focus on the teaching of science in an after school setting. Lastly, it will investigate the current thinking on and effectiveness of the models of professional development currently in use.

For the purposes of investigating the questions of this study, a special focus will be placed on intervention, self initiated and district directed professional development. Research will be organized to ask a series of questions.

A. How has the role of after school programs changed over time?

As the demand for out-of-school time services becomes greater, the expectation and demand for quality instruction will see at least a proportional if not greater increase. With more women entering the workforce, diminishing availability of afternoon adult supervision and an increased focus on improved academic performance, Out-of-School Time (OST) is now being looked upon as a valuable opportunity to provide additional hours for students, particularly struggling learners, to access the curriculum and experience success.

Historically, after school personnel known as providers, childcare workers, instructor teachers, youth worker teachers and even recreation specialists have taught programs. Certified educator or master teacher qualifications are rarely, if ever, mentioned. The roles and responsibilities of out-of school positions were aligned with youth developers rather than education specialists. After school communities are now being considered as a possible extension of the school day, thus becoming a more important learning environment. Students may receive tutorial help designed to help learn basic skills, participate in enrichment opportunities such as music or art lessons, or participate in cultural or social activities. Extra time often gives students the opportunity to look at the world through a larger lens that connects what they are learning to their own purpose and their own future (Hill, 2008).

The Charles Stewart Mott Foundation funded "A New Day for Learning" (2007), a report from the Time, Learning and After School Task Force. This task force examined extended day, after school, community efforts, and mentoring as they relate to new ways of looking at organizing and structuring learning time. Their findings indicated that

educators are no longer constrained by school days and the school year. Creative approaches and applications can dramatically change the way we think about and structure instructional time (A New Day for Learning, 2007).

According to Milton Goldberg, former director of the United States Department of Education's Office for Research, "Learning must become a seamless process that encompasses the entire day and year, helping young men and women develop a genuine range of skills and abilities…. And we have to take that step now if our country is to succeed in a global society" (Elling, 2007, p. 12). Effective use of afterschool time is a central part of ensuring the future success of our students in the global marketplace. After school programming is expanding the definition of learning time and methods of delivery used to accomplish its goals. Simultaneously, "after school activities have the potential to counteract the effects of a range of factors that contribute to urban children's lack of opportunities and underachievement" (Butty, 2001, p.24). This present view and role of after school time is radically and fundamentally different from those held less than a decade ago.

B. How can after school classes be redesigned to better meet the needs of students?

Cappella & Larner, co-authors of *America's Schoolchildren: Past, Present and Future* (Capella & Larner, 1999) compare children of the 1900's to those living in the 1990's. Cappella & Larner feel that there is a fundamental shift in the perception of children during this time frame. In the year 1998, there where thirty-nine million children ages five to fourteen, accounted for in the United States census data. This

increase represents more than double the entire population of the United States at the turn of the previous century (Capella & Larner, 1999).

In October 2006, the United States Census Bureau calculated 40,203 million children in the same age range (Government, 2008). During the 1960's, the majority of children, nine out of ten, lived in household that included two parents. Thirty years later, this figure had dropped by more than twenty percent.

Childcare has become a major necessity for both working parents and parents who seek additional educational services for their children. Yet, childcare for all children must not only be considered an educational opportunity for a child, but a place where parents can receive the benefit of knowing their children are safe (Lombardi, 2003).

Free of the institutionalized roles of regular schools that make change occur slowly, after school programming may be better able to develop, adapt, and adopt their practice and policies. After school programs have the potential to become places where students are in a safe environment, additional student services are made available, where extra time to learn can be addressed, and where an opportunity to learn in different ways can become a reality.

To make the most of the professional development available, there must be an accurate inventory of skills learned, and there must be an acceptance of a period of transition and development. Progress must be viewed as working towards the achievement of the stated goals. It will also require re-evaluation of present personnel roles and budgeting to provide the additional services that are necessary.

The teaching staff will have to take on additional responsibility for their own learning as well as the students serviced. Their traditional after school roles as care provider will have been usurped by the goal of improving and supporting academic achievement. They will also have to be open to new ways of delivering curriculum and to try in earnest to implement those changes learned from their professional development.

Students will have new and exciting activities in which to participate that are directly connected to the content they will be required to know. They will have instructors who are motivated and dedicated to making the time of after school filled with learning, exploration and investigation.

C. What does the literature say about professional development?

The purpose of this study is to look at the different forms of professional development and investigate how each form can contribute to teacher learning. "If they are to help students reach national and state standards in science, teachers will need substantial supports in the form of better pre-service training, as well as professional development that will bolster their knowledge of the science they teach" (Duschl, 2007, p. 300). It is by having and effectively using all forms of professional development that the greatest improvement can be made across the board within a school

Professional development in any form is designed to improve the pedagogy or content area knowledge of an instructor. While this is essential to the implementation of good teaching practices, "few school districts provide teachers with curricular-based institutes, mentoring and coaching, and opportunities for examination of and reflection on

classroom practice required to deepen their subject-matter expertise and pedagogical content knowledge" (Duschl, 2007, p. 313). Teachers understand what resources are available and seek out options (Brochu, 2004). Options can be delivered as a one time workshop or be a part of an ongoing collaborative process. There are three different types of professional development used by teachers in the PAS After School Program. All three forms of professional development are utilized to improve teacher learning.

Intervention professional development provides direct classroom access, support and information in the form of a guest instructor. The Urban Ecology Institute under the sponsorship of Boston College provides this form of professional development. Two teachers have participated in this form of professional development. At this point in time, one remains.

Self-initiated professional development draws its focus, content and goals from the desires, strengths and needs of the teaching professional. This type of professional development can be supported by prior knowledge and interest in a content area. They must have a firm foundation in the basic elements of their chosen field for development to be able to effectively improve their practice. One of two teachers using this approach possesses a strong background in mechanics and electronics through career experience and is able to engage in this form of professional development. The other teacher has little foundation of science education, and will rely on self-directed professional development for self-improvement. Self directed professional development includes a desire to improve your practice and student learning. It is this desire that serves as the

motivator for engagement in the process of professional development (Grootenboer, 1999).

Many districts "continue to rely on stand-and-deliver, one shot workshops, and menu-driven conferences and conventions. While most of them acknowledge that the transfer of new skills and knowledge into practice requires more than what they are providing, too few teachers have access to the kinds of learning opportunities they need" (Duschl, 2007, p. 314). Yet, district directed professional development compared to intervention and self initiated forms of professional development, is often the most structured, best supplied and encompasses a wealth of information. While it often lacks direct classroom support, because it is solely content driven as opposed to practical implementation, it is an efficient way to increase content area knowledge. One member of this study receives district directed professional development. This series of the public schools' workshops are designed to introduce kits and activities for classroom use. This form of professional development is more instructional in nature than the other forms mentioned above.

Each form of professional development serves a purpose. Teachers are as varied in their needs and abilities as the students they teach. Furthermore, the needs of an individual change over time. For example, there are some for whom a self-initiated form of professional development would lead to frustration and confusion, the exact opposite of what professional development seeks to provide. For them a district directed kit implementation workshop might be the best and most effective form. Intervention professional development allows someone with little or no experience in the target area to

make rapid improvements in content knowledge and implementation. By examining how each of these forms fit into and integrate with career long professional development, more informed choices can be made regarding what types of professional development are needed to improve science instruction in the PAS program.

Teachers in the after school program are highly committed to improvement (Brochu, 2004). Teachers within a program understand the instructional goals, and understand the need for trust and efficacy among all staff members. "Collaborative professional development results in curriculum that is tightly mapped to standards – well designed and well sequenced" (Brochu, 2004, p. 13). The National Institute for Out of School Time at the Wellesley Center for Women suggests that there must also be appropriate training for OST workers, particularly in core competencies essential for those who work with OST children (Dennehy, 2005). An example of such training is the Youth Development Associate (YDA) program currently being piloted in Boston. The competencies that are stressed in this and many other training programs for afterschool workers is on monitoring and managing behavior. However, while these programs do train additional staff workers for after school programs, the program's goals do not generate individuals who are knowledgeable about curriculum development, proactive behavior management, or strategies for working with special needs students. Consistency among after school staff is often varied. If after school programs are to be a place where additional opportunities to learn and opportunities to demonstrate learning are provided to all students, there must to be a fundamental change in the way after school programs and service providers are viewed, utilized and evaluated (Dennehy, 2005).

The year 2008 and beyond promises to place science in a more prominent position in the minds of educators. Science, as an important and evaluated subject, now joins the ranks of English language arts, and mathematics. No Child Left Behind will add science to the list of mandated subjects tested by all districts. The Massachusetts Department of Education MCAS Science test requirement has also been added to graduation requirements (MADOE, 2006).

With the added emphasis, there undoubtedly needs to be more focus on the discussion of and implementation of professional development in science instruction, both in terms of direct instruction and inquiry based learning. However, controversy still exists over whether direct instruction or discovery learning promotes better scientific reasoning skills and student outcomes (Cavanaugh, 2007). Direct instruction is less costly and often uses science textbooks in teaching while cooperative learning and hands on methods of instruction require a laboratory approach to learning.

When moving from a behaviorist to a constructivist approach in teaching science, the role of the motivated, active learner takes on a different form. From a strict behaviorist point of view, the individual teacher is responsible for delivering information and assessing its retention and usage on the part of the students. In this model, the administrator's role is focused on evaluating the delivery of direct instruction. In a constructivist model, the teacher becomes a facilitator and developer of relevant discourse (Marzano, 2003).

There is a great deal of literature on the teaching of science, however there is not an equally large amount of agreement on best practices. When looking at trying to

improve science instruction in PAS, the approaches will be used and investigated. By investigating and cataloging the changes in teaching practice in PAS following each of the three forms of professional development, additional insight into proper design of an effective professional development plan can be reviewed. This information could then be used to develop a plan for professional development that would be sensitive to the needs of teachers and thereby provide the greatest benefit for the students they serve.

Design of Study

Merriam states, "The key philosophical assumption…upon which all types of qualitative research are based is the view that reality is constructed by individuals interacting with their social worlds" (Merriam, 1998, p. 6). To effectively implement and conduct qualitative research, Merriam's five characteristics must be utilized. They are as follows: "The researcher must be interested in understanding the meaning that people have constructed…the researcher is the primary instrument for data collection and analysis…it involves fieldwork…employs an inductive research strategy…and its product is richly descriptive" (Merriam, 1998, p. 6,7,8). There has to be a deep knowledge and understanding of the subjects and their individual and collective histories. The relationship between the researcher and the subjects is far more involved and intimate than in quantitative research. This qualitative case study design is based on grounded theory in which the "investigator, as the primary instrument of data collection and analysis assumes an inductive stance and strives to determine meaning from the data" (Merriam, 1998, p. 17). The study seeks to assess the changes in understanding and

perception of teaching in an after-school program on the part of a sample group of teachers teaching science. Due to the nature of the research, the study group to be examined was chosen through a non-random selection process.

The sample will consist of five teachers within the school and the after school program. Before starting the project, group and individual interviews and teacher surveys will be developed to assess the following characteristics: level of understanding about the science curriculum, scientific content knowledge, and current ability to implement the existing science curriculum in a new way. A set of pre-determined close-ended and open-ended questions will be given to all participants. The data for a qualitative study often takes the form of "participant's own words, direct citations from documents and excerpts of videotapes" (Merriam, 1999, p. 8). When collecting and evaluating data in this form it is necessary to establish a baseline and obtain an accurate character and skills map for the sample group. This initial collection of data will provide the reference point from which to gauge changes in both perception and practice.

Participation by members of the sample group is completely voluntary. Permission from all participants, the Progressive After School (PAS) site director(s), principal of the school where the data are gathered, and any sponsoring institution will be obtained prior to the beginning of data collection. All written consent will be gathered before the onset of this study.

Complete confidentially and anonymity surrounding and protecting each human subject in this research study is, and will continue to be upheld. All participants will be included in a Human Subject Review by faculty and staff at Boston College. After a

significant review by the Human Subject Review Board, basic guidelines will be set and discussions will take place between both researcher and participants. Participants may decline to participate at any time. Complete assurance will be given that declining to participate will not, in any way, be consequential.

This study will draw from three sources of information to generate a data set. The three sources of information are interviews, journals and observations/field notes.

Interviews

Interview questions were piloted with two science teachers who were not participating in the core portion of this study. Although teachers in the original pilot chose not to participate due to time constraints, their discussion provided an opportunity to evaluate and modify interview questions for clarity and content. Through this review process, questions were added to the interview instrument for use in interviewing selected participants. Pre and post interviews were conducted with each instructor in the sample group. This data will permit the tracking and evaluation of the changing perceptions and practices over the course of the study. Interviews will be semi-structured with a mix of both open-ended questions and pre-determined questions. Interviews will be recorded and subsequently transcribed for accuracy and coding purposes**.**

Journals

A written journal will be kept by each teacher for personal reflection. They will record their observations, both anecdotal and formal, about the entire process. Teachers will be asked to write weekly reflections in their journals. Time for journal entries will be

provided each week. Teachers will be compensated for their time. This will help track the incremental changes that occur in attitude towards and ability to work with the existing and evolving science curriculum in after school. Journals will be kept for the purpose of the measurement of changes in practice for science instruction in after school time. Written prompts will be given to each participant.

They will include, but not be limited to the following questions:

1. Why were you interested in participating in this project?
2. How has your attitude about teaching science changed from the beginning of the project?
3. Describe the benefits, if any, you see in adding science to the after school program.
4. What is your perception of student interest after the initiation of science instruction within the project?

At the end of the project, all journals will be reviewed by the researcher and coded with appropriate codes. Common and enduring themes will be examined.

Observations and Field Notes

Observations will be used to measure perceptions and understanding in day and afternoon science programs. These observations will be conducted by the researcher and will occur at preplanned intervals throughout at the beginning, middle, and end of data collection. Each observation will be followed up by a de-brief meeting, These meetings will be unstructured, informal and exploratory in nature. During this time, the researcher

will introduce and discuss the new pedagogy, curricular tools, and information provided by professional and university partners. These meetings will also serve as a forum to express and discuss the teachers' questions and concerns. The researcher will record data through journals, tape recordings and transcripts. Data will be transcribed by a professional stenographer and approved for accuracy by all participants.

This study will use direct interviews with the sample group members to obtain their thoughts on specific questions relevant to the study. The journals kept by participating teachers and students will serve as the source documents for information. Finally, field notes and taped recorded interviews and observations will serve to record the interactions of the study sample group. It will be from these sources that data will be triangulated. All data will be aggregated and checked for agreement with the findings from the collection of observations, interviews and questionnaires. This will create triangulation for collected data.

Research Questions

This study is designed to answer the following questions:

- What are teachers' perceptions of how involvement in teaching a new science program affected teaching practice in the after school program?
- How do teachers perceive the three models of professional development--intervention, self-initiated, and district directed - contributed to teacher learning?

Limitations of the Study

Researcher bias is one of the most significant limitations. The main tool to counteract the influence of researcher bias is to take as objective field notes as possible.

When making observations, the data collected are not about what the researcher thinks and feels, but rather what is occurring. The process of making meaning from data will be undertaken during interviews and meetings. In so doing, the infiltration of researcher bias can be reduced. "The qualitative researcher runs the risk of identifying with one or more participants or being judgmental towards others" (Gay & Mills, 2006, p. 423). The researcher's challenge is to be aware of this limitation.

Time is a limitation in that the study is conducted over an eight month period. Limitations also include the single site and small sample size due to the size of the after school program and the availability of only five teachers at the site. A small highly detailed study can develop limited generalizations, which can be corroborated by analysis of the artifacts; however, the sample does not provide adequate information for replication and thus cannot be generalized to other schools. The information obtained through this study can, however, is used to inform the development of similar processes to increase teacher capacity.

At the conclusion of the study, the researcher will document findings through a detailed description and explanation of the study. The interviews, observations and journals provide an invaluable lens to the possibilities for further after school studies.

Definitions of Terms

PAS – Professional After School Program – Pseudonym used for actual name of large urban after school program.

Professional development – Individualized training for members of the teaching staff.

Effective learning communities – Teachers who are committed to student improvement through working together to better understand student needs.

Out-of-School Time, (OST) – The hours beyond the regular school day.

NAEP – National Assessment of Educational Progress

Chapter Two

Review of the Literature

Introduction

The connection between home and school is essential to the implementation of curriculum goals and student success. One of the main challenges plaguing after school programs is they often focus on being a place where children can congregate safely rather than a place where children can learn and explore a variety of activities. The rise in after school programs has been, in part, due to the added need in supervision leading to a decrease in engagement of antisocial or destructive behaviors (Fashiola, 2002).

Essential questions to ask are:

- How has the role of after school programs changed over time?
- How can after school classes be redesigned to better meet the needs of students?
- What does the literature say about professional development?

Historically, after school providers, childcare workers, instructor teachers, youth worker teachers and even recreation specialists have taught programs. Rarely, if ever, have certified and qualified teachers been mentioned as after school providers even though there has been an increase on improved academic performance at both the national and state levels. Creative approaches and applications can dramatically change the way we think about and structure instructional time.

In addition to parental needs, there has been additional pressure placed on after school programs to increase access to learning time. The average hours spent on learning time of the average American child is approximately only twenty percent of their time (Afterschool Alliance, 2007). This alarming statistic, coupled with the need for after school care creates an opportunity for after school programs to be both supportive of the educational community's needs and supportive of opportunities to learn in a different way particularly in the area of science.

The primary institution in the lives of American children is school (Dryfoos, 1994). According to Milton Goldberg, former director of the United States Department of Education's Office of Research, "Learning must become a seamless process that encompasses the entire day and year, helping young men and women develop a genuine range of skills and abilities…And we have to take that step now if our country is to succeed in a global society" (Elling, 2007, p. 12). After school programming can become a central part of the future success of our students in the global marketplace.

In the state of Massachusetts, the Massachusetts Department of Elementary and Secondary Education requires state mandated tests in science. Therefore, in Massachusetts additional science instruction, particularly as science has become an integral part of graduation requirements, is necessary. The regular school day does not hold enough time for all children to learn what they need to learn (Dryfoos, 1994). Researchers agree that a cookie-cutter approach to after school programming does not work (Dryfoos, 1994; Halpern, 2003; Hill, 2008). It is imperative that directors know

their audience, available resources and need at the site level before undertaking a redesign.

In a 2007 plan entitled, *A Blueprint of Action,* created by the Coalition for Science After School, critiqued exemplary programs and promising program efforts. Their charge called to "Provide engaging and intellectually challenging programs, curricula, and activities, build staff capacity and (to) develop appropriate assessment and evaluation measures" (Exploratorium 2007, p. 10).

How has the role of after school programs changed over time?

While public education holds a long and rich history, the history of after school programs, or extended learning programs, is very limited by comparison. *Building Effective After School Programs,* by Olatokunbo Fashola, points out that there are many reasons for which children enroll or are enrolled in programs that extend the school day. These programs are a necessity for some children who need extra time to learn and for parents and guardians who need their children to be at a location that offers appropriate supervision. Parents also desire that a variety of enrichment opportunities be available for their children (Fashola 2002).

During the past two decades after school programs have become ubiquitous, and the concept itself commonplace. A variety of programs offer children and their caregivers supervised activities, enrichment opportunities and, in many instances, the time needed to improve academic achievement (Fashola, 2002). Ms. Fashola, a leader in the after school movement, was quoted as saying, "All too often, extended day programs, expected to increase basis skills end up instead as enrichment at best, baby sitting at worst" (Fashola,

2002, p. ix). As the demand for out-of-school time services becomes greater, the expectation and demand for quality instruction, using a variety of delivery methods, will see at least a proportional, if not greater, increase. Extended learning time and after school programs have become elevated in importance since the implementation of high stakes testing. This change in perception and application reflected a need for development of strong critical thinking skills, and to counteract a genuine lack of enrichment opportunities, particularly in high poverty areas. In many instances, this demand requires that students be offered more than simple supervision and enrichment; they require additional time to learn.

Another desire is for school programs, including after school, to serve the needs of the whole child (Fashola, 2002, Dryfoos, 1994). Not only do parents expect children to be enriched, educated and encouraged to be community contributors, they expect to receive additional support. In some instances, schools offer a range of support services for children and their families. These services often include social/emotional support groups, psychological testing, drug and alcohol awareness programs and an array of parenting classes (Dryfoos, 1994).

More women have entered the workforce thus creating a diminishing availability of afternoon in-home adult supervision. This has made it increasingly important to connect families with services at all levels for after school hour's care. The National Institute on Out-of-School Time (NIOST) looks at after school time as a valuable opportunity to "fill the gaps in communities" by providing the much needed link between family and school (NIOST, 2005). Programs not only provide additional hours for

students, particularly struggling learners and English language learners, to access the curriculum and experience success, but can, in some cases offer health connections, social services and youth development (NIOST, 2005). This is a definite shift of the historic view of afternoon care from being available as a solution to the lack of adult supervision at home, to that of a vehicle advancing academic and social concerns. Interestingly though, the busy work schedules of parents is reported to be one of the greatest impediments parents have to being engaged in afterschool activities with their children. Over 28 million children have parents who work outside the home. This statistic on its own is not necessarily of concern, but the Afterschool Alliance reports that "as many as 14 million "latchkey children" go to an empty house on any given afternoon" (NOIST, 2005). Today, time is critically important to all families. Afterschool programs help to make a better connection between the families they serve and the opportunities children need (Kakli, Kreider,Little, Buck, Coffee, 2006).

Many parents feel that the safest place for their children is home (Cassell & Cramer, 2008). This would likely be the case if there were adequate supervision at home, however, most children arrive to a home that will be empty for many hours. It is for this reason that many parents continue to look for affordable ways to keep their children in a safe environment while they work. It is out of that direct parent concern that safety continues to be a factor in after school programming.

Parents also use a variety of monitoring strategies by "community-bridging" (Jarrett, 1999). This community-bridging includes the monitoring of a child's time, the circle of friendships made during this time, and most importantly, the space they occupy.

"No one recognizes better than inner-city parents how pervasively the neighborhood around them shapes the lives of young people" (Jarrett, 1999, p. 2). In addition, "inner-city neighborhoods now provide limited economic, institutional and social resources for the families and adolescents living there" (Jarrett, 1999, p. 2).

After school programs in the United States have been driven to change and develop because of three major concerns. These concerns are economic, educational, and societal shifts. The following changes and beliefs have occurred during the past century. Krugler states there are three changes. They are:

a. A shift in employment patterns

b. All children can learn

c. Patterns of youth crime and victimization (Kugler, 2001, p. 4-5)

Ms. Kugler's study also focused on afterschool programs and the national effort to close the achievement gap by giving children more time to learn. "Extended-day programs, with homework help, poetry, and chess clubs, drama programs, field trips, and reading tutors, provided the extra learning opportunities needed to help close the achievement gap" (Kugler, 2001, p. 4).

Up until recently, after school personnel have been known only as providers, childcare workers, instructor teachers, youth worker teachers and even recreation specialists. In most cases, limited experience or education was necessary. Certified educator or master teacher qualifications were rarely, if ever, mentioned. The roles and responsibilities of out-of school positions were aligned with youth developers rather than education specialists.

Now, after school communities are being considered as a possible extension of the school day. This change in perspective turns after school programs into important learning environments. Students may receive tutorial help designed to help learn basic skills, participate in enrichment opportunities such as music or art lessons, or participate in cultural or social activities (Fashola, 2002). Extra time often gives students the opportunity to look at the world through a larger lens that connects what they are learning to their own purpose and their own future (Hill, 2008). The Charles Stewart Mott Foundation funded "A New Day for Learning" (2007), a report from the Time, Learning and After School Task Force. This task force examined extended day, after school, community efforts, and mentoring as they relate to new ways of looking at organizing and structuring learning time. Their findings indicated that educators are no longer constrained by school days and the school year. Creative approaches and applications can dramatically change the way we think about and structure instructional time. According to Milton Goldberg, former Director of the United States Department of Education's Office for Research, "Learning must become a seamless process that encompasses the entire day and year, helping young men and women develop a genuine range of skills and abilities…. And we have to take that step now if our country is to succeed in a global society" (Elling, 2007, p.1). Effective use of afterschool time is a central part of ensuring the future success of our students in the global marketplace.

Another change in focus is looking at after school programming through the lens of child development. Children between the ages of six and fourteen are experiencing a transformation in their ability to reason as well as their physical development. Part of

this development includes the normal distancing from parents to others in the community. "Out-of-school programs can play a role in this distancing process" (Eccles, 1999, p. 39). Packard also states that additional focus on developing a safety zone, fostering individual growth, providing leadership opportunities and activities that promote high effort will promote effective after school programming (Eccles, 1999).

Cappella & Larner, co-authors of *America's Schoolchildren: Past, Present and Future* compare children of the 1900's to those living in the 1990's. Cappella & Larner feel that there is a fundamental shift in the perception of children during this time frame. In the year 1998, there where thirty-nine million children ages five to fourteen, accounted for in the United States census data. This increase represents more than double the entire population of the United States at the turn of the previous century. In October 2006, the United States Census Bureau calculated 40,203 million children in the same age range (Government, 2008). During the 1960's, the majority of children, nine out of ten, lived in household that included two parents. Thirty years later, this figure had dropped by more than twenty percent (Cappella & Larner, 1999).

Another significant difference in after school experiences lie within the geographic area surrounding the home. During the middle of this century, children were able to move around freely within their community. Children moved about their neighborhoods meeting new neighborhood friends, exploring the surrounding community and expanding their own worldview in relative safety. Families lived in close proximity to each other and children knew their neighbors. Today, neighborhoods look much

different. “Children today grow up surrounded by experiences and influences that differ sharply from those that operated earlier in the century” (Cappella & Larner, 1999 p. 25).

Today, poverty rates continue to be high, particularly in urban settings. Even with the increase of two-parent incomes, high poverty still exists (Government, 2008). This, alone, causes a greater need for after school opportunities. “Opportunities for children to express themselves and nourish their own talents are disproportionately absent for children in low income families, particularly for children of color” (Moldow, 2007, p.13). A recent study conducted by the Harvard Family Research Project/Harvard Graduate School of Education found that “children from low income families and from ethnic minority backgrounds participate less in structured OST activities than their higher income and White counterparts” (HFRP, 2007, p. 1). Harvard also found that youth from low- income families participated in programs that offered tutoring and that “youth with academic deficits should continue to be a focus for youth workers and other OST stakeholders” (HFRP, 2007). This study also found there were fewer opportunities for children to participate in high quality OST programs in poor or dangerous neighborhoods, making an argument for strengthening services provided in high-poverty areas. Jeffrey Nellhaus, Massachusetts Acting Education Commissioner, stated: “To do our “new job” right, we must improve before and after school care” (MADOE, 2008).

As after school programming continues to evolve over time, each of these arguments will need to be addressed. After School programs and providers must remain adaptable and reflective to meet the changing needs of its community. There is at present

a discord with regard to the desired outcomes of those in after school implementation and the actual observed outcomes found by research.

How can after school classes be redesigned to better meet the needs of students?

The primary institution in the lives of America's children is school (Dryfoos, 1994). Children who need greater attention than the school day offers can find refuge following the structured school day in afterschool time. The regular school day does not hold enough time for all children to learn what they need to learn (Dryfoos, 1994). The responsibility then falls to effective extended day programming. Robert Halpern, author of *Making Play Work*, defines after school programs as having a story that "has been partly one of struggle to define an educating, socializing and identity-shaping role in relation to that of other institutions, notably children's families, the schools, and the streets" (Halpern, 2003, p. 5). If we are able to redesign afterschool programming not only to better meet students' core academic needs by being able to offer extra time to learn, but also to foster effective collaboration with neighborhood community organizations, mental health services and support services, including teachers, to better provide support for those at particular risk, after school programming will be able to meet its goal of improving student achievement.

Researchers agree that a cookie-cutter approach to after school programming does not work (Dryfoos, 1994; Halpern, 2003; Hill, 2008). Redesigning after school depends on first knowing one's audience. In addition, the stakeholders must seek comprehensive answers to a variety of difficult questions which include the following:

1. Does the program meet the needs of low-income families?
2. Are there opportunities for children to grow socially, physically and psychologically?
3. Are there opportunities for children to participate in sports and lessons?
4. What other enrichment opportunities are offered in the community?
5. Does the after-school space offer safe places to play, work and talk?
6. What full service resources can be offered during after school time?
7. What professional development opportunities are available for staff?

These questions underscore the importance of doing a close evaluation of the needs and available resources on the site level. The answers to these questions will frame the discussion that ultimately leads to the development of an appropriate plan of action.

William White, President and Chief Executive Officer of the Charles Stewart Mott Foundation, remarked on the importance of quality after school programming during his July, 2005, Foundation Address. He said, "There is no single formula for a successful after school program. The most effective after school programs reflect the needs of the young people they serve, and the resources available within a community to address those needs" (White, 2005, p. 6). After school programs provide a safe haven for all students, but in addition it has been found that students who frequently participate "make better grades, complete more homework, and have less absenteeism and tardiness" (White, 2005, p. 6). White continued, "it is not just about after school. It is bigger than that. It's about what all our kids need from us if they're going to unlock their potential" (White, 2005, p. 7). After school programs are often viewed as something a little extra,

not as central to the functionality of the system. White puts forth an analogy that challenges the notion that after school is the "frosting on the cake of education" with the assertion that afterschool is the "yeast in the bread". "Indeed, just as the yeast helps the bread to rise, after school and other forms of productive activity help students to grow; they help excellence to rise through learning" (White, 2005, p. 8). This change in perspective necessitates a change in the way after school programming is planned and implemented. After school programming can no longer be viewed as an extra, it must now be seen as an essential.

The focus of after school programming must always be a fully developed education. For some students this is additional time to learn, while for others it is access to support services to allow them to fully access their education. To this end, after school classes and services can be adapted to meet student needs that are often left unaddressed during the regular school day. "Good after school programs include health, nutrition, and physical activities, the promotion of literacy (both reading and computer knowledge), the arts (music, art, drama), nature, the immediate community, and the larger world" (Lombardi, 2003, p. 111). Lombardi's vision is for after school to be more full service for all children; the creation of flexible programming that focuses on interest while maintaining a strong emotional and social climate. While the parameters which define the needs of the community of learners changes and the services and opportunities provided must change respectively, it is the commitment to flexible programming that it sensitive and responsive to a community's changing needs that is essential to high quality afterschool programming.

Joy G. Dryfoos points out that "the educational institution's first order of priority is to ensure that all children gain the basic skills required for full participation in our society" (Dryfoos, 1994, p. 5). Although her book, *Full-Service Schools*, focuses on support services in school, Dryfoos points out that multi-component programs that are the most successful are more holistic. They serve and address the full range of concerns that effect a child's readiness and receptiveness to instruction. This research is directly transferrable and applicable to after school programming. Outside services in a full service environment can include student counseling, parent education, health, before school activities, after school activities and skills surrounding employment (Dryfoos, 1994). Dryfoos points out those family services, often considered "add-on" services, are not part of an integrated plan for improving student outcomes. If developed as part of a cohesive plan, these services will allow the students to be more prepared and better able to access activities, learning experiences and needed services. By addressing the stumbling blocks for students to accessing their education, students are given an opportunity to learn and to demonstrate learning. Providing support services in conjunction with traditional academic enrichment ensures that students whose prospective outcomes may have been limited, now have a real possibility for improved student learning outcomes.

Lombardi points out that "good after school programs are not just about filling children up with activities and things to learn; they are about taking the time to listen and talk, to encourage and motivate" (Lombardi, 2003, p. 113). Interaction with a variety of caring adults and peers is also essential in helping a child make further connections to the

larger world outside his/her own home. Starratt also points out that ethical relationships and personal commitment are also important (Starratt, 2004). By developing healthy relationships and modeling the maintenance of said relationships, the work is seen by all stakeholders as being more genuine and relevant. It is not about superimposing a program on a community it is about truly listening to the needs of the community and forming a meaningful and rigorous relationship.

Lombardi, like Dryfoos, sees a need to promote not only emotional health, but physical health through physical activity and nutrition. "After-school programs have to start with a strong commitment to health and nutrition" (Lombardi, 2003, p. 112). We have to make sure that we are covering the basic physiological needs in Maslow's hierarchy of needs before we can hope to address the deeper emotional and academic needs.

America's Promise Alliance, led by founder Colin Powell along with over forty trustees and nearly one hundred corporate alliance partners, created a *Five Promise Vision* (Alliance, A.P., 2006). The organization's vision encompasses five promises for every American child. These promises focus on turning "failure into action" (Alliance, A. P., 2006, p. 3). The five areas of promise listed by the America's Promise Alliance areas as follows:

The Alliance believes that a child must have:

1. Caring adults who are actively involved as parents, teachers, mentors coaches and neighbors
2. Safe Places that offer constructive use of time

3. A healthy start and healthy development
4. Effective education that builds marketable skills
5. Opportunities to help others by making a difference through service

(Alliance, A.P., 2006, p. 4)

Nearly a decade has passed since the first summit, yet the challenges remain the same. According to their research, over fifty percent of students of color and twenty-five percent of all students fail to complete high school on time, only thirty percent of eighth grade students are proficient in mathematics, and the United States finished next to last in the "child well-being" category in twenty-one developed nations as reported by UNICEF (Alliance, A.P., 2006). These facts indicate that present methods are not successful at providing for the needs of America's children. Members of the Alliance believe that children who experience at least four of the five promises listed in their vision are more likely to succeed "academically, socially and civically" (Alliance, A.P., 2006, p. 5). Further expansion and redesigning of after school programming has the potential to better meet the learning needs of students.

Better meeting the needs of students is not simply about increasing access to afterschool programming; it is about providing relevant programming to those most in need. Extended day services provided by schools increased between 1988 and 1994. "The proportion of public school reporting extended day programs increased from 16% in 1988 to nearly 30% in 1994; the proportionate of private schools with programs increased from 33% to 48%" (Dryfoos, 1994 p. 9). While there was a definite increase in both public and private sectors, Joy Dryfoos's research found that extended day programs

were more common within elementary school settings and although important in the elementary setting, the greatest potential for afterschool programming lies in middle and high school settings. It is often for these students and their families that afterschool programming is deemed irrelevant. Students are now old enough to look after themselves and, as they reach high school, are exploring opportunities to earn money rather than invest it in program fees. In 1994, the reported participation rate of extended day services by states ranged from 10% to 66% but did not indicate how many total students took advantage of programs. Yet, the Dryfoos Report indicated that less than one quarter of the programs were actually located in schools (Dryfoos, 1999). By having such a small proportion of the programs being school based, there is a potential loss of connectivity to the learning goals of the students. School based programs have a higher degree of crossover of staff and information making the transition seamless rather than disjointed.

In their 2007 plan entitled, *A Blueprint of Action,* the Coalition for Science After School critiqued exemplary programs and promising program efforts. The Blueprint called for a charge to: "Provide engaging and intellectually challenging programs, curricula, and activities, build staff capacity and develop appropriate assessment and evaluation measures" (Science, A.S.C.F. 2007, p.10). This is an area where afterschool programming has traditionally fallen short. It has been a place for remediation/support rather than enrichment/challenge. The changing global economy necessitates an increased focus on science and mathematics and how after school assesses and deals with the related issues.

The National Science Foundation supported most programs listed in their Foundation's literature. Many of their programs focused on inquiry-based experiences, skills and confidence building, problem-solving techniques, decision-making relations, and higher order thinking skills.

> "The potential benefits of connecting after-school and science make it worth the effort. If high quality science demands creativity, imagination, investigation, time, communication and above all the identification and accumulation of evidence, then after-school environments that encourage young people to ask questions, take a chance on something new, learn to sift through competing explanations, and make sense of the world around them may be valuable resources for recapturing a generation's interest in science" (Science, A.S.C.F., 2007, p. 7).

The vision and mission of the organization was to have learning experiences that were high quality and available to all students from diverse backgrounds during out of school time (Science, A.S.C.F. 2007, p.10). The Coalition's blueprint, although focused on science instruction, could be used by other academic endeavors. Not only do the blueprints offer a layout for goals and tasks but they also focus on the advancement of after school programming as an essential part of the educational process. One of the key aspects for their blueprint for successful after school science programming was that equal opportunity or equity needed to be considered a driving force. All groups must be represented and programs must be "multilingual, culturally sensitive, and accessible to persons with disabilities" (Science, A.S.C.F. 2007, p.10). For the purpose of this study, science instruction in after school programs was of particular interest.

After school programs often fall into a variety of categories ranging from activities that focus on popular and peer culture, interest in visual and performing arts,

self-help initiatives, and those who seek more opportunities for children to use time in a productive manner. Exemplary programs "point to the importance of balance in many aspects of program life" (Halpern, 2003, p. 131). There is a need for children to have engaging activities, time sensitivity for completion of engaging projects or activities and a place to rest, move and play, all of which are the goals of a good after school program. Successful programs must strike a balance between self expression, guidance, and childhood spontaneity (Halpern, 2003).

Children, particularly those who qualify for free/reduced lunch programs, have additional burdens of care that can also be addressed during after school time. Their need for additional time and support are often heightened by these conditions. When considering "Costly Out of School Time (OST) activities, like athletics and lessons, low-income youth (are) unlikely to participate regardless of their academic and social abilities or positive parenting. …Practitioners and policymakers should consider providing enriching activities like sports and lessons *free of charge* to low-income youth" (HFRP, 2006, p. 2). Issues of equity and availability continue to be at the forefront of after school programming.

The Harvard Family Research Project studied predictors of participation in Out-of-School Time (OST) activities. They found there is "little information, especially for youth at risk, about the factors that contribute to getting youth 'in the door' and keeping them engaged" (HFRP, 2006, p. 1). When designing and implementing after school programming, consideration should be given to the developmental, social and academic needs of the participants. When considering how to get youth involved and engaged, the

structure of after school space should also be considered. Space must be located in a safe area, be as informal as possible and have a space reserved for quiet talk. Program sites should be places where children are encouraged to develop interpersonal skills with other children, and have an opportunity to converse with caring adults. Halpern argues that there is an unsettling discrepancy between after school programs' capacity to create physically and (for the most part) psychologically safe places for children and their potential to create rich, sustaining relational and learning environments and interesting contexts for play and the pursuit of interests. Even the more transparent benefits of after-school programs depend on a variety of resources, program supports, and staff skills that too many programs in low income neighborhoods are hard put to provide (Halpern, 2003).

Senator Thomas McGee and Representative Marie St. Fleur co-chaired The Massachusetts Special Commission on After School and Out of School Time. In their Executive Summary Report dated November 2007, they stated the following:

> We encountered several themes that resonated across the state: children and youth describing their participation in afterschool and out of school time programs as life changing; dedicated and talented staff struggling to stay in the field on low salaries and uncertain career paths; innovative programs confronting unstable and inadequate funding; and transportation, in particular, presenting significant challenges for families and providers in getting young people to programs (McGee, St. Fleur, 2007 p. 3).

Senator McGee and Representative St. Fleur's findings are consistent with research findings throughout this chapter. Their study concluded that "children and youth who participate in quality afterschool and out of school time programs increase their academic and cognitive skills, increased their social and emotional development, have better

physical skills, and heightened exposure and appreciation for arts, culture, and civic involvement" (McLaughlin, Gittleman, et al, 2007, p. 18).

There is much agreement that after school programs are a critical first step in coming together in partnership with other organizations for the good of all children (Dryfoos, 1994; Halpern, 2003; White, 2005). Of all considerations, funding is the lynchpin that holds the success of afterschool programming. Funding of after school programming continues to be "inadequate and erratic" (Halpern, 2003, p. 150). Funding not only impacts the use of specialists, it reduces availability of field trips, adequate professional development for staff and qualified front-line staff. An "all-funds" approach, where every stream of income and resources at the school level is pooled and redistributed to the maximum benefit of all students, must be used in order to create a more substantial collaborative effort in creating an after school budget strategy with a focus on program improvement. Unfortunately, many programs are operating at a survival level and as a result do not have the capacity to be innovative or progressive. The research indicated that there are significant changes to the ways in which after school programs are viewed and operated. Awareness of this research is essential to improving student outcomes in the 21st Century, especially to students who would benefit through additional time and support to reach increased expectations.

What does the literature say about professional development?

Teacher preparation requires support structures and significant investments in teacher learning. Capacity building, self-evaluation and the commitment to possible change in practice are essential in purposeful professional development. While it is

important to build upon a teacher's current base of knowledge, it is equally important to build personal application into his or her own classroom. High quality professional development must meet both of these needs. "Low expectations for student achievement and poor quality professional development go hand in hand" (Sparks, 2002, p.19). While there are many cited barriers to professional development for educators, the most commonly cited reasons are funding, unresponsive teachers, limited time, and the lack of skills needed by administration to lead change efforts (Sparks, 2007).

Arguments have been made that on-the-job training and supervision can be much more effective than participating solely in coursework. However, research has shown that a combination of professional education coupled with mentoring and supervised training experience is preferential (Darling-Hammond, 2005). The premise that "development of individuals ensures enhanced organizational performance is patently wrong" (Dufour, Baker, Dufour, 2005, p. 19). Without addressing the component of collaboration and reflective practice, neither the individual nor the organization will sustain lasting improvement. Successful professional development takes place within the classroom, not outside the classroom (Dufour, 2005). Thus, school capacity building rather than solitary professional development produces greater results.

Embedded professional development, where the learning takes place within the walls of the classroom, supports teachers new to the field by helping teachers feel more successful in their practice and gain greater satisfaction, particularly in the area of their personal contribution to the learning community through reflective practice. Reflective personal development has recently risen to the forefront of professional development.

Research on effective teaching over the past two decades has shown that effective practice is linked to inquiry, reflection, and continuous professional growth (Harris 1998). Reflective practice and a culture of collaboration were not traditionally considered to be part of professional development. This change in personal growth and practice has opened up an opportunity for teachers to create new frames of thinking with regard to their own practice and the success of their students. Little funding is available for professional growth after one leaves a college or university. Although changes are beginning to be discussed nationally, the "National Council on Accreditation of Teacher Education (NCATE) [has begun to] adjust its standards to allow for innovations and strategies for preparing teachers" (Darling-Hammond, 2005 p. 24). Current thinking on the characteristics of effective professional development for all teachers is in a transition phase. Darling-Hammond points out that "unless policy and practice are jointly reconstructed across institutional and state bureaucracy boundaries, the possibilities for creating a foundation of learning-centered teaching and teacher education will, once again, go unrealized" (Darling-Hammond, 2005, p. 26).

While after school programs are not a part of any research currently conducted on professional development, it is expected that relevant information gleaned from the research on day program professional development will correlate with the needs of after school professional development.

The change process, particularly when focused on student results, is most successful when teachers are included in the creation of a meaningful plan that includes complex discussions around problems, solutions and prescriptions. Educators become

dependent on outsiders particularly when looking for solutions to their problems. (Sparks, 2007). The process of professional development often is focused on outside expertise and skill and often ignores the strength of the participants. For the most part, teachers are a wealth of knowledge, have a deep concern regarding the children they serve and know what they wish to create in both their classrooms and their school. By tapping into the resources already within the school and combining it with that of the professional development provider, purposeful and lasting professional development can be achieved (Sparks, 2007).

What does effective professional development look like?

Professional development that centers on dialogue and interaction between groups of teachers can both deepen and highly influence teacher knowledge and understanding (Sparks, 2007). In addition to teacher/teacher dialogue, Spark speaks to the importance of student/teacher dialogue for building a mutual respect for two-way communication, which is important to both parties. Understanding that students have something to say, and that teachers are sincerely interested in hearing what each student has to say creates an environment of learning where all skills and expertise are brought to the forefront.. Wide-open communication, sharing of information and the seeking of different ways to communicate and share information were keys to a successful outcome. Many researchers agree that communication is an integral part of the success of any student's success plan (Fullan, 2006; Darling-Hammond, 2005; Sparks, 2007). "Though communication takes time, investment and information sharing eventually pays off" (Darling-Hammond, 2005, p. 217). Whereas the goal of any professional development is

to provide the instructor with a greater skill set to improve the educational outcomes for their students, it is essential to include the student needs in the plans for professional development.

Fullan and Sparks agree that successful schools must also have a network of opportunities for conducting outside professional development, district directed assistance and resources. Commitment, motivation and effective problem solving strategies are also important to building capacity.

Although teachers are exposed to many forms of professional development, some are more effective than others. Professional development can range from brief workshops given to introduce long term and complex topics, short-term subject topics, inquiry and action research projects. The North Central Regional Educational Laboratory (NCREL) states in a 1999 study that effective models of professional development should include a clear plan documenting goals and objectives. Plans should include participants and organizers, both focused on student outcomes. An effective plan must also promote continuous learning and be research based (NCREL, 1999).

The possession of deep content knowledge is an important part of successful student learning. While pedagogical knowledge is necessary to effectively educate children, in the present economic and technological landscape the demands of content knowledge are far more dynamic and change to a greater degree. Both district driven and university driven course selections have increased the availability of content based professional development for educators to better meet these ever changing needs. Summer employment opportunities such as curriculum development, testing review

boards and outside employment opportunities in a particular field of study can also help strengthen curriculum knowledge. This could be considered as either self-directed professional development or outside assisted professional development.

Teachers need to not only have a full understanding of content, they must also be able to present that knowledge in a clear, concise manner that is challenging to the student (Sparks, 2002). Possession of the relevant curricular knowledge is insufficient for good teaching and learning to occur. Without good pedagogy, the knowledge is undeliverable and therefore wasted.

Communicating to educators that a teacher's knowledge development process is continuous, building on prior knowledge not only through direct learning but through transference as well, is essential. By continually improving practice and reviewing student outcomes, teachers can reflect on their current practice and continuously support students while improving their own instructional practices. This method of teacher development promotes improvement in practice and increases in student learning outcomes.

Peter Senge's *Mental Models* suggest that much can be solved through communication and the sharing of experience as an ongoing practice. He states, "We often spend so much time coping with problems along our path, that we forget why we are on the path in the first place" (Senge, 2006, p. 131). When teachers begin concentrating on student learning and remembering why they chose the field of teaching, student improvement begins to happen. Managers and developers of professional

development must facilitate this process. All professional development can be tailored to meet these basic needs as well as the specific needs of the participants.

Professional development, in any form, is designed to help improve either the pedagogy or content area knowledge of any instructor for the purpose of improving student learning. While this is essential to the implementation of good teaching practices, "few school districts provide teachers with curricular-based institutes, mentoring and coaching, and opportunities for examination of and reflection on classroom practice required to deepen their subject-matter expertise and pedagogical content knowledge" (Duschl, 2007, p. 313).

As the expected and needed outcomes for program and student development are widely varied, so too are the types of professional development offered. Each type of professional development carries with it specific benefits and limitations. Although teacher professional development is just beginning to find it's way into the afterschool or the extended learning time setting, "over the next few years, a breakthrough will occur in which the education community as a whole focuses on improving classroom instruction and adopts processes for turning it into a more precise, validated data driven expert activity that can respond to the learning needs of individual students" (Fullan, Hill, Crevola, 2006, p. xv). As mentioned, most programs of professional development rely on the one time workshop model. While staff now has a wider range of options, the most prevalent remains "stand and deliver" professional development.

This study will look at different forms of professional development, and investigate how each form can contribute to teacher learning in an afterschool setting.

This study will also look at science instruction and a similar professional development extension in an afterschool setting. It is the premise of this researcher that by having and effectively focusing on three forms of professional development the greatest improvement can be made across the board in the day school classroom and within an afterschool setting.

At this time, if an after school program is involved in professional development at all it is likely to be in the workshop or conference model. There is a paucity of information on professional development in afterschool programming; however, there is a wealth of information available from other sectors, including regular day education. Irrespective of what form it may ultimately take, "Effective (Professional Development) must be designed, implemented, and evaluated with care and expertise." (OSTRCO. 2007, p. 5). Once an understanding has been reached that the experience must be fully transferable and applicable to student outcomes, then and only then, can an effective plan for professional development be created. A major objective in the design of professional development for teachers and instructors is in establishing objectives and reachable goals. Goals and objectives assessment can be conducted by a formal needs analysis, on-line surveys, paper surveys, group discussions, or informal interviews. In a December, 2007 article conducted by the Out-of School Time Resource Center (OSTRCO), at the University of Pennsylvania, OST staff concluded that the findings of "research in the out-of school time (OST) field is that there is a strong connection between professional development (PD) for staff and positive outcomes for youth" (OSTRCO, 2007, p. 1). Much information stated in the University of Pennsylvania's literature is based on

developmental workshops and conferences, but is directly applicable to other forms of professional development. There are also opportunities that fall outside the category of workshops and conferences, which could further improve the quality of OST professional development and student learning. Self-initiated and intervention-based professional developments are but a few of the possible additions to the traditional "stand and deliver" model. The National Staff Development Council concluded that other forms of professional development are not only as effective as "sit-and-gets", but that they are in most cases even more effective (NSDC, 2004). The OSTRC suggests complementing the traditional workshop model with formats drawn from other fields of professional development that include the following: Technical Assistance, Peer Mentoring, Small Learning Communities/Peer Networking, Internships and Apprenticeships, and Observation (OSTRCO, 2007, p.4). Each of these options place emphasis on building long-term sustainable improvement that will build capacity within a program. Furthermore, they represent a deeper involvement on the part of the participant in that they build relationships with professionals or other practitioners in their field.

The After School Corporation (TASC), evaluators were able to identify five characteristics that seemed to breed positive results. Relationships included an exposure to a variety of new learning opportunities, opportunities to master new skills through practice, positive relationship building, a highly trained and supervised staff and administrative, fiscal and professional development support (Birmingham, Russell, Pechman, & Mielke, 2005). There are, within any program and building, what can be referred to as pockets of excellence While professional development is clearly important,

it is also clear that "one of the most critical features of high-quality programs necessary for achieving positive outcomes is the quality of the program's staff" (HFRP, 2009, p.11). The relative quality of a program's staff can be measured by the existence of positive relationships between staff members and students.

Anne Bouie, author of *After-School Success,* attributes after school academic success to high expectations, highly structured programs, challenging curriculum content, engaging instruction, a nurturing environment, parental partnership, and, lastly, community support (Bouie 2007, p. 140). All of these elements require directed professional development to be done well. These connections within the community can often lead to other areas of involvement in professional development including, but not limited to added finances, needed equipment and facilitators (Bouie, 2007).

The traditional model, even the nomenclature of professional development provides a sense of finality to process. Fullan, point out that a more appropriate name for effective and sustainable professional development might be professional learning due to the level of importance of continual and daily learning on the part of teachers and/or leaders (Fullan, 2006). Student improvement, if not aligned with deepened content knowledge and the acquisition of new practices by teachers will not result in ongoing performance improvement for students (Fullan, 2006). By fully understanding the existing forms of professional development and the current research on their efficacy the process of developing effective professional learning can begin.

A Look at Three Forms of Professional Development

By looking generally at the structure and from of the three most prevalent forms of professional development, we can gain an understanding which will allow us to measure their relative effectiveness and worth with respect to their ability to make a difference in the education of students.

- **District Directed Professional Development**

District Directed Professional Development is primarily focused on increasing the levels of content knowledge of teachers within a specific content area. "School districts – either singularly or in partnership with universities – are increasingly offering their own workshops or courses aimed at improving teachers' content knowledge" (Sparks, 2002, p. 103). Regardless of whom they have partnered with, many districts "continue to rely on a stand-and-deliver method, one shot workshops, and menu-driven conferences and conventions. While most of these methods acknowledge that the transfer of new skills and knowledge into practice requires more than what they are providing, too few teachers have access to the kinds of learning opportunities they need" (Duschl, 2007, p. 314). Yet, district directed professional development compared to intervention and self-initiated forms of professional development, is often the most structured, best supplied and encompasses a wealth of information in a short period of time. A helpful and quick fix district directed professional development often employs the use of model kits provided by a variety of different sources including curriculum providers, museums, and outside organizations. Model kits come with directions and provide a teacher with basic instantaneous knowledge for unknown or little known curriculum. Kits focus on a quick and easy lesson for all students involved in the class. Unfortunately, this method does

not promote either gradual student involvement or gradual teacher knowledge. By design, they are providing all the necessary information in a single or limited number of sessions with little or no follow up. This requires teachers to be completely on board immediately and there is little time afforded to process information and implement it in an incremental manner.

Teacher development programs in the United States provide limited exposure to the concept of gradual improvement over time. If gradual teacher improvement over time is part of an ongoing professional development plan, that concept alone will put teachers at the center of the improvement or change process (Sparks, 2002).

Although districts, museums, and a wide variety of outside vendors often develop focus-driven workshops with corresponding kits, the retention rate for attendees depends greatly on the instructor. Kits are designed to introduce subject matter and activities to classroom and focus groups; however, pedagogical knowledge gained by instructors through the use of kits is minimal.

Despite its many strengths, district directed professional development often falls short in terms of overall effectiveness. By not providing an opportunity for gradual learning and continual support, many of the gains realized are viewed and treated like the workshops themselves; they are treated as individual and independent experiences that are part of but not integrated into global practices.

- **Intervention Professional Development for Teachers**

Intervention professional development provides outside leaders with direct classroom access, support and information in the form of a guest instructor or coach.

While this form provides direct instruction aimed at improving content knowledge it also incorporates a component of pedagogical development as well by providing support in the implementation of lessons. An example of this form of professional development might be an outside school or university that provides a classroom or afterschool professional with lesson plans for student instruction and over-the-shoulder coaching for staff members. In this form, the participants are engaged directly with others within the target environment. They are collaborating with other professionals to implement the learning they have developed. This process incorporates the knowledge and skills of all participants, which is why "Collaborative professional development results in curriculum that is tightly mapped to standards – well aligned and well sequenced" (Brochu, 2004, p. 13).

Outside organizations can often support staff learning by offering assistance. An example of intervention professional development is the Urban Ecology Science collaboration between Boston College and the Urban Ecology Institute. This collaborative effort enhances student learning and staff development by offering innovative instructional materials and classroom assistance in urban schools. Curriculum materials, field trip suggestions and coaching are just a few of the many support services given to teachers and youth developers. This is just an example of one of many institutes that offer intervention services (Urban Ecology, 2009).

A common characteristic that typifies this form of professional development is that teachers are afforded direct and long-term access to those who are most familiar with and well versed with the relevant content. The practitioners who provide this type of

professional development are actively engaged in the ongoing development of the field of study. To this end, they incorporate a much more long term and incremental approach to eliciting change from the teacher and for the student. Intervention professional development focuses on developing relationships both working and professional with the teachers and students involved. In so doing, the practice is inherently reflective and allows for the development of reflective teachers in the context of a professional learning community rather than an independent practitioner in a workshop.

- **Self Initiated Professional Development**

Self-initiated professional development draws its focus, content and goals from the desires, strengths and needs of the teaching professional and is inherently collaborative. While this type of professional development is supported by prior knowledge and interest in a content area, it also draws upon the individual strengths within the participant pool and disseminates it throughout the group. Possessing deep knowledge in a content area, being able to understand the rate at which students can absorb the information taught, and the anticipation of student questions and conceptions are key elements in teaching a subject well (Sparks, 2002). Teachers must have a firm foundation in the basic elements of their chosen field to be able to effectively teach. However, they must also engage in collaborative learning if they are to continuously improve their practice. *Education Week* reported, "The time U.S teachers actually spend on professional training largely continues to take place in isolation rather than school-based settings that draw on teachers' collective knowledge and skills" (Sawchuk, 2009 p. 1). Self initiated professional development can include sharing materials and knowledge

with other teachers, surfing the internet for both teacher strategies and content, and the collection of additional sponsored activities that can enhance one's own personal knowledge. In a study conducted in 2001, Lohman and Woolf found that there were three different types of self-initiated learning activities that were used by experienced teachers within their study.

- Exchange of knowledge and practices shared with others
- Experimental practices that shared new ideas and techniques
  Gathering information from resources that were not connected to the school. (Lohman, Woolf, 2001)

Furthermore, in their 2001 study, Margaret Lohman and Nicholas Woolf pointed out that a great deal of information was learned from discussions with students. Student questions, in-depth discussions and informal talk raised questions regarding teacher perspective and the need to consider expanding different points of view. (Lohman, Woolf, 2001)

The gathering of information and resource sharing are amongst the highest rated elements of self-initiated professional development. Talking, collaborating, resource sharing and observing others in their chosen field are key components to self-initiated professional development plans.

In addition, web-based resources are more prevalent today than ever before. The internet has become a valuable resource for reviewing teacher created curriculum and hands-on activities for a variety of topics and budgets (Science, A.S.C.F., 2007). Often teachers will rely on web-based self-directed professional development for self-improvement. Lohman and Woolf also found that teachers also engaged in independent scanning for new ideas beyond their walls. They referred to this as "environmental

scanning" (Lohman and Woolf, 2001, p. 67). This additional method of professional development creates a more global view of classroom instruction and incorporates the techniques and tools of others through independent study.

Although Lohman and Woolf's study was largely based on self-reporting by voluntarily participating teachers, the findings of their study focused on teacher commitment to improving teacher practice and student learning.

In review, self-directed professional development includes a desire to improve practice while promoting student learning. It is this desire that serves as the motivator for engagement in the process of professional development (Grootenboer, 1999). Although self-directed professional development has as a foundation a focus on life-long learning, this form of professional development has been primarily done in isolation. Falk points out that "free choice" learning is a term that recognizes the unique characteristics of such learning: Free choice, non-sequential, self-paced, and voluntary" (Falk, 2001, p. 7). By incorporating these experiences into a professional learning community, they become more meaningful.

Closing Thoughts on the Forms of Professional Development

While a review of each type of professional development individually can highlight potential strengths and weaknesses inherent, it is insufficient to be used as a measure of effectiveness and the circumstances under which a specific method should be applied. To derive that type of information a research-based comparison of the three types must be undertaken to begin to determine, or at least describe, their relative

effectiveness with respect to impact on student learning outcomes. A 2003 study cited by National Center for the Study of Adult Learning and Literacy, conducted by Christine Smith and others, researched one hundred six men and women from the New England area. Their study looked at three models of professional development. The models of professional development included multi-session workshops, mentor-teaching groups and their own practitioner research group, which map directly onto the models of professional development this paper outlines. Smith's study was conducted primarily to help decision-makers understand the need for high-quality professional development in any form, create a well thought-out plan for delivery and to better understand the change process (Smith, 2003). It does however provide information on the effectiveness of these forms. Smith's research divided change into four categories on a spectrum covering "no or minimal change" to "significant integrated change" (Smith, 2003, p. 25) The team found that there were differences in patterns of change throughout the different models studied. "The most important professional development factor included hours of professional development attended, and the quality of professional development both as rated by researchers and perceived by teachers" (Smith, 2003, p. 25). Greater say in the decision-making of professional development and opportunities for teachers to share with other teachers were two additional recommendations. These findings were common across all forms studied and indicate that irrespective of the type or form, that effective professional development that enacts long lasting and integrated change must be collaborative and ongoing.

Dr. Schmoker's findings echo these assertions. He captures this sentiment in his chapter *No Turning Back: the Ironclad Case for Professional Learning Communities*. "Teachers do not learn best from outside experts or by attending conferences or implementing "programs" installed by outsiders. Teachers learn best from other teachers in settings where they literally teach each other the art of teaching" (Dufour, p 141, 2005).

While each of the reviewed forms of professional development have unique value, it is important to note the context within which the learning is applied is what will have the most impact on the overall and long-term effectiveness. Collaboration among teachers who teach in the afterschool program through reflective practice must be an integral part of any professional development plan. By examining how each of these forms fit into and integrate with career-long professional development, more informed choices could be made regarding what types of professional development are needed to improve individual knowledge and expertise. In all cases, instruction can be further enhanced by developing a strong learning community in conjunction with any information learned.

- **The Future of Professional Development**

Having a map of where one wish to be and the road one wishes to travel takes considerable planning. Difficult questions must be asked. Where are we? Where do we wish to go? Most important, how do we plan to get there?

This question is equally important to those who teach in out-of-school time. In addition, research presently available indicates that generating this kind of change within

an educational environment that will result in improved student outcomes will require additional resources with a focus on professional development. One of nine major indicators of quality afterschool programming outlined in *The Cost of Quality Out-of School-Time Programs* report funded by the Wallace Foundation, states that an effective "organization provides or refers staff members to required training sessions" (Grossman, Lind, et al, 2009, p. 60).

"The future of education must engage all professionals in the process of instigating and managing collaborative change" (Darling-Hammond, 2005, p. 217). The complexities of funding, communication between staff members, the shared vision of school, community and university partnerships all add to the dilemma of managing collaborative change through any one professional development model.

Educators must also cultivate an excitement of self-discovery and a vision of life-long learning within every student they teach (Dufour, 2005). The best way in which to achieve that goal is to cultivate that same excitement and vision within themselves in the context of a professional learning community. No matter how well planned out, funded and intentioned professional development may be, if it is given and received by a teacher in an environment that does not value incremental change to practice along with reflective and professional learners, it will lose much if not all of its effectiveness. While professional development provides the necessary building blocks for improving teacher practice and student performance, it is however, the method of delivery and the service/working environment that determine the impact it has.

What Does the Literature Say About Science Education and Professional Development?

The National Science Teachers Association (NSTA), indicated in their Position Statement dated May, 2006, what good professional development of science teachers should incorporate. Student learning needs and learning difficulties with regard to subject matter must be addressed. Professional development opportunities must be based on individual needs and collaborative or group needs. In addition, the needs of educators must continually be assessed and re-defined thus providing for an opportunity to continually improve on practice. Whenever possible, science should be integrated with the other program initiatives. Collaboration among teachers is encouraged at all grade levels (NSTA, 2006).

Throughout the decades, science learning has taken place in a multitude of settings, not simply the school. Science learning can happen at home, the internet, television, museums, books and outside organizations (Falk, 2001). While this particular study is directed at the process and development of science knowledge in children, the same statement applies directly to teachers as well. The matter of teacher knowledge becomes even more crucial when one considers the area of science education. "If (teachers) are to help students reach national and state standards in science, teachers will need substantial supports in the form of better pre-service training, as well as professional development that will bolster their knowledge of the science they teach" (Duschl, 2007, p. 300). During recent years, significant emphasis has been placed on the importance of science learning through a number overlapping learning experiences as those listed.

Science education cannot come from a single strand of learning experiences, but from many varied learning experiences.

- **Science Education and Teacher Involvement**

Professional growth is a key element to success in being a teacher of science. One first must understand the vastness of the word science. Science can encompass health, mathematics, natural science, physical science, earth and space science, engineering and science inquiry (Falk, 2001, National Research Council, 1996).

A teacher of science must understand essential content knowledge, methods of inquiry, and updated information on subject matter. Students must understand the reflective process, and teachers must have continuous support (National Science Education Standards, 1996). A teacher will be able to gain content knowledge utilizing any of the forms of professional development discussed above. This is more true for science instruction that any other field. While most teachers will have an adequate basic knowledge and understanding of nearly every other subject area because of their constancy and permanency when considering the field of science this is not true. The theories, rules and applications of science are changing now faster than ever. What was once considered fact might have recently been proven untrue, so with each passing year, teachers will need to update their knowledge and understanding of science and its applications.

The skill set involved in being an effective facilitator of student learning in the areas of science education is as vast as the subject matter itself. The experience students have with their teachers and the ability teachers have to guide students to self-assess their

own learning are important factors in successfully building student content knowledge and student achievement. Science teachers must be interested in their subject, hold great enthusiasm for scientific inquiry and help students develop similar science passion. Teachers must develop a student's sense of curiosity, ability to question and to question the validity of their findings. It is an interactive learning environment that will require pedagogical skill that cannot be gleaned in a one shot or isolated study. It is here that the role of collaboration and professional learning communities becomes essential. In addition to strong content knowledge, teachers of science need to be able to engage with each other and their students. Questioning is one of the key traits in developing a life-long learner of science both for teachers and students. Inquiry-based study that includes new research and ongoing developments found from many sources helps students feel confident that their learning process is a continuing process, not stationary. The improvement of science education is a task for all participants including legislators, school boards, teachers, educators, parents, students and, equally important, community partnerships including, extended learning time or afterschool programs. All stakeholders must be considered a part of systematic education reform in science education. Science educators must focus on students' immediate needs and the long term science goals.

Unlike other subject areas, science, due to its complex and ever developing content base, not only requires a strong and sound foundation, but also requires continuous opportunities to build on that foundation and develop further understanding This characteristic makes the need for continuous professional development even more critical.

- **Science in After School**

When looking at science instruction in after school there is an opportunity to incorporate different forms of professional development that have been traditionally offered. Because of restrictions in time during the regular teaching day, often science programs and teachers are unable to incorporate project based learning and experiential learning. After school can expand and enhance both student and teacher exposure to quality science instruction and the implementation of procedures utilizing relevant technology.

In March of 2007, The Coalition for Science After School presented a blue print for action. In this report, the coalition refers to the use of kits for after school use. The kit is designed to help create informal science education for out-of-school time professionals. While collaboration was deemed of utmost importance, the depth of sophistication and need for continuous scientific inquiry was less important. The report does suggest however, that after school programs create an ideal setting to reach young people. This kind of thinking represents a necessary first step in science professional development in after school time. This type of work will provide the scientific knowledge base necessary for building a community of learners who are capable of inquiry based study (Science, A.S.C.F., 2007).

The next step is building strong connections between the scientific community, museums, research organizations and the educational community. Such a process can only offer students and teachers additional opportunities to learn science in another setting. It is through the cultivation of these relationships that organizations will be able

and encouraged to offer the additional forms of professional development to those who work with after school students. The larger community will help support student learning through improving teacher learning and offer new and creative ways to reach the next generation of scientists.

Summary of Major Themes

The literature review conducted for this study focused on a number of areas. First, research was done on the changing role of after school programs and what changes might be needed in programming to better meet the new demands. The changes, that were found to be necessary, required enhancements to pedagogical and content knowledge. With the knowledge of the necessary changes, the next step was to look at what the literature said about professional development in its many forms to determine which form would be most effective at addressing the needs as researched. Finally, there was further refinement of the focus to look specifically on science education in after school time as well as its associated professional development.

It is clear that the role of after school programs has fundamentally changed from just a decade ago. No longer are simple childcare and provisions for safety enough. After school time has evolved into an extension of the regular learning day and now represents an additional opportunity to learn and demonstrate learning. This change in which curricular demands and goals are being placed on after school instructors necessitates a change in the way we recruit and develop after school professionals.

The literature on professional development clearly indicates that professional development in any form must be a part of a larger and coordinated professional development plan. Furthermore, research repeatedly indicates that professional learning when derived, implemented and sustained within the context of a professional learning community is far more effective.

With specific respect to science in after school time and science professional development, it was shown that the pedagogical and content knowledge necessary to successfully foster effective learning were less likely to be present in the general and after school teaching population. It was further indicated that partnerships with local and community based organizations and business would provide access to key resources to support effective professional development and improved student learning.

All of the research indicates that the role of after school programs has shifted rather rapidly into a mode of providing education services. While the research on professional development in after school may not yet be substantial, the research available of regular day academic professional development in general is transferrable to after school as its role and focus has become more aligned to regular day goals. As such, focused and ongoing professional development delivered in a relational and long-term way within the context of a collaborative professional learning community, will provide for the best teacher and student outcomes.

Conclusion

Effective after school programs will have to become more full service providers which are capable of meeting and attending to students' and families' social/emotional

needs (Dryfoos, 1994). Furthermore, after school time presents an opportunity for students who are unable to access the curriculum during the regular academic day, whether due to problems with time or method of delivery, to receive another chance to learn the necessary material in new and engaging ways (Dryfoos, 2004). It is also indicated that if we as a nation are to maintain our competitiveness within the global marketplace, it is essential that our students skills, specifically in the area of science education, receive intervention (Elling, 2007). As such, after school programming is not simply a tack on, value added proposition. It is becoming, and must continue to be so, more integral to the delivery of education in the United States. It is not merely a remedial endeavor, but is much more now a catalyst for positive change within the school system (White, 2005).

With these types of demands being placed on programs and their corresponding staffs, it is clear that additional support will be necessary to meet these challenges and goals. This type of change is best enacted in professional development which encompasses professional learning in conjunction with mentoring and continuous supervision (Darling-Hammond, 2005).

This study has examined the ways in which after school programming needs to change with respect to the role it plays in the social and academic growth of students and identified the forms of professional development available and their reported effectiveness. Using this information the study seeks to evaluate the effectiveness of these forms of professional development within the context of the development of the program and instructors of the PAS with respect to science instruction.

In the next chapter, the design of this study to examine the effects of professional development on the participants' perceptions of the impact on their teaching and instruction as well as their overall perception of how their participation in this study has changed their teacher learning, will be explained.

Chapter Three

Design of the Study

Introduction

Extended time offers struggling students additional opportunity to learn. It also affords students opportunities to demonstrate personal progress. It is not simply a matter of more time to learn subject matter through standard methods of delivery; quality after school programming represents the possibility of introducing alternative methods of curriculum delivery and student assessment. One of the main problems plaguing after-school programming is that the focus is often on being a safe haven for students, rather than creating a genuine opportunity to offer students a variety of activities focused on student learning. Traditional after school programming, when focused on improving academic achievement, tends to use "more of the same" pedagogical approaches. There has to be a radical rethinking of the manner in which after-school time is expended to better support the learning needs of a diverse community of learners.

During the last decade, after-school time has become increasingly popular among both suburban and urban families. This rise in popularity is due, in part, to a need for supervision during a time when children may become exposed to and perhaps engage in antisocial or destructive behaviors (Fashola, 2002). With this rise in popularity, there has been a shift away from simply providing supervision, to looking for a way to improve learning in a fun and different way.

This study will focus on examining science instruction within an after school setting. The site selection was determined by the researcher's familiarity with the

existing program. It also met the criteria of a school-based, academically focused, after school curriculum that did not previously offer science instruction. Site selection is based on the importance of "sound relationships with the study participants" (Gay, Mills & Airasian, 2006, p.87). The researcher knows each participant in the sample group.

This study will also look at the way science is currently being taught at the school and look at new and creative ways of teaching science in the after school program. Five teachers volunteered to teach science to students who were interested in joining science clubs designed to focus on one or more scientific topics. Staff participants selected these topics. Topics include renewable energy, space exploration, Boston College's Urban Ecology program, and a variety of weekly scientific topics chosen by one of the participants. Students sign up for each science club based on their own particular interests. Student sign up is voluntary, and student involvement is not part of this study.

Since most of the participants have never taught science prior to this study, a form of professional development will be needed. Professional development concerning ecological topics is offered by an outside resource and will provide intervention based professional development for one of the participants. Professional development in the areas of renewable energy and space exploration are not currently available within the geographic area, or district, so self-initiated professional development will be utilized in this case, building upon the technical and mechanical experience of the participant. Professional development for some science subjects, including Earth science, within in this project are offered at the district level, as such the remaining participants will utilize district based professional development when available.

Research Questions

This study is designed to answer the following research questions:

- What are teachers' perceptions of how involvement in teaching a new science program affected teaching practice in the after school program?
- How do teachers perceive the three models of professional development-- intervention, self-initiated, and district directed - contributed to teacher learning?

The expectations are that there will be a change in teacher content knowledge and changes in teacher practice after participating in science-based professional development. Teachers will also change their practice based on their own personal research and self-initiated professional development. Teachers will feel more confident in teaching science, a subject not previously taught by most volunteers.

Research Methodology

This study will use a qualitative case study design based on grounded theory in which the "investigator, as the primary instrument of data collection and analysis assumes an inductive stance and strives to determine meaning from the data" (Merriam, 1998, p. 17). The study seeks to assess the changes in understanding and perception of teaching in after-school programs on the part of a sample group of teachers, teaching science. This study, using qualitative research design, is focused on "provid(ing) an understanding of a social setting or activity as viewed from the perspective of the

research participants" (Gay, 2006, p. 402). This format allows for full participation on the part of all members of the sample group.

The sample will consist of five teachers within the school and the after school program. Before starting the project, group and individual interview protocol will be developed to assess the following characteristics. These characteristics include: level of understanding about the science curriculum, scientific content knowledge, and current ability to implement the existing science curriculum in a new way.

This study will also assess differences in professional development opportunities in the area of science education offered to the sample group. Features of this approach include the study of teacher perception with regard to their teaching of science. The aim of this study is to create an in-depth understanding of how teachers perceive their changes in practice over time, and how their influence and delivery can promote understanding within a learning community.

The researcher is considered a human instrument in this analysis by becoming an investigator and primary observer. "Conversely, the investigator as human instrument is limited by being human – that is, mistakes are made, opportunities are missed, personal biases interfere" (Merriam, 1998, p. 20). The researcher must also address timing and sensitivity to issues such as space, personal biases and people.

Qualitative Approach and Key Features of Qualitative Research

For the purpose of this research, a qualitative case study is the most effective method in that it will provide for, and allow, the greatest range of responses. It is in the range and diversity of the responses collected that the researcher will be able to draw

conclusions that would not be possible through the collection of quantitative data. A number of key features are specific to qualitative research that functions well to address research questions. One function is the capture of participant perspectives through open-ended questions during interviews. This is a key feature in qualitative research (Hatch, 2002), and will be used throughout this study.

Another qualitative approach is the use of journaling. "The most obvious strength of journals as data is that they can provide a direct path into the insights of participants" (Hatch, 2002, p. 141). The researcher has given participants in this study additional free time to write in journals so that participants will have an opportunity to reflect on their after-school teaching practice. All participants in this study are working more than full time. Therefore, it is necessary for the researcher to allow for additional free time for each participant to write reflective journal entries. "Participants can make journal entries at their leisure" (Hatch, 2002, p. 141). This allowance will help reduce the participant's anxiety regarding time for reflection and further enhance the information provided and conclusions drawn.

The third method of data collection is observation. Observations and coded field notes will help the researcher to address areas that include social action and activity, engagement, sequence of activities, emotions and accomplishments.

Hatch suggests the following points of reference:

> What are the places where social activity occurs?
> Who are the people involved in the social action?
> What individual activities are people engaged in?
> What group activities are people engaged in?
> What are the objects people use?
> What is the sequence of activity that takes place over time?

What things are people trying to accomplish?
What emotions are expressed? (Hatch, 2002, p. 79)

"Being alive renders us natural observers of our everyday world and our behavior in it. What we learn helps us make sense of our world and guides our future actions" (Merriam, 1998, p. 94). While it is important that the researcher make keen observations of the environment, it is of equal importance to take steps to organize it logically and learn from what is observed. Through this, substantive change can be made. By using the points of reference above, the researcher will be able to better understand the social and academic landscape and the interactions of those within to make better and deeper meaning of their responses. During this study, particular attention will be paid to effective participant observation when teaching science. Merriam states that "observation is a research tool when it '(1) serves a formulated research purpose, (2) is planned deliberately, (3) is recorded systematically, and (4) is subjected to checks and controls on validity and reliability'" (Merriam, 1998, p.95). By maintaining a focus on the research questions, utilizing the points of reference and implementing a specific system for coding and validity checks, the observations made during class lessons and meetings can be used by the researcher to build a data set from which conclusions may be drawn.

Miles and Huberman point out three distinctive approaches to qualitative data analysis: interpretive, social anthropology and collaborative social research (Miles & Huberman, 1994). For the purposes of this study, two of these approaches are utilized. The first approach used in this study is generating "practical understanding of meanings and actions" (Miles and Huberman, 1994, p. 8). This is the approach more generally

referred to as interpretivism. The second approach used in this study is social anthropology. Social anthropology, including patterns and language that develops during the study are important because they provide the researcher with keys to culture within the setting. Understanding the depth and dimensions of the cultural landscape is essential in examining participant responses within the context of their social and academic landscape. By knowing and understanding the cultural frame from which the responses come, meaning that is more significant can be drawn from individual responses (Hatch, 2002).

Using a variety of methods and activities within this analysis, such as those described in Miles & Huberman, create an opportunity for the researcher to gather data, reduce data through simplification and selection, display the information and, finally, draw conclusions from all gained information (Miles & Huberman, 1994). The variety of methods such as interviews, observations and journals will allow for the triangulation of data and help answer the question of how this collection of data will fit together. The researcher will look for similarities and differences in the analysis. The researcher will then ask the question, "what threads connect the domains in positive ways?" (Hatch, 2002, p. 174). By examining the commonalities, trends can be assessed. By investigating the differences, further validity can be added to the trends proposed by the commonalities through assessing how these differences, both expected and unexpected, are a manifestation of the characteristics of the methods of data collection.

Sample and Sample Selection

The Morning View School is located in a large community on the eastern seaboard of the United States. This K-8 school serves students from K0, (age 3) to grade eight, (age 14). More than 900 students attend the regular school day, which operates from 8:20 to 2:30 p.m., Monday through Friday. School choice is offered throughout this district. The Morning View School is one of the most over-chosen of all district public schools. Students and families are permitted and encouraged to pick schools that best fit their transportation, physical and programmatic needs. Because of this system, some schools gain the status of "over-chosen". There are provisions made for siblings to be placed in the same school, but in all cases zone assignment specialists and special education specialists make the decisions around final placement. Morning View School enrollment data for the SY 2007/2008 is shown in Table 1.

Table 1

Morning View School Data

School Data	Sub Categories	Number or Percentage
Total Number of Students		941
Socio-economic Categories		
	Free and Reduced Lunch Eligible	69%
	ADFC Recipients	56%
Programmatic Categories		
	Special Needs	15%
	LEP	20%
	Advanced Work Class	18%
Racial Categories		
	African American	35%
	White	33%
	Asian	23%
	Hispanic	7%
	Native American	2%

School choices notwithstanding, the racial and socio-economic background of students are mixed. Nearly sixty percent of all students are eligible for free and reduced lunch. Eleven families are known to be homeless. The racial demographics of the school indicate an even distribution among Caucasian, Black and Asian students. A small percentage of Latino and Native American students comprise the remainder of the

enrollment. There are approximately one hundred more male students than female students in the school's population.

Each day, over two hundred fifty students, approximately twenty-eight percent of all students, participate in after school activities ranging from musical instrument classes to tutorial support. The racial and socioeconomic backgrounds of students who participate in after school mirror that of the regular day school population. Parents pay a sliding scale ranging from zero to eighty dollars weekly, for their children's participation in the program. Twelve families receive government-subsidized vouchers for out-of-school-time care. A small number of students from other schools also attend the after school program, but these students have not caused a difference in student demographics. The Morning View School has a wide range of staff members including sixty-five teachers and over thirty other education staff members. The level of experience ranges from novice first year teachers to those who have over thirty years teaching experience. One teacher has been at the school since it opened in 1973. (See Table 2)

Sample subjects were volunteers drawn from thirty-two teachers, substitute teachers, paraprofessionals and interns working in the after school program. All after school teachers were invited to join the sample group. Five of the current staff members accepted the invitation. One teacher holds an advanced degree in special education, three hold undergraduate degrees in education, and one attends a local university and is expected to graduate in May. All five teachers are between the ages of 22 and 45. One teacher has less than two years teaching experience, and one has several years of after-

school teaching experience. Three have more than five years experience. Only one teacher teaches science in the regular day school program. (See Table 2)

Table 2

Progressive After School Participant Sample

Teacher	Years in PAS	Professional Development Science Experience	Subject and Years of Teaching Teaching	Amount of Experience Teaching Science
Teacher 1	3	0	History 3 years	None
Teacher 2	6	1 (Urban Ecology)	Math 2 years	.5 years
Teacher 3	6	3	Elementary Science 3 years	3 years
Teacher 4	3	1 (Urban Ecology)	After School Teacher 3 years	None
Teacher 5	2	0	General Education 2 years	None

The selection process was limited to the current staff in the after school program and by the availability of teachers willing to participate in this ongoing study. Teachers in this sample have voluntarily agreed to participate based on willingness, availability, and the opportunity to participate in afternoon professional development. Their willingness to share science instruction with small groups of students during after school was also a key factor. The researcher invited all five teachers who expressed an interest in participating. Teachers agreed to participate knowing that their participation will not affect their school commitments for professional development, after school employment, or any further promotions either in the regular school or after school programs.

Pre Test

Interviews were conducted with two science teachers who were not interested in participating in this study. "The key to getting good data from interviewing is to ask good questions, asking good questions takes practice" (Merriam. 1998, p. 75). With this in mind, the interview tool was used with the pilot group. Although teachers in the original pilot chose not to participate due to time constraints, their discussion provided an opportunity to pilot interview questions for clarity and content. Some questions based on concerns and feedback mentioned during the original pilot was added to the proposed interview questions.

After defining the most suitable questions, the researcher conducted a second meeting with the pilot group to allow an additional opportunity to review the newly generated questions as well as those that were refined for further clarity. Following this

second piloting session, it was determined that no further adjustments were needed. The purpose of pilot interviews was to explore the effectiveness of the questions and format to illicit useful information from group participants. To that end, the extent of their participation was limited.

During the course of this study, the sample group will be subject to additional group interviews and observations coupled with journal entries. Pilot group members were not required to complete these additional steps.

Data-gathering Procedures

Merriam states, "Data are nothing more than ordinary bits and pieces of information found in the environment" (Merriam, 1998, p. 69). Although the statement is somewhat simplistic, the gathering of data must first begin with permission to conduct this study and permission to collect data regardless of what techniques are selected. As such, this case study will incorporate interviews, journals, observations and field notes to gather and triangulate all data regarding the teaching of science in the after-school program.

Permission from all participants, the Progressive After School Program (PAS) site director(s), principal of the school where data are gathered, and any sponsoring institution must be obtained prior to the beginning of data collection. All written consent will be gathered before the onset of this study.

Complete confidentially and anonymity surrounding and protecting each human subject in this research study is, and will continue to be upheld. All participants must be

included in a Human Subject Review by faculty and staff at Boston College. After a significant review by the Human Subject Review Board, basic guidelines will be set and discussions will take place between both researcher and participants. Permission forms and consent waivers will be signed by all participating members at the onset of this study. At any time, participants may decline to participate. Complete assurance is given that declining to participate will not, in any way, be consequential. Written consent forms will be kept in a secure place.

Interviews

Interviews will take place at the beginning and at the culmination of the study. All teachers will be interviewed using the questions developed by the researcher using the piloting process. The researcher will ask a list of pre-determined questions piloted by seasoned science teachers to each sample group member. The researcher will use "the most common form of interview…"person-to-person" (Merriam, 1998, p.71). Although this common form of direct conversation will be used, all interviews will be semi-structured with a mix of both open and closed-ended questions. A semi- structured format will allow for a mixture of both structured and less structured questions (Merriam, 1998).

Interviews will be audio recorded using a digital recording device for accuracy and coding purposes. Verbatim transcripts will be made, thus creating an appropriate database for analysis (Merriam, 1998). A professional transcriber will be hired to transcribe all interviews. Interviewees will be given access to transcripts and asked to review the transcripts for accuracy. All data will be kept in a locked cabinet within the researcher's office.

The questions for post interviews may be significantly different, taking under consideration teacher professional development and changing perceptions. Post questions will be drawn from experiences gained throughout the study process. These questions will be developed during the course of the study. While the group initially used to pilot the pre questions will not participate in the study, they will serve again as question testers. Their familiarity with the process of piloting questions will facilitate a quick and accurate assessment of post questions.

Observations and Field Notes

Observations will be used to clarify the perception of the researcher's understanding of day and afternoon science programs. An observation is considered a research tool when the observation is used by the researcher and is planned by the researcher for the purpose of research (Merriam, 1998). Observations must be recorded in a clear and consistent fashion. The data collected during observation will be recorded. Although the data recording will be repeated as precisely as possible during each observation, the timing of the observation will not follow a fixed pattern. Scheduled times and duration for all observations will be unknown to the participants. The researcher will take under consideration the physical space of the activity, participants' interaction with the teacher, and any unexpected disruptions. Remembering that the researcher is also observer as participant, the researcher will "observe and interact closely with members to establish an insider's identity without participating in those activities constituting the core of the group membership" (Merriam, 1998, p. 101).

Field notes will be taken during all observations and meetings. "Field notes describe, as accurately as possible and as comprehensibly as possible, all relevant aspects of the situation observed" (Gay 2006, p. 414). Field notes are also used for reflection by the researcher. Thoughts and personal reactions are noted and coded accordingly. In addition to the field notes, documents will be collected to support the observations made. Examples of artifacts will include, but not be limited to, graphic organizers, reference sheets, activities, take home assignments and student survey data.

Meetings will be both structured and unstructured. All group meetings will be informal and exploratory in nature. During these meetings, the researcher will introduce and discuss the new pedagogy, curricular tools provided by outside organizations, and review the faculty's questions and concerns. Attendance will be taken at all meetings.

Journals

Journals will be used as an instrument in data collection, and will be kept by all five teachers who participate. Written journals will be kept for reflection of their personal changes in attitude and the significance and importance science education. Participants have been advised and are expected to maintain at least a weekly personal journal entry. These entries are supplemented by written journal prompts which will be given to each participant at the end of the month during our monthly meetings.

They will include, but not be limited to, the following questions:

1. How has your attitude about teaching science changed from the beginning of the project?

2. What is your perception of changes in student interest after the initiation of science instruction within the project?
3. What changes have you made in your lesson development and lesson implementation?
4. What changes do you plan to make in your lesson development and lesson implementation?
5. What form of science professional development have you most recently participated?
6. Which form of professional development has proven most effective in improving your teaching practices?

More written questions will be added as the learning process and study continues.

Journals will used as a reference tool by the participants during the interviews and meetings. This will ensure they are being used appropriately by providing the necessary information of changes in perception and practice over time. The Journals will be reviewed by the researcher and coded with appropriate codes at the midpoint and the conclusion of the study. Common and enduring themes will be examined. All instruments are confidential. Instruments will be kept in a locked area within the school. All researcher notes and observations will also be kept in a locked cabinet located in the main office of the school. Any artifacts collected, including meeting agendas, minutes, recorded interviews, surveys and forms will be locked in the main school office within a locked filing cabinet.

Methods of Data Analysis

"Qualitative data analysis is based on induction: The researcher starts with a large set of issues and data and seeks to progressively narrow them into small and important groups of key data" (Gay, 2006, p. 468). Collected data from the listed resources will be consolidated, transcribed, if needed, and checked for accuracy. These data include transcribed interviews, observations, field notes and reflective journals. Dates and times will also be assigned to field notes, observations journals and interviews for clarity of purpose. Data will be placed into categories ranging from chronological to thematic. Identifying themes can be helpful in the initial stages of the data analysis. This step is critical to telling the story. All information will be sorted into categories defined by the researcher. As categories become more apparent through the data and artifacts collected, the researcher must make meaning of these by identifying themes and patterns, keeping in mind the original purpose of the research and research questions (Miles & Huberman, 2004). Additional themes will include out-of-school time historical data, after school data, science education and teacher professional development. Common and enduring themes will be examined. This data will be aggregated and checked for agreement with the findings from the collection of observations/meetings and interviews, thus creating triangulation by the use of a variety of data collection methods.

Once organized, the data from transcribed interviews, observations, field notes and journals will be coded for further analysis by the researcher. The researcher will check all coded documents for accuracy. The codes were specifically designed to categorize the types of responses expected to be generated by the researcher's key

questions. Additional codes will be added as needed to reflect participant responses that fall outside existing codes. The following codes are provided as examples of the researcher's coding system. These codes are expected to change and develop as experiences grow throughout the study. (See Table 3)

Table 3 Coding

Type of Code	Meaning
UC	Understanding of Science Curriculum (plus or minus degrees)
DT	Day Teacher
AST	After School Teacher
DS	Day Staff
AS	After School Staff
VP	Views of Practice (plus or minus degrees)
CFS	Caring for Students (plus or minus degrees)
HE	High Expectations (plus or minus degrees)
LE	Low Expectations (plus or minus degrees)
CSI	Connects Curriculum with Student Interest and World Views (plus or minus degrees)
SLT	Uses Student Learning Teams (plus or minus degrees)
CWP	Contact with Parents (plus or minus degrees)
MI	Multiple Intelligence (plus or minus degrees)
PCP	Planned Change in Practice
CP	Change in Practice
SI	Student Involvement (plus or minus degrees)
ILS	Independent Learning by Student (plus or minus degrees)
ILT	Independent Learning by Teachers (plus or minus degrees)
TE	Teacher Expectations

Format for Reporting the Data

Within the narrative of this study, the researcher will represent the data in forms that will be understandable to the reader through visual displays and representations, and data sources will be continuously compared. "Displaying data in the form of a chart, matrix, table, or figure can be an aid in analyzing that data" (Merriam, 1998, p. 233). All displays will be kept within close proximity to the narrative description detailing teacher responses to questions, study group participant journal entries and researcher field notes. Displaying the data using a variety of graphs and charts will present a different view or clearer picture of the written analysis. While the majority of the data in raw form will be field notes, quotes and anecdotal information, these responses and those from the monthly journal questions will be aggregated by response type. Data will be divided into categories of response utilizing groupings of the codes listed above to display any overall trends or changes.

Limitations of the Study

Researcher bias is one of the most significant limitations. The main tool to counteract the influence of researcher bias is to take as objective field notes as possible. When making observations, the data collected are not about what the researcher thinks and feels, but rather what is occurring. The process of making meaning from data will be undertaken during interviews and meetings. In so doing, the infiltration of researcher bias can be reduced. "The qualitative researcher runs the risk of identifying with one or more participants or being judgmental towards others (Gay and Mills, 2006, p. 423). The researcher's challenge is to be aware of this limitation.

Time is a limitation in that the study is conducted over an eight-month period. Limitations also include the single site and small sample size due to the size of the after school program and the availability of only five teachers at the site. A small highly detailed study can develop limited generalizations, which can be corroborated by analysis of the artifacts; however, the sample does not provide adequate information for replication and thus cannot be generalized to other schools. The information obtained through this study can, however, is used to inform the development of similar processes to increase teacher capacity.

At the conclusion of the study, the researcher will document findings through a detailed description and explanation of the study. The interviews, observations and journals provide an invaluable lens to the possibilities for further after school studies.

Chapter Four

Findings of the Study

Introduction

Merriam states, "Data are nothing more than ordinary bits of information found in the environment" (Merriam, 1998, p. 69). It is in the collection, compilation and analysis of these "ordinary bits" that a more complete and powerful source of evaluation can be found. A systematic search, utilizing all available forms of data, to develop meaning and answers to the researcher's questions are of key importance. The bits of information gathered in this case study, in the form of one to one and small group interviews, journal entries and informal observations, allowed the researcher to develop a picture of teacher participation in professional development and the resulting change in practice during both school and out-of-school time.

This chapter will provide readers an opportunity to see how teachers were directly impacted by the professional development opportunities provided during their out-of-school time assignments. The impact will be examined in the context of professional development and measured by the change experienced in practice. The analysis of the data collected and reported findings by the researcher will be conducted with respect to capacity building through a variety of professional development opportunities, self-evaluation of the processing and the sharing of personal experiences. The benefits and limitations of the professional development models within the study will be explored with respect to both time and opportunities.

This study is designed to answer the following questions:

- What are teachers' perceptions of how involvement in teaching a new science program affected teaching practice in the after school program?

  How do teachers perceive the three models of professional development -- intervention, self-initiated, and district directed - contributed to teacher learning?

Chapter Four will present the data collected through four specific sources. They are:

- Interviews - Conducted prior to, during and at the end of participation in professional development programs in one to one and small group settings
- Observations - Both formal and informal conducted throughout the study period
- Small group meetings
- Journals - Ongoing as kept by study participants and personal reflections following the conclusion of study period

Each source has been evaluated separately, themes noted, and then factored into the analysis in a manner which allows a system of conclusions to be drawn on the overall impact of professional development programs in generating changes in teacher perception and practice.

Chapter Four is organized into the following sections.

1. Introduction of Research Site – An overview of school statistics, demographics and participant background information.

2. Research Study Participants - This section provides a description of the five participants, their educational background, years of teaching, grade levels and

demographic information. The initial interview provided the relevant context and background necessary in developing a clear picture of the participants' motivation and views on professional development and their practice prior to study participation

3. Introduction to Professional Development at the Progressive After School Program (PAS) - A summary of each of the three forms of professional development focused in the study.

4. Research Design – This section highlights the design of the study.

5. Research Findings – This sections presents the data collection source and analyzed through the researcher's codes.

6. Research Findings Related to Question # 1

What are teachers' perceptions of how involvement in teaching a new science program affected teaching practice in the after school program?

7. Research Findings Related to Question # 2

How do teachers perceive the three models of professional development -- intervention, self-initiated, and district directed - contributed to teacher learning?

8. Conclusion

1. Introduction of Research Site

This study is a snapshot in time of one of the largest K-8 schools located in a large urban district in Eastern Massachusetts. Since the mid 1970's, parents actively chose schools in one of three zones within the city. To this day, this school remains one

of the most over-chosen of all the schools in its zone. There are approximately 56,000 students enrolled in grades K0-Grade 12 in this district. Over 900 students attend the Morning View School. In addition, approximately 25% of all students from the Morning View School attend the (PAS) after school program hosted by the parent school.

The after school population draws mainly, though not exclusively, from the day population and thereby mirrors the constituency of the regular day population. Children who participate in the after-school program range from students who qualify for government-subsidized free breakfast /lunch programs to students who meet high socio-economic standards. More than sixty percent of all students who attend Morning View School and the PAS are eligible for free or reduced federal school lunch programs. the program is designed to service the full range of academic and physical needs represented in the general school population, and this diversity of need is reflected in the qualifications and certifications of the staff.

The school and after school program have a history of excellence as evidenced by their consistently high standardized test scores in the school and the fact that all students who attend the PAS pass their district and state benchmark testing which has resulted in the school and the program receiving numerous accolades and being asked to present to professionals at the district, state and national level. The school operates with a professional community that actively engages in collaborative teaching and learning. Those who teach there are focused on academic achievement for all students as stated in the school report card. The Morning View School develops a Whole School Improvement Plan (WSIP) to guide its focus and selection of goals. The Progressive

After School Program (PAS) aligns itself with the focus on instruction and Whole School Improvement Plan (WSIP) created by the faculty and administration within the host school.

The school is also rich in racial diversity and culture. The population of the Morning View School is 33% Caucasian, 35% Black, 23% Asian and 7% Hispanic/Latino and 2% Native American The population of the after school program mirrors the population of the school in terms of its racial/ethnic diversity. The school demographics are previously stated in Table 1

Research Study Participants

Section two focuses on research study participants and the team members who agreed to participate in this study. This section includes relevant background information of study participants with respect to their length of service to this community of learners, length of service to the profession, each participant's educational background and the participants' overall initial views of professional development. This information will allow the evaluation on the extent to which their perceptions of their own practice and the effectiveness of their professional development with respect to changing practice.

The Morning View School was chosen because it houses the Progressive After School Program as well as for its focus on academic achievement with ongoing evaluation, its large number of students, the racial diversity of participants, and teachers' willingness to participate in this project. The selection of participants during the planning process was of utmost importance. Candidates were teachers who worked in public schools and after school programs in large urban area. Participants in this sample agreed

to participate in the study knowing that their positions within the school, after-school employment, or promotion in any area, would not be affected in any way by the findings of this project. Written consent was gathered before the onset of this study and the parameters of data collection were explained and agreed upon.

The study sample included five afterschool teachers. Table indicates the level of teaching experience that each participant had prior to teaching in the PAS program, participants' level of education, teaching experience and focus area, subject experience and previous professional development in science education. While all participants were employed, within the school district, many of the participants' degrees were not affiliated with elementary education.

The age of participants ranged from 22 to 45 years. Two of the participants were in their early to late 20's with the outlier being a career change teacher of middle age. All five teachers who participated in the study were hourly employees paid directly Morning View School's after school program. Employees of PAC are paid an hourly rate set at the beginning of each year. Teachers were not paid to participate in the study. All professional development opportunities were also paid directly by Progressive After School Inc. or offered free of charge by the district. Table 2 also includes a summary of general background information on study participants.

Table 2

Progressive After School Participant Sample

Teacher	Years in PAS	Professional Development Science Experience	Subject and Years of Teaching Teaching	Amount of Experience Teaching Science
Teacher 1	3	0	History 3 years	None
Teacher 2	6	1 (Urban Ecology)	Math 2 years	.5 years
Teacher 3	6	3	Elementary Science 3 years	3 years
Teacher 4	3	1 (Urban Ecology)	After School Teacher 3 years	None
Teacher 5	2	0	General Education 2 years	None

Teachers where chosen by this researcher for their willingness to share their personal views of professional development opportunities. Participants were also selected based upon their desire to participate in professional development in different forms with which they may or may not have had prior experience. They also needed to be able to assess and articulate their personal perception of the quality of each form of professional development and then reflect upon its impact upon their personal professional practice.

The process of reflection began in the pre-professional development formal interview, continued with the informal interviews, observations, journals, and culminated in the second formal interview at the end of this study.

3. Introduction to Professional Development at the Progressive After School Program (PAS)

In order to fully evaluate the impact of the professional development on the practice in the PAS, it is necessary to provide a brief overview of the menu for professional development that study participants were offered. By knowing the forms and the context within which the professional development occurred, patterns found in participant responses can be correlated directly to the forms of their particular professional development.

Three forms of professional development are found in the Progressive After School program. They are district directed intervention, and self-initiated. All three forms of professional development are described below.

- District Directed Professional Development is primarily focused on increasing the levels of content knowledge of teachers within a specific content area.
- Intervention professional development provides outside leaders with direct classroom access, support and information in the form of a guest instructor or coach.
- Self-initiated professional development draws its focus, content and goals from the desires, strengths and needs of the teaching professional and is inherently collaborative.

All five participants in the study engaged in one of these three forms of professional development, which focused on specific science instruction. Two participants chose intervention opportunities provided by Urban Ecology at Boston College. One participant chose self-initiated or self study professional development, one was solely involved in district directed professional development and the final teacher simultaneously participated in a two forms, self-initiated and district directed professional development.

There are several known barriers to the implementation of professional development. The most commonly cited barriers for professional development for teachers included limited time, unresponsive teachers, restricted funding and lack of skills needed by administration to lead change efforts (Sparks, 2007). While it was outside the scope of this study to address possible systemic solutions to these barriers, the barriers were considered when forms of professional development were selected. By focusing on a selected group of teachers who use multiple forms of professional development and use the lessons learned to improve student outcomes in a cycle of reflective practice, the resulting changes in practice can be tied to the professional development they received. In this context the study was able to offer and gain teacher perceptions of a number of different styles of implementation for professional development around the teaching of science. Chapter 4 will further discuss professional development opportunities during out-of-school time and the findings associated with the participant's professional development opportunities during the regular professional day.

4. Research Design

The process began with the acquired teacher permission to participate in the research. After a significant review by the Human Subject Review Board, basic guidelines were established and discussions took place between both researcher and the Progressive After School faculty. Data collection opportunities included pre-, during, and post- study personal interviews, field notes from observations, group interviews and written participant journals.

- **Personal Interviews**

The first opportunity for data collection was during the pre-study personal interview. The purpose of the pre-study interview was to obtain a frame of reference for the coding and analysis of responses to future interview questions. These interviews were conducted exclusively in a one to one setting. Each of the study participants has unique personal and professional experiences, which influence their personal assessment as well as the researcher's evaluation of the participant responses. The pre-study interview questions were designed to ascertain their motivations, and desired outcomes. Their responses provide a baseline by which to measure the net effect of the participation on their perceptions and practice. A full listing of pre-study interview questions can be found in Appendix A.

The during and post-study, interview questions were formed to gather data in understanding the significance of teachers making adjustments to their practice. The interviews were conducted as one-to-one interviews and small group interviews. Teacher interviews were part of an ongoing and continuously evolving process. Through

information gained from the review of literature, the data gleaned from the interviews were aligned and analyzed. Although interviews were informal in nature, specific questions were asked in a standardized fashion within the scheduled interview time.

Fourteen questions were asked during the pre and post-study interviews. Questions were formed around understanding pedagogy, adjustments classroom practice and teacher's professional development plans.

Some questions asked were grounded in determining the need for pedagogy and topic specific support, others focused specifically on the participant experience with and perceptions of the three forms of professional development. Also evaluated was the overall effect of additional professional development support on teachers. These questions focused on instructional practices prior to and post study participation and perception of program effectiveness. Questions included subjects related to changes in understanding pedagogy, teacher adjustments to practice, professional development's influence of change in practice, significant changes in growth of knowledge and different strategies teachers used to reach diverse learners. The researcher also examined what instructional practices found in existing programs have proven to be effective from a teacher's perspective.

By keeping the questions for the during and post-study interviews consistent with a sufficient interval of three months time between each one-to-one interview, the researcher was able to track and describe changes that occurred during the course of the study. The fidelity of responses to questions regarding practice and perception prior to the study period could be determined by cross-referencing responses to the same question

asked during each of the three one-to-one interviews. This information could then be correlated with the participants' responses within the mid-study and final group interview to more fully describe the changes that occurred in teacher practice as well as describe the elements that lead to this change.

Personal interviews were conducted three times in the same year during the research process. The first interviews began in September, the second in December and the final interview in May. The researcher's two research questions and questions regarding process were addressed in each of the sessions.

- **Observations and Field Notes**

Observations were made in a non-evaluative fashion. The observation and observational tool used were structured so as to preclude an evaluation of the teacher. These observations were specifically designed for the purpose of obtaining data relevant to the research questions rather than specific information about lesson planning and implementation on the part of the teacher. Observations in a school setting are regularly conducted to assess teacher performance and effectiveness of strategies. It was made clear to participants that the purpose of the researcher's observations was not in any way to evaluate their practices, but rather to observe and catalogue student responses, level of engagement and level of questioning. Researcher compiled field notes, assessment of personal bias, a log of weekly observations and a summary of findings are included in this sector. While it was of important that the researcher make keen observations of the environment, it is of equal importance to take steps to organize the observations logically and learn from what was observed. Understanding the landscape added to a meaningful

understanding of responses. The researcher is subject to checks and controls of both reliability and validity.

Observations and field notes were used to further clarify understanding of the researcher. Field notes were also used by the researcher for reflection, to generate questions to serve as prompts during the large group discussions as well as to better understand the questions and statements raised during the one to one interviews. Observations and their subsequent review were exploratory in nature and used for the purpose of assessing the introduction of new pedagogy, or outside organizations' curricular tools and to provide a common frame of reference for faculty's questions and concerns about the project.

- **Small Group Interviews**

All five teachers participated in two whole group discussions on the researcher's questions and their involvement in teaching a subject matter that, in most cases, was foreign to each study participant. These questions mirrored the questions asked during the one-to-one interviews but were geared more towards eliciting interactive conversations between teachers rather than direct responses to the researcher. A listing of the guiding questions used by the researcher to initiate discussion is provided in Appendix D. During these discussions, participants spoke candidly about their desire and motivation to participate in this study and about the challenges they faced during implementation. These group sessions took place between the pre-, during and post-interviews and were designed to gather insight into the observable changes in practice and perception that were occurring for study participants.

- **Journals**

An opportunity for fully candid and open discussion was found in the data collection from the teacher journals. The journals allowed participants time to think and revise their thoughts before sharing them. Though interviews were informal and observations non-evaluative, they both have the capacity to generate fear or apprehension depending on the participant. The journals, in addition to mitigating the possible stressors of the other forms of data collection, provide a unique opportunity to observe the more subtle changes that occurred during the study. While the interviews provide the beginning and end point for the changes in a participant's practice and perception, the journals provide the pathway that the study participant utilized to reflect on his/her thoughts.

As in the less formal group discussion, there were a series of focus questions provided by the researcher. Each of the questions was designed to illuminate changes in perception and practice over time and identify trends in the data with respect to the central research question. Some questions used the most frequently by study participants were:

1. Describe the benefits, if any, you see in adding science to the after school program.
2. What is your perception of student interest after the initiation of science instruction within the project?
3. How does the effect of professional development play a part in teaching and learning in the regular school day?

Journals were kept by participants for the entire study period of over six months and were completely contained within one school year. Participants were required to make a minimum of ten entries over the designated period and were guided by the focus questions. They were welcome to record their thoughts more often and in greater detail than required. Personal perceptions, student achievement data, anecdotal student data and personal reflections to focus questions were kept in the personal journals.

Method of Data Analysis

At the end of the project, interviews, one-to-one and group journals, observations and field notes were reviewed by the researcher, transcribed and then coded to provide insight as to common and enduring themes. After verifying all transcribed documents for accuracy, the researcher input the documents into a coding software program, HyperRESEARH, which was supplied with codes specifically designed to categorize the types of responses expected to be generated by the researcher's key questions. Additional codes were added as needed to reflect participant responses that fell outside pre-existing codes. With all data sourced transcribed into electronic text, the coding software was able to identify the most frequently referenced codes. By utilizing a common coding system, all forms of data could be used both individually and collectively to allow the researcher to effectively analyze the data and draw substantive conclusions.

As previously stated, the codes in Table 3 are provided as an example of the researcher's initial coding system.

The most frequently referenced codes were CP (Change in Practice), CSI (Connects Curriculum with Student Interest), VP (Views of Practice), ILSP (Independent Learning by Students Plus Degree), UC (Understanding of Curriculum), and THE (Teacher Expectation High)

Table 4 Most Frequently Referenced Codes

Type of Code	Meaning
CP	Change in Practice
CSI	Connects Curriculum with Student Interest
VP	Views of Practice
ISLP	Independent Learning by Students (Plus Degrees)
UC	Understanding of Curriculum
TE	Teacher Expectations

At the end of the project, all interviews, journals, and field notes were reviewed again. Common and enduring themes were further examined through a second review of the pre-, during, post- and large group interviews. That data was aggregated and checked for agreement with the findings from personal journals. While examining personal interviews, coding data was reviewed looking for patterns and relationships of responses which might have been inconsistent with responses from the large group discussions. Interpretivism and social anthropology were used in this study due to the intensely

relational aspect of the study. Much of what is measured is based upon how individual study participants interact with outside professionals, peers and students and their perception of those interactions. Interpretivism and social anthropology allow the analysis of the responses within the context of human relationships.

Final analysis of the findings focuses on minor implications for policies and practices in professional development for educators in after school science programs. Teacher attendance was also reviewed by the researcher and noted to review participation levels. Budgetary issues and constraints were also considered (Miles, 2004).

Format for Reporting the Data

This study used a qualitative case study methods based on grounded theory in which the "investigator, as the primary instrument of data collection and analysis, assumes an inductive stance and strives to determine meaning from the data" (Merriam, 1998, p.7). Assessing changes in understanding and perception on the part of the teaching staff were key objectives of the researcher. This chapter examines the differences in professional development opportunities and the availability of each professional development opportunity to teachers within the study.

Teachers' informal interviews, journals and observations were major sources of data collection. Interviews were coded by date and time collected in order to further triangulate findings. Program observations and group interviews were also major sources of data collection. Recognizing the importance of scientific knowledge through changes in perception was a key dependent variable in data collection. The independent variable

of professional development through the description of meetings and coded notes are also key in data reporting for this study.

Research Findings

Because each individual forms and builds their perception on the basis of their life experiences and education, it was necessary to start with the gathering of baseline data to see where each participant was at the beginning of the study. This was the purpose of the first formal interview; to ascertain motivation of each and participants views on science education in after school. The two questions asked during the first of the formal interviews were as follows:

- Why were you interested in participating in this project?
- Describe the benefits, if any, to adding science to the PAS program.

By examining participant responses at the start of professional development, the impact of the professional development could then be more accurately determined and would allow conclusions to be drawn about Research Question #1, What are teachers' perceptions of how involvement in teaching a new science program affected teaching practice in the after school program?

We can chart their development throughout the data collection process and compare end of study responses. The participant responses in the pre-professional development interviews, during study interviews, small group discussions, journal entries, informal observations and field notes, and final formal interviews were all coded using the same system referenced previously in this chapter.

First Formal Interview

The first formal interview was a taped, semi-structured interview, which asked participants about the reasons for their interest in participating in the study as well as their thoughts and feelings about the implementation of science instruction. This interview focused on assaying and establishing the baseline of participant perception to be used for final comparison in the analysis of data collected by all subsequent observations and interviews.

Q. 1 - Why were you interested in participating in this project?

For all of the participants there were two elements that prompted their interest in participating in the study more than any others: Connects the Curriculum with Student Interests (CSI), and the potential for Change in Practice (CP). Each participant cited both as their reasons for wishing to participate. It is interesting to note that the emphasis placed on each element, by virtue of the number of times referenced, came down to years of teaching experience. The teachers who have been teaching for over 2 years cited Change in Practice as being the most important to them with CSI taking the subordinate spot. Codes were selected as a result of information being included in the responses of each participant as well as being generated multiple times within a single response for a participant. While there were additional codes that were generated, these were the only two which were ubiquitous and so highly referenced.

Code (CP) Change in Practice

> At the moment, I've been teaching the last three years. With (the after school) program, we have more room to maneuver so as it develops more, I could possibly take (what is learned) back to my regular classroom (Teacher 1).

> I knew that it would provide me with an opportunity to utilize my content knowledge, as my academic degree in Molecular and Cellular Biology, as well as develop my pedagogical knowledge with respect to my skill set in science (Teacher 2).

> I am the elementary science teacher at the (Morning View School) and I was asked if I would be interested as the science teacher and, of course, I immediately said yes knowing that it would give me a chance to learn and practice new skills in a different setting (Teacher 3).

In each case, it was about how participants hoped to learn something new that would impact their practice. When pressed on the issue as to why this was something that they thought was necessary, they cited the need to find new ways to engage students by connecting their learning to their world and experiences.

Participants with less time in the teaching profession and experience with the concepts of professional development, were primarily motivated by the idea of Connecting the Curriculum with Student Interests (CSI).

Code (CSI) Connects Curriculum with Student Interest and World Views.

> I think (after school) is important, especially for kids in an inner-city school to be involved by going outside and doing stuff within nature...I think it's really important to bring access to the curriculum in a fun way (Teacher 4).

> I brought it up to the students. I gave them a choice of obviously learning about motion (or) the solar system and they chose the solar system. The energy of just me bringing it up to the class really motivated me to, you know, not mind doing it (Teacher 5).

When asked what effect they hoped to have from participation in this type of work, they indicated that they hoped that this would have an impact on how they taught and developed as a teacher, which indicated their orientation to CP as well as CSI.

Irrespective of level of experience or subject area taught, there seems to be a consensus among the study participants that the two most motivating elements are the creation of change in practice and an increased connection with student interests and worldviews. While there were other supporting reasons given, Understanding Curriculum, Views of Practice, and Caring for Students, reasons were not universal and varied in degree from participant to participant. Yet, all comments tied back to the main two common codes of Change in Practice and Connects with Student Interest. Teacher 1 stated, "I need to understand the scientific principles better so that I can learn to see how to connect my lessons to what the kids know and want to do." While this is technically coded as a need to improve understanding of curriculum, the motivator that drives that need is a desire to better connect with student interests giving a link to CSI. Similarly with Teacher 2, "I want to make sure that my students can access the content that they will need in order to be successful through my teaching." This is coded as Caring for Students, however it is driven by a desire to see a Change in Practice which will result in his stated goal. This was the case with nearly all of the responses found in the pre-study interview, though they may also fall into other categories, they were easily understood as being driven by codes CP and CSI.

Q. 2 - Describe the benefits, if any, you see in adding science to the after school program.

Participants had a range of responses with regard to this question. There was no single code for which all participants had a reference point. There were, however, some commonalities which became apparent after analysis of the responses within different classes of participants. This time the commonality of response was not based on years of service or experience, but was rather based on familiarity with or experience in teaching the subject of science. The two teachers who have science backgrounds had very strong opinions with regard to Views of Practice (VP). They felt that there was something lacking in the provision of time and/or resources for science education in the regular day and saw after school as a way of recovering some of that lost time and resources. Those who were non-science based instructors were more focused on Connecting Curriculum to Student Interest and World Views (CSI). They saw an opportunity to provide connection to the concepts learned during school time and provide more hands on learning to enrich student understanding. Again, as with question one there was consensus on the issue. The issue as described by all participants is that students were unable to connect to the science learning that they needed to connect with, and the concepts they needed to master. The perception of why there was this present gap was drawn strictly down the line of the participants with and without science education or training. Science professionals saw it as a function of limited time and resource while the non-science

participants attributed the disparity to a deficiency in the relevance of the curriculum as it exists.

Code (VP) Views of Practice

> I believe that the … regular day classroom is insufficient in its ability to provide hands on activities as well as field experiences which serve to deepen the understanding and broaden the knowledge base that will allow them to be successful. We can work in conjunction with the existing structure and allow extensions and connections to be made for which there is either a lack of time or resources (Teacher 2).
>
> As science educators, we need more face time with the children. I could take what I do in after school and have a student explain what we've done, creating a dialogue between students (Teacher 3).

Those who were immersed in the field and education of science, recognized and articulated a deficiency in the manner in which science instruction is structured and delivered and saw this study as an opportunity to support and build upon what they see and do during the regular day. It was their view on presently accepted practice that seemed to frame their desire to participate in the opportunity to expand or extend the learning and curriculum that they see in place now. For the remaining participants their focus was on providing an opportunity for CSI.

Code (CSI) Connects Curriculum with Student Interest and World Views

> Learning coupled with enrichment opportunities to enhance the day program would be most beneficial to the students (Teacher 1).
>
> I think it's great we're starting to incorporate science into the after school program. (It will) give kids one more way to access the curriculum. (The) ideal would be finding something very fun to do stuff so we (could go) on field trips to really cool places (Teacher 4).

> I think, not just what I'm teaching, but all sciences… it's very important that students have a basic understanding of science because of how things work in this world (Teacher 5).

Without a particular experience with regular day programming in science, they were focused on injecting fun into the curriculum and generating exposure. They were not yet coordinating these efforts with specific changes in practice nor were they connecting their plans to any particular student outcome indicator.

Journal Entries

At the close of the study, the participants' journals, which had been compiled throughout the study period, were coded and organized utilizing the same system as the formal interviews. The most common codes produced from this data source overall were Views in Practice (VP), Teacher Expectations (TE), Change in Practice (CP), Connects Curriculum to Student Interest and World Views (CSI) and Independent Learning by Students P (ILSP). As the journal entries developed over the course of the study the tone of the entries changes. Initially, the entries were short and speculative in nature, mid study there were many more statements about the methods of implementation and student comments, and at the close of the study the entries took on a reflective tone that evaluated the changes that the participants themselves had noticed and implemented in their individual and collective practice. This was the most dynamic and abundant data source and allowed for a continuum of evaluation of changing perspectives on the two research questions. By examining the journal responses chronologically sorted by research question, the manner in which participants arrived at their responses for final interviews

at the close of the study becomes clearer. This facilitated the process of deriving meaning and drawing conclusions on the basis of the changes observed.

With respect to the first research question regarding perception of the impact on their teaching practice as a result of being a part of a new science program, within the first month of the study participants were making substantive changes to their views on practice (VP) and expectations for students (TE).

Code (VP) Views of Practice

> I think that researching my topic area will allow me to add to what I have already started to with my kids (Teacher 1).
>
> This is going to be a great opportunity to work with an outside science specialists to present the science I know in a different way (Teacher 2).
>
> I don't know where to start; I have no practical teaching base upon which to build. I know my science, but I am not fully secure teaching it (Teacher 4).
>
> I think that I have a pretty good grasp of what I need to do to make this work (Teacher 3).
>
> I am not sure about how much of my skills in the general education classroom will translate into this new after school class (Teacher 5).

Code (TE) Teacher Expectations

> The kids have been able to do all that I have asked of them up until now, I wonder if they will be able to adapt quickly to a change in format (Teacher 1).
>
> For many of my students this will be the first exposure to field science, I hope they will have the perseverance necessary to work through the difficult lessons to learn (Teacher 2).
>
> New to me, new to them, I don't know what to expect from them other than to try their best (Teacher 4).

> They (the students) are picking the topic so I know they are interested, I just hope the energy keeps going as we move through the project (Teacher 5).

There was a fair amount of doubt and trepidation stated in the early entries, which was referred to by Teacher 3 as a period of "Hopeful yet highly reserved optimism". This was understandable when considering that this was an entirely new endeavor for the program and for one of the participants their first point of entry into teaching. This mood and the tone of the entries became less reserved when taken from mid-study period. While the most prevalent coding types from the start of study remained so for the mid-study period, the manner in which the teachers expressed their observations and expectations began to transform. The coding types remained consistent (VP and TE), however their perspectives and personal goals changed significantly.

Code VP

> While all this is still relatively new to me I think this is something I can become really proficient in (Teacher 4).

> I am beginning to see that there are different ways to teach science than the way that I learned and I can see these practices as being possibly transferable to my other content areas (Teacher 2).

Code TE

> I am going to push these kids faster now, I can see they are soaking it all up (Teacher 1).

> I can see my kids from the regular day going through a thinking metamorphosis, they are not just answering my questions, they are questioning my questions, I can engage them on an entirely different level (Teacher 3).

> My kids are capable of so much more creative and independent problem solving than I ever imagined, I am not giving them enough of a challenge (Teacher 2).

The entries that were completed near the close of the study not only changed in tone, but the codes referenced by the participant responses began to shift to CP (Change in Practice) and CSI (Connecting with Student Interests and World Views). At this time, most of the journal entries make note of changes in the level of ownership and independence their students were displaying and improvement in the participants ability to foster a learning environment which catered to increasing student independence. No longer do the entries express doubt or hope, rather they featured practical analysis of learning conditions and outcomes. There is also an indication based on entries that participants no longer focused on what the students will or will not be able to handle, but rather focused on finding further ways to connect with students and add practical relevance to their content.

Code (CP) Change in Practice

> I have a new set of skills that I have been able to try out in an environment that is open to and promotes changes in practice (Teacher 4).
>
> I can now implement project based learning with my students with a fair amount of skill (Teacher 3).
>
> I have always had the idea that this was important, now I know how to do it (Teacher 5).
>
> I no longer feel compelled to micromanage every moment of my lesson, I have to plan a great deal more and do a more comprehensive prep, but I am now able to facilitate my classes rather than direct (Teacher 2).

CSI – Connects Curriculum with Student Interest and World Views

> The way that I am teaching now really connects with the kids, they are engaged and active (Teacher 4).

> They (the students) love that they are a part of the lesson and the direction it takes. They are working because they want to learn and it is interesting to them (Teacher 5).
>
> My kids are making connections that I haven't even thought of, they are taking time outside of class to conduct independent research and are seeking out information from all available resources. The class never ends; each lesson spills into and is connected not only to each other but to the students as well (Teacher 2).

As the study progressed, it was not solely the tenor of the responses that changed markedly, so too did their quantity. By the end of the study period, the teacher journals were awash with quotes from students and the energy that the participants were able to convey was powerful. Not only were participants recognizing the benefits of the addition of science instruction in after school programs, they also noted that their teaching practice in general was necessarily changed by that addition.

The same kind of progression was noted when assessing the journal entries with respect to the second research question regarding the contribution made to their practice from their respective forms of professional development. There was remarkable agreement in terms of coding in that the Codes of VP (Views on Practice), CP (Changes in Practice) and TE (Teacher Expectation) were equally represented in both question analyses. However one key difference is found in the near complete omission of code CSI (Connect to Student Interest and World Views) and the dominance of code ILSP (Independent Learning by Students Plus Degrees). The first journal entries reflect a strong emphasis on codes VP and TE, while those from the mid-study period begin to reflect more frequent and almost exclusive references to CP and finally by the end of the study period, there is a resurgence of VP and the notable addition of ILSP.

Code VP

> My PD has already changed the way I look at teaching science. I have been teaching for some years now, and this is still new and exciting to me (Teacher 3).
>
> I thought that my instruction was meeting the needs of my kids, they did what I asked and I counted them as successful. After meeting with outside partners and my fellow teachers, I realize that I may not be as effective as I could (Teacher 2).
>
> I'm not doing anything that different yet, but the team has got me thinking (Teacher 1).
>
> With my outside partner support and my in school project mate I think I am up to the task of delivering science instruction for the first time (Teacher 4).

As the study participants became to experience changes in how they viewed their practice, and their expectations regarding their practice, there was a corresponding change that was noted in their expectations for students.

Code TE

> I think I am going to get a lot out of this PD and in turn get more out of my kids (Teacher 1).
>
> I am watching my students begin to take initiative with their projects, I think I can pull back some of my structures for support and let them operate with more autonomy (Teacher 5).
>
> I have to keep reminding myself, do not underestimate what the students will be able to tackle. I should not shy away from a problem that causes them to struggle, they seem to enjoy problem solving more the greater the challenge (Teacher 2).

By the mid-study, journal entries participants have become much more knowledgeable of and comfortable with their professional development and have begun to articulate specific changes in practice as they relate to their respective forms. It is at this point that nearly all of the entries reference as CP. Regardless of the form of

professional development, it is clear that CP has a profound impact on the perception of change in practice.

Code CP

> Working on my own I have been able to find a lot of new stuff to try. It is great to be able to try new ways of doing things. I have begun to put in more open-ended questions and opportunities to come up with multiple solutions. I can let the kids work it out (Teacher 1).
>
> So awesome! Every time I come back from a training I have at least 2 new practices that I want to attempt to implement. What is even better is that I can get immediate feedback from my partner and use it to improve the next day's lesson (Teacher 2).
>
> I have the supplies that I need and with teachers from across the city I can brainstorm with them and bring something back to our school that I would never have come up with on my own (Teacher 3).
>
> I have learned how to allow hands on learning to happen without my hands all over it (Teacher 4).
>
> I am more and more letting my students take an active and even leading role in the direction their projects will lead (Teacher 5).

The journal entries from the end of the study period became more reflective in nature. As they were coded, the study participants began to highlight the manner in which their respective forms of professional development had impacted their personal views on practice. They also universally indicated that there were positive changes in their students independent learning (ILSP).

Code (VP) Views of Practice

> Just sitting with my colleagues has changed the way that I think about science instruction (Teacher 1).

> Being with such a focused group of educators all working towards building engagement and improving proficiency in science teaching has had an impact on not only how I teach but how I think about teaching (Teacher 2).

> I didn't even know before where to begin to improve my practice, but having worked so closely with people in the field as well as fellow teachers has made me realize my strengths as well as how much I still have to learn (Teacher 4).

> The professional development has given me some really practical tools that I can use not just for this group of students in science but in my teaching in general (Teacher 5).

Not only are participant views on their practice changing, the views indicate highly positive changes. The VP coding in early journal entries was much more abstract while later entries represent concrete and substantive changes in what they view as effective practice. These changes in practice correlated with an increase in the independence exhibited by the students with respect to their learning.

ILSP – Independent Learning by Students

> I still deliver a good program, but it is less work for me. (The students) are taking up everything that I put out and running with it (Teacher 1).

> After working with the team, I can see how my changes in practice have lead to my students taking the initiative in the class and their empowerment to learn (Teacher 2).

> My kids are really learning how to work together to solve problems with less and less input from me (Teacher 4).

The journal entries when analyzed with respect to the research question and taken as a chronological progression show that while there were instantaneous changes which came as a result of professional development, there were also more long lasting and

professionally meaningful changes in perception and practice that occurred over the course of the study.

Informal Observations

The data collected in this phase of the study though subjective in nature, was collected systematically and utilized the same coding as the taped interviews and journals. To ensure that researcher bias was kept to a minimum, the observation was conducted using a data collection sheet and looked specifically to corroborate the codes which seemed to be most prevalent in the journals as well as to assess any changes from the initial coding gathered in the first formal interview.

The codes which were most prevalent in this data collection were UC - Understanding of Curriculum , CP - Change in Practice, and CSI - Connects Curriculum with Student Interest and World Views. There were clear changes in teacher understanding of the content; along with an associated change in practice.

Code UC – Understanding of Curriculum

Teachers 2 and 3 had significant background and content knowledge in science, so there was an expectation of the researcher's part that they would not experience significant gains in UC Understanding of Curriculum. However, in their conversations both with students and the researcher both indicated that they were able to learn a great deal of new content relevant to the specific topic areas. They had a strong base of knowledge, which allowed them to delve more deeply into the content and make further connections for their students. In the informal observations it was noted in 3 out of the 5 follow up sessions that they had infused their lessons with new activities and information

based specifically on material that they learned or discovered in their professional development.

It is notable that the most trained and least trained individuals experienced the same form of professional development. Teacher 4 had no prior teaching experience and limited exposure to science education and noted that the Intervention Professional Development gave her the tools they both needed to feel instantly proficient enough to take on the responsibility of teaching the lessons. Teacher 2, with a more significant knowledge base, saw the intervention as an opportunity to deepen his understanding and looked at it as more an opportunity to try a different form of delivery and use the time with colleagues to create a new view of their practice and implementation. Though they were working together and received the same support, their application of the PD was widely different and valued for different reasons. Teacher 4 was implementing an entirely new skill set and knowledge base. As such, the Intervention PD provided her with the ability to implement the lessons on the basis of their partnership and sought direct assistance and mentoring, "I could get the help I needed right away and I knew that it would work".

Teacher 2 accessed and utilized the same resources in a widely different manner. He knew the content deeply and was able to use this opportunity to look at how he could present material that he was already familiar with in a totally new way, "I had a second perspective on the lessons, we could talk to each other and generate solutions and activities that I could never have come up with on my own. It forced me to reevaluate what I thought I knew about the content." The remaining three teachers all

demonstrated improvements in UC evidenced by introduction of new content into their afterschool classrooms.

Code CP – Change in Practice

The most drastic change in practice came understandably from Teacher 4. Because there was little prior formal training, all the elements in practice observed were essentially a change in practice. Over the course of the study it was noted that Teacher 4's style of teaching went from being very teacher directed at the beginning to student driven by the end. The level, type and sophistication of the questioning strategies showed the progress made in this area. In the researcher's first observation it was evident that Teacher 4, as a result of her own level of inexperience with the topic, was loath to relinquish control of the lesson to the direction of the students. She held very closely to her plan and did not deviate or accept deviation on the part of her students. When doing a lesson on animal habitat, she redirected several questions back to the particular habitat she had planned to deliver, rather than take the opportunity to explore student understanding or create a spirit of inquiry. By the final observation, Teacher 4 was able to effectively manage an inquiry based lesson, her prep style had changed and she was no longer adhering to a script, she was rather guiding her students through a process of discovery with a minimum of direct instruction.

Teachers 2 and 3 both indicated that they were looking forward to and therefore seized every opportunity to try new practices. It was evident in their rapid adoption and modification of new lessons as well as their enthusiasm at trying something completely

different from their prior practice. Teachers 2 and 3 as the resident science teachers were well versed in the curriculum standards as well as prevailing practices. They were familiar with the textbook approach and direct instruction that was associated with many science programs. They recognized the deficiencies found in even some experiment based kit programs. Though they participated in different forms of professional development, Intervention and a combination District Directed and Self Directed professional development for Teacher 2 and 3 respectively, they both actively pursued ways to supplement a curriculum, which they felt was good but insufficient to fully meet the needs of students in the 21st century. While other participants often waited a week to plan and implement their new lessons, Teachers 2 and 3 were applying new strategies the day after their professional development sessions as well as actively consulting each other on the outcomes of their latest endeavors.

For the remaining teachers, although indicating otherwise in their first formal interview, CP took the dominant place in the observation. While CSI remained their focus, it was CP as a result of the PD that was directly impacting their practice and which was most notable over the course of the study. These changes were most evident in the physical restructuring of their rooms and the ideological restructuring of their lesson delivery. The classrooms of all 5 participants now included a different physical orientation which placed the focus on collaborative work rather than teacher driven instruction. The student tables were oriented in a manner which was conducive to both paired and quad groupings. The objectives for their lessons were clearly posted and students were participating in the development of the goals for the unit as well as

determining how they would assess successful completion of a task. While before, the lesson delivery was biased heavily to direct instruction, with more than 60% of the observation time spent with the teacher speaking. By the end of the period of this study, the percentage of time spent on teacher speaking had been reduced to less than 30% of the lesson. The frequency of questions asked of students went from an average of 5 questions per class to over 30 questions nearly half of which were opened-ended.

Code CSI Connects Curriculum with student interest and World Views

While other classes within the PAS do a good job of engaging their students, there was a distinctly different energy level in the classes where the instructors were receiving focused PD in their subject area. Student interest was evidenced by all students being engaged in all facets of the lesson. The number of students indicating willingness to participate was measured by the number of students raising their hands to respond to teacher questions. At the start of the study, the majority of students did not raise their hands in class. In some cases, hand raising was as low as 10% of the class observed. By the end of the period of this study, the percentage of students raising their hands ranged from 80%-100% in all classes observed. Each student participated and offered substantive input both in the form of solicited response and spontaneous questions and suggestions. Each classroom increased their level of CSI. Teacher 5 in particular, due at least in part to involving the students in the selection of the topic "area," was most advanced in the levels CSI. In Teacher 5's room, the students not only were actively driving individual lessons, they had developed a vocabulary and protocol which allowed

them to actively guide the selection of subsequent topics and areas of study. As the class neared the end of the unit, the students began to discuss what would make an appropriate next and connected step. Teacher 5 had created an environment where the students were not only empowered but fully capable of making their own connections with the lesson materials as well.

The observations and field notes allowed for a corroboration of or challenge to the perceptions of the study participants, which was further examined in the context of the final formal post study interview.

Final Formal Interview

The Final interview was a taped, semi-structured interview asking participants to reflect on personal educational practices in and out of school time and the need for and significance of professional development. This interview also asked participants to comment on the quality and quantity of professional development opportunities offered during the course of this study. The questions employed to elicit participant response were as follows:

- How has your attitude about teaching science changed from the beginning of this project?
- What is your perception of student interest after the initiation of science instruction within the project?
- How does the effect of professional development play a part in teaching and learning in the regular school day?

Q. 1. – How has your attitude about teaching science changed from the beginning of this project?

In the final interview it became clear that following involvement in the professional development effort, there was much greater consensus with regard to the importance and impact of the forms of professional development than there had been at the beginning of the study. Whether their orientation before had been to change practice or connect the curriculum to student interest or world views at the beginning of the study, by the end of the study they almost universally spoke in terms of views of practice and change in practice.

Code VP Views of Practice

> I feel the kids are picking up on science right now and it's the first time (PAS) has been a true academic setting (Teacher 1).
>
> I have been able to engage and connect with students with respect to their scientific process and understanding (Teacher 2).
>
> Actually, I'm excited about it now (Teacher 3).
>
> If I just focus on one part of science, like the solar system and hopefully (students) will gain further interest that will motivate them to want to learn science through 6th grade and high school and hopefully, higher education (Teacher 5).
>
> I think I am able to do a good job at executing urban ecology (Teacher 4).

While in the previous formal interviews and in subsequent journal entries, participants had expressed apprehension at the application of some of the skills learned during professional development. By the end of the period of study they were more

confident about their teaching, about how they connected with their students, and their ability to connect science to the lives of the children they serve. They were also now able to cite specific and concrete changes to their practice that had observable and measureable impact on student learning. There was a significant transition that took study participants from discussing the possibility of improved student outcomes to the certainty of success with the implementation of new measures. They were now able to attribute increases in student engagement, such as increased responsiveness, increased attendance, increased task perseverance and reduced frustration levels, as being the direct result of a concerted and coordinated change in practice. Also, because the changes made to practice were now being closely monitored and enacted in a systematic way, the evaluation of their efficacy was greatly enhanced.

Code CP Change in Practice

> (My after school teaching) mirrors and complements what is done in science during the regular day (Teacher 1).
>
> The peer support and assistance with making lessons developmentally appropriate has made me more effective in afterschool and regular day class as well. I have also found new ways to incorporate experiential learning and project based learning into my regular day classroom activities (Teacher 2).
>
> What I'm doing now is pretty much using books as supplements and we're doing all hands-on activities which I believe to be a better way of teaching science (Teacher 3).
>
> I feel like I can implement a curriculum or I can see a benefit to (the students) who won't feel the anxiety toward science that many (teachers) may feel now because there is so much to cover in science (Teacher 5).

It is interesting to note that the only participant that did not articulate a change in practice was participant 4 who had no prior classroom teaching experience. While she now had a completely new skill set, this was not how it was articulated in interviews and journals. However as indicated by the progress through the observations, the journals and the response to this question coded as VP, it was evident that there was a very deep change in practice. At the beginning of the study the participant "did not know where to begin". During the final interview, the response to the same question asked at the beginning of the study yielded a myriad of strategies and interventions which were given as possible courses of action. This indicated the most sweeping change in practice of those five teachers who participated in this study.

Q. 2. What is your perception of student interest after the initiation of science instruction within the project?

In the response to this question the coding indicated a convergence of thinking unlike that on any prior question. There were only two codes which were generated by this question, CSIP and ILSP. The participants saw universally that the impact on student interest was positive and tied directly to the level of connection between the material and their impact on student learning.

Code CSIP Connects Curriculum with Student Interest - Plus

> Previously, I have stated that if it (a lesson) is delivered right…connected to them in some way….they will come and I'm finding that to be true as I'm going along (Teacher 1).

> They are so engaged right now, they are a part of the science. They are not learning it, it is a part of who they are and what they are doing. It is not just in the room for them it is everywhere (Teacher 2).
>
> I have seen that they ask if they can also do this in regular school. I can see that if it (their interest) was peaked like this before, you would see a difference (Teacher 3).
>
> I think they (the students) will definitely be interested and will come if we keep doing things this way. I think it is really, really, important to have all that "hands-on" stuff (available) (Teacher 4).
>
> The fact that they played a role in the selection of the topic area of study was a huge deal for them. It connected directly to what they were interested in and what they wanted to learn about (Teacher 5).

What is not readily accessible to the reader is the level of energy with which these responses were delivered. Each of the teachers spoke with a confidence and conviction that indicated their level of commitment to this method of teaching. This is notable in that over half of the participants were more focused on finding a new practice or way to deliver science knowledge; they were all now focused on the concept of connecting the science learning to the students' interests and the world around them.

For those who did focus on independent learning experiences by the children, it was always in the context of connecting to student interest. Connecting with student interest is a necessary precursor to Independent learning by students. Students who share a genuine connection with the lessons and concepts to be learned can then take upon themselves some of the responsibility to advance their own learning.

Code ILSP Independent Learning by Students Plus

> Because they own it, the students are much better and being independent learners. They form questions from their observations and attempt to resolve the problem because it has a deep personal relevance (Teacher 2).

> I'm finding that students are working better independently and more cooperatively than ever. The delivery is a lot different (in after school). They are doing (science) because they want to and it interests them, that's it! (Teacher 3)

Perhaps owing to their greater exposure to science teaching in general, it is, again, the two teachers with a science background who noticed a marked difference in how their students were conducting their learning in science. While all participants noted that there was a deeper connection to the interests and the world of the students, these teachers observed that there was a notable difference in the ability to learn independently and that that this too had an impact on not only how they approached a scientific problem, but how they interacted with each other as well.

Q. 3. – Effects of after school professional development on the regular day classes.

Though there were three types of professional development utilized during this study, the response from all participants, regardless of what form in which they elected to engage, was that they had experienced a Change in Practice, which was Positive (CPP). In addition, there were responses relevant to changes in Teacher Expectation (TE) and Independent Student Learning (ILS). This alone might make it appear as though there is no distinction to be found in the forms of professional development. This is, however, not entirely true. In this case,, regardless of form, professional development had a positive impact on practice. What generated the change in practice differed depending on the delivery method of the professional development.

Change in Practice – Positive (CPP)

> In the after school program I think as we have more room to maneuver… so as it (teacher practice) develops more… I think I will continue to develop. I'll possibly take (what I've learned) back to my classroom (Teacher 1).
>
> Intervention provided me with not only additional and new ways of thinking and working, but it also gave me a safe environment to try them out. I know the methods work, I have had a chance to try them and I can apply them with confidence in my regular day class (Teacher 2).
>
> Teaching becomes a lot easier because now I know what the way, the technique to get to (the students) (Teacher 3).
>
> I am not very comfortable with teaching the actual subject of science, but I am now confident on finding ways to provide children with experiences in the specific topic of Urban Ecology (Teacher 4).
>
> I feel like now the more activities, the more project based things you can do, the less it becomes about me presenting them information and them taking notes. It makes science real the (the students) (Teacher 5).

While all of the teachers indicated a positive change in practice, *what* practice changes were made and *why* the changes were made depended on their science knowledge and years of experience as well as their respective types of professional development. Teacher 1 had sufficient background knowledge and independent nature making self-directed professional development not only attractive, but also most effective in generating a change in practice. Teacher 2, with a strong math and sciences background, and a gregarious nature, was looking for a way to improve practice in order to improve student outcome as well as to collaborate with a partner. This facilitated a mutually beneficial pairing with Teacher 4 who held no previous teaching experience, but who was an experienced afterschool worker. Teacher 3 as the most experienced science teacher was well connected to district based professional development and was thus

knowledgeable of those offerings and their past success and problems. Teacher 3 participated in a hybrid Self-Directed and District Directed professional development model which best accessed the available resources and skills.

It is evident from an analysis of the final interview coupled with the journal entries and the observations, that for all of the participants in this study, the major impact of professional development was that of a positive change in practice. Those who noted ILSP and TEP did so through the frame of how they came about due to the perceived changes in practice. In this case again it was the two experienced science teachers that highlighted and articulated these changes in addition to the general changes in practice. Teachers 2 and 3 were uniquely positioned to observe and comment upon the changes in ILSP and TEP with regard to science instruction because of their prior experience with teaching science. They could identify not only that there was a change in practice but could ascertain how that change could have an impact on ILS and TE.

Code ILSP – Independent Learning by Students Plus

> The PD has helped me to foster and facilitate the inquiry process for my students. They have become more independent and can defend their reasoning far better than before (Teacher 2).

> It is a whole lot easier teaching this way, you are able to get the whole group going while still being able to talk to students individually at the same time (Teacher 3).

Code TEP Teacher Expectations Plus

> This has taught me to not underestimate the tenacity with which my students can attack a task and their endurance to work through a difficult problem until the reach a resolution." I don't have to shy away from the complex and abstruse, they can handle it (Teacher 2).

> Whereas I used to expect students to give me the right answer, I now try to teach them that wrong answers are good answers too. I have to accept all answers openly and let them explain their reasoning and then resolve any remaining confusion (Teacher 3).

While the outcomes were similar with respect to the coding types, the path by which the CPP and TEP arrived at was tailored specifically to the individual teacher's experience and needs. The coding again showed that there was a consistency which followed along the lines of experience and exposure coupled with an appropriate form of professional development in order to generate positive change. The two teachers with science backgrounds, Teachers 3 and 2 respectively, participated in different forms of professional development, one in District Directed and the other in Intervention Based Professional Development. Their outcomes, while similar, were arrived upon by a plan which was tailored specifically to their levels of experience and expertise. The findings indicate that professional development in any form will have a direct impact on the implementation of lessons and student learning. However the overall effectiveness and depth of impact is directly correlated to how well selected the PD type is with respect to the individual teacher.

Research Summary Related to Question # 1

What are teachers' perceptions of how involvement in teaching a new science program affected teaching practice in the after school program?

The addition of a strand of science education to the PAS began with the implementation of professional development for the selected teaching staff. The effect of the new science program on teaching practice in the afterschool program was due to the

changes in the teacher perspectives on the nature of programming available and teacher expectations for student performance.

Teachers indicated in their first formal interview that they were excited to incorporate a new strand in afterschool programming. At the start of the study, they were focused on the idea of injecting fun and new levels of student engagement. Throughout the course of the study they did make a difference in the level of student engagement, as noted in their journals and the researcher's informal observations.

At the final formal interview, participants were clear that their practice had indeed changed based on the professional development they received. Those teachers who were already deeply knowledgeable in the content area were now seeking new and innovative ways to present that knowledge. This was evidenced by the new lessons and activities that were implemented in their classes. Participants who lacked content knowledge now spoke confidently on their subject matter and had multiple strategies to draw upon to impact student learning and were far more engaged in the planning of lessons and activities. While they started with a focus on student engagement, all participants concluded with a focus on changing their practice to generate higher levels of student engagement and thereby achievement.

Research Summary Related to Question # 2

How do teachers perceive the three models of professional development -- intervention, self-initiated, and district directed - contributed to teacher learning?

Though the teachers participated in the three specified forms of professional development and had varying levels of experience and expertise with the content area, there was a remarkable synchronicity in their responses and their perceived learning. At the start of the study the interview responses indicated that the study participants were at varying stages of involvement in and expectations for professional development. However, by the close of the study, each participant's responses indicated that they had a different view not only of their practice, but of how professional development can impact a change in that practice.

The findings indicate that when participants begin professional development they may be more focused on the idea of connecting with the students' interest and environment (CSI). At the close of the professional development cycle, their focus becomes more on their positive changes in practice (CPP) which will illicit the increased CSI.

Additionally, it became clear that participants, particularly those who needed support in terms of content versus pedagogy, recognized that certain forms of professional development presented greater personal benefits than others. This indicates that while all the forms of PD may provide the same outcome, CPP, their associated effectiveness is governed by how well matched their methods are to participants' needs and experience.

Conclusion

The structure of Chapter 4 provided an introduction to the research site, study participants and the three types of professional development employed. Following this background information, the research design was described detailing the sampling procedures as well as coding protocol. The data gathered were then organized by source (pre-, during, and post-interviews, field notes and observations, small group meetings and journals) and research questions according to the researcher's codes. The findings as presented were then summarized relative to the two main research questions posed by the researcher.

Chapter Five will fully review the study's findings and analyze the data sources to determine the implications for professional development in "out of school time" as well as identifying the necessary changes in leadership style to support the suggested professional development structure. It will also fully delineate limitations of the study and how researcher bias may have contributed to the process of data collection and analysis and subsequent conclusions.

Chapter Five

Summary, Discussion and Implications

Introduction

Developing and implementing challenging curriculum that focuses on improving student outcomes can be demanding for any after school program. Historically, after school programming has been staffed by workers who were not specifically trained in education and thereby lacked content training through content specific professional development. This chapter offers an interpretation of the findings of both the current literature and the teacher practices at the Progressive After School program. In 1999, Dryfoos reported that public schools reporting extended day programs increased from 16% in 1988 to nearly 30% in 1994 (Dryfoos, 1999). More than ten years have passed since this finding, and during that time, charter schools, public schools and outside organizations have taken an increased interest in out-of-school time and further expanded their number and influence. With this increased prevalence and interest comes the need for more research and evaluation of what it takes to create and sustain exemplary programming.

Organization

Chapter 5 is organized in the following manner:

1. **Summary of Findings in Relationship to the Research Questions**

   This section outlines a summary of the findings as they relate to the research questions.

Research questions are reviewed and subsequent findings discussed.

2. Discussion of the Findings

This section outlines research theories found in the literature review as they relate to the findings and interpretations generated by the researcher. It addresses the question of significant differences in the finding of this study with respect to the review of current literature. It will disaggregate the data to address each of the two research questions.

3. Implications/Recommendations for Practice

Utilizing the findings of this study and their interpretation, this section proposes how this study can inform the process of generating more effective and sustainable change in after school programming.

4. Limitations of Study

Expressed in this section are some of the possible limitations of this study's design and what efforts were made to mitigate these potential limiting factors. It will also indicate what impact these potential limitations had on the interpretation of the data collected and the conclusions drawn.

5. Future Research Recommendations

This section proposes what next steps may be implemented to further verify and expand upon this study. In addition, it provides potential questions to be used in the generation of future studies.

6. Reflections on Leadership

Explores the researcher's leadership practices throughout the study. Changes in practice and the results of change in practice are discussed.

7. Conclusion

Discusses and defines the researcher's thoughts on how the data collected and the research conducted respond to the primary research questions.

Summary of findings in relationship to the research questions

The focus of this summary is framed by the two research questions posed at the beginning of this paper. The summary of findings will allow future researchers to develop and conduct further study on the impact and efficacy of offering different forms of professional development to support teaching and learning in after school time.

The questions asked were aligned to the knowledge required for after school program growth:

- What are teacher's perceptions in how involvement in teaching a new science program affected teaching practice in the after school program?
- How do teachers perceive three models of professional development – intervention, self-initiated and district directed – contribute to teacher learning?

This study concentrated on the rationale behind the implementation and teaching of a new science program that was novel to all participants, and the forms of professional development that were available to help them in this endeavor. Teachers were identified, approached and given the choice to volunteer to participate in this research. Before the onset of this project, there were few opportunities for students to actively participate in

science education in both the day program and during after school hours. Funding for offsite visits, transportation costs and time were key limiting factors in the development of a stronger after school program in science.

This process of program development encompassed input from parents and students in addition to program staff. It was determined that professional development focusing on the development of science knowledge and instruction was a programmatic strand that would most conclusively impact the mission.

Both research questions focused on the change in teachers' perceptions over time. Therefore it was imperative to have detailed and comprehensive information that could be analyzed throughout the study. Multiple tools were utilized to evaluate the same assessment points. The coordination of each tool's use and the process of correlating responses both by individual participant and by time period, generated better resolution with respect to the findings.

What are teacher's perceptions in how involvement in teaching a new science program affected teaching practice in the after school program?

All teachers who elected to participate in this study did so for largely similar reasons. They each identified with the idea that there were gaps and in some cases complete absence of science programming. Their thoughts on why this gap existed and what was required to bridge that gap differed slightly, but they were all focused on closing the perceived gap in programming.

Teacher 1 felt that, at some point in time, the teaching of science in after school might begin to affect his teaching during the regular day program. However, at the

beginning of the data collection, he felt more strongly that the day program might be affecting his after school instruction more so than the reverse. Teacher 1 also felt that after school provided opportunities to develop more hands on experiences and many more "off-site" experiences than classes taught in the regular day program. This teacher believed that "off-site" science experiences helped students connect knowledge learned to their own life experiences, an opportunity rarely gained in regular day classes. As a byproduct of engaging in self-directed professional development, he experienced less partnering support. As such, he was limited in innovation to his own creativity and active research. He did implement practices that were generated in the after school professional development, but saw them as a byproduct or development of his daily practices rather than novel practices. As his journal entries changed over time, it showed that his views on practice were indeed evolving, but there had only been gradual and incremental change. He clearly saw the impact that professional development had on the quality and level of teaching in the after school program as being positive, yet he still held to the idea that it was his repertoire of skills that were brought to bear on improving instruction in the after school program which resulted in the change.

Teachers 2, 3 and 4 believed at the beginning of the study that their participation in professional development would have a direct impact on their teaching both in after school and regular day programming. It is interesting to note that this grouping contained the most and least experienced teachers in the study.

The two experienced teachers, 2 and 3, were both teachers of science during the regular day and were acutely aware of the gaps in the curriculum and knew that they

wanted to find new and better ways to engage their students. They were actively seeking to try out new practices in the smaller and safer setting and trial them for implementation in their regular day classes. They went in with the expectation that their professional development would lead to direct and sustainable change in their classrooms. They both noted that the skills and tools that they utilized from their professional development had a direct and measureable impact on the level of engagement and content knowledge demonstrated by their students. Both noted the added time and space within which to test out new teaching methods in a relatively safe and judgment free environment lead to rapid changes in their practice that would have been impractical and in some cases impossible in their regular day classed. Further, they saw the addition of the science programming to the after school program as being not only beneficial in terms of increasing science knowledge, but as also having an impact on the perception of teaching in general in the after school program. They saw this new strand of implementation leading to a formalization of expectation on the part of students, parents and staff with respect to student outcomes.

Teacher 4, because of her novice status in teaching, fully expected to gain an entirely new skill set. As a result, her perceived change in practice was the greatest in the sample group. She began the study looking specifically for ways that her professional development would generate practice. Her perceptions of the impact of adding the strand were thereby much more dramatic. She listed all of her interactions with the students and additions in practice as having a direct impact on and being the direct result of the

addition of science teaching to the after school program with the support of professional development.

Teacher 5 commented on the district's focus on math and English, and that he believed that the subject of science was almost "left out" of curriculum planning. Teacher 5 went on to say that he felt that "science was a great benefit to after school programming because if (he) could focus on one small science topic (astronomy), students would gain interest and that (interest) would help them, hopefully, throughout 6th grade and into high school" (Teacher 5). The teacher's remarks about project based learning and method of delivery creating high interest in subject matter, helped him focus on his personal method of delivery. He also felt that project planning, experiments and additional materials would be beneficial to developing and maintaining increased levels of student interest. When asked if teaching a new science curriculum to students would be helpful, and if science would be a welcomed after school choice, the teacher felt that a new science program would be embraced by many of the after school students. Although this teacher initially felt that his involvement in this new form of professional development may or may not change his personal practice, he felt that time would tell. By the end of the study, this participant was fully engaged with the active exploration of science topics and continued collaboration with his colleagues. This lead to substantive changes in his classroom resulting in an active learning community where students communicated and participated well with each other as well as with the adults in the room. This teacher went on to say that while after school provided a strong structure and additional time to learn in new ways, unfortunately many students are not able to take

advantage of additional after school course offerings in science due to time or financial constraints. It was mainly out of this concern that he began to infuse his practices in the regular day with elements learned and put into practice in the context of after school science lessons. Teacher 5 saw the type of science instruction knowledge and experience he had gained was a great way to provide students with note taking, observational analysis and information tracking skills. In his view, hands on discovery in after school played an essential role in science education in after school. Unfortunately, the regular school day provided little in the way of hands on or "off-site" experiences. While he could not effect a change in the time or the off-site experiences, he was able and did include the hands-on elements of project based learning into his general curriculum class.

Irrespective of their initial opinion of what the impact of professional development would be on their practice, at the conclusion of the study period all participants noted that their participation yielded significant change in their practice in all teaching settings. In some cases they attribute the new practice as an evolution of their prior practices and in others they were viewed as completely novel practices rooted in the lessons learned and collaboration found in their respective forms of professional development.

How do teachers perceive three models of professional development intervention, self-initiated and district-directed contribute to teacher learning?

Teacher 1's comments on self-initiated professional development were candid. He enjoyed participating in self-directed professional development because it could be done on this own time and without the constraints of others' interests. He could focus

largely on the interest of his students without what he termed as "the distraction of others". He believed that his own version of self-initiated professional development helped him address direct questions asked by students and to generate genuine and meaningful answers. Teacher 1 believed that the lesson plans he developed were designed to focus on students' thoughtful questions, and these lessons were more beneficial than those that contained questions created by others. However, sustained change in practice as a result of professional development was not a demonstrated outcome as Teacher 1 saw the change as being a modification to practice he was already doing and functional only with this particular group of students at this time. He did not view the changes that he made as being transferrable to other subjects or lessons. This type of professional development allowed him to gain the content knowledge that he felt he needed to use in practice the skills that he already possessed to impact student learning.

Teacher 2 participated in Intervention Professional Development and credited the rapid changes in practice and student engagement directly to the structure of the professional development delivery. He had what he saw as an expert partner in the field with whom he could share and gain new insights into science concepts and methods of delivery. In addition, he was able to partner directly with Teacher 4 during the study to discuss implementation strategies as well as to identify persistent problem areas. He noted that having access to external support in the form of expert content knowledge paired with a collaborative teaching network, allowed him to immediately put into action

radically different forms of practice. He stated that it gave him "a stockpile of practices from which to draw and the tools and freedom to be innovative".

While the District Catalogue of professional development in science is the most commonly accessed form of professional development based on ease, economy and availability, what form it takes is widely variable. Teacher 3 noted that some of the professional development he accessed was indeed a "Sit and Git" style that provided information in a very short period of time through direct instruction and sends you off largely unsupported. In those instances he found value in that he was able to obtain new information and materials in a very rapid fashion. However, he often encountered "minor difficulties" in the implementation of the kits and materials which had been provided. He had no cooperating teacher within the program to discuss the challenges and thus initially attempted implementation independently, but later on during the study he began to work more closely with the teachers who were involved with Intervention Professional Development. While he did not participate in Intervention professional development, he accessed the learning of the newly forming network between the two teachers who did. It is also interesting to note that as the study period progressed, Teacher 3 accessed offerings in the district catalogue that were more incremental, long term and incorporated a collaborative element within its meeting structure. He had found that the professional development that specifically and directly connected the learning with other practitioners and their experience in the classroom was the most beneficial to his being able to take in and deliver new curriculum.

Teacher 4 saw her participation in Intervention Professional Development as a "saving grace" for her own practice and the learning of her students. As an instructor, who was trained as a youth worker not a classroom teacher, the collaborative nature of Intervention Professional Development afforded her the opportunity to see elements of a lesson put into practice. Further, the support of an experienced teacher who was accessing the same professional development and worked with her in a collaborative team setting was positive. In her eyes it allowed her to "bounce ideas" off of a peer and discuss successes and struggles within a context that provided a "network of support".

In the past, Teacher 5 was solely involved in self-initiated professional development. Now, after having participating in some of the District Based options and engaging in conversations with those who had completed Intervention Professional Development, he felt that intervention professional development and the opportunity to consult with experienced staff might be more helpful.

Each of the teacher participants contributed to the understanding of how the forms of professional development interact with individuals and their effectiveness in advancing the goal of improving student engagement and outcomes. Each of the three forms of professional development was shown to have merit.

The first form, *Self Directed Professional Development*, was particularly successful with a teacher who had limited time, was interested in subject matter that was neither offered by the district, nor local university or interest group, and held a great deal of interest for the students he taught. Teacher 1 followed the interest of his students, learned what was necessary to conduct discussion groups, furthered his knowledge

through the use of "environmental scanning", and focused on "off-site" trips to enhance the students' knowledge. This learning was the most efficacious form for this individual at this time. He was able to maximize his time and resources in a format which meshed with his personality and learning style.

The second form, *District Directed,* served as a successful tool for professional development for Teacher 5, due in part to it's focus on the district's curriculum guide lines. District Directed professional development also offered Teacher 3 a professional development plan that would meet the district's needs, enhance his own learning, and enable him to be knowledgeable in curriculum areas less familiar to him.

While this form of professional development offered Teacher 3 exactly what he needed in terms of content knowledge and materials, it fell short in developing and sustaining student interest and developing collaboration with other teachers. While he was working diligently to engage his students, the nature of the program supported by this type of professional development was unitized and closed ended. Student interest as a result was powerful in the moment, however short lived and fragmented in nature. Often, topics were changed frequently, not allowing enough time for student inquiry to take root and genuine conversations around understanding and connection to their experiences to take place.

The third type of professional development studied, *Intervention Professional Development,* proved to be the most successful in this study in terms of generating sustained change throughout and ongoing change after the study period. Not only did this collaborative effort offer teachers and students an opportunity to continue to build on

prior knowledge, it gave Teachers 2 and 4 an opportunity to explore the most current information available and access the most current opportunities to learn from professionals in the field. Additionally, students were able to participate in "off-site" activities. This project enhanced students' opportunities to connect with real life experiences.

Another feature of *Intervention Professional Development*, is the connection between university administrators and field coordinators. Each teacher, regardless of experience, was given the opportunity to meet with knowledgeable science instructors and collaborate with teachers of similar topic interest. This opportunity alone, provided teachers a forum within which to gain practical and proven knowledge from others who had similar interests. It was also the only form of professional development to allow a participant at any academic or experience level to feel not only connected to, but to be a contributing and fully valued member of the group

Discussion of the Findings

The After School Corporation (TASC) identified characteristics that seem to breed positive results. These characteristics include exposure to new learning activities, mastery of new skills through practice, positive relationship building, highly trained staff and professional development support (Birmingham, Russell, Pechman, & Meilke, 2005). The intervention model provided by Urban Ecology and others that followed incorporated a much more long term and incremental approach to professional development than either self-directed or district-directed professional development are

able to offer. Both teachers were able to broaden the scope of the science program the following year as well as continue developing existing strands.

Dr. Mike Schmoker's findings were similar to those found by this researcher. In an article published in the February, 2003 edition of Education Week, Dr. Mike Schmoker, author and consultant, spoke about the need for teacher collaboration and strong professional development communities. In this case, intervention professional development offered both. "It is still the rare school that recognizes that teachers, working together, have the capacity – right now to improve instruction" (Schmoker, 2003, p. 2). The intervention professional development created by the teacher team and the Boston College group allowed that collaboration to happen and the necessary community to form. The intervention provided an opportunity for collaboration between the teachers as well as those providing the training and development they needed. The structure of the professional development was mirrored in the lessons that were delivered to the student. After each teaching session, there was an opportunity to stop and check for understanding, provide feedback, make adjustments where needed, and focus on student mastery.

An article written in 2007 by staff at the Out-of- School-Time Resource Center (OSTRC) at the University of Pennsylvania concluded that the findings of "research in the out-of-school time (OST) field confirms that there is a strong connection between professional development (PD) for staff and positive outcomes for youth" (OSTRC, 2007, p. 5). It would be reasonable to assume that all OST programs would seek to provide professional development for their staff. Unfortunately, professional

development opportunities for youth workers and those who work with children is so wrought with challenges, such as time constraints and funding, that it is often deemed impractical or an inefficient use of resources. It is when the need or desire for professional development becomes so clear that it necessitates action.

The subject of science was the catalyst that drove teachers to experience different forms of professional development. Teachers did not feel that it was the determining factor in the selection of one type of professional development over another. All forms of professional development were geared towards improving teacher practice with the aim of improving student outcomes, no matter what gift, disability or learning difficulty each student might have. Furthermore, student improvement, if not aligned with deepened content knowledge and the acquisition of new practices for teachers will not result in improving performance appraisals for students (Fullan, 2006). As such, each of the participants shared this view of the importance of and their need to engage with professional development. How the teachers chose to engage in professional development had little to do with their thoughts on its relevance in terms of content. Rather, it was the format that best matched with what they saw as the basis of the perceived student and programmatic need coupled with their own learning needs.

The development of meaningful academic instruction through the support of teacher development, and an expectation of change in practice through professional development are key practices well in place with the Progressive After School (PAS) program. This study was able to examine this process through the lens of science instruction and identify the impact of the individual forms used.

Self-directed Professional Development

Grootenboer found that effective self-directed professional development included a desire to learn coupled with a desire to improve practice Grootenboer, (1999). Like Grootenboar, Teacher 1 found within himself similar desires. The personality of Teacher 1 was predisposed to self-directed professional development. He thrived as an independent thinker and preferred to work in isolated conditions. He felt comfortable with learning in isolation and working under his own guidelines in a self-paced environment. Falk found similar characteristics with those who participated in self-directed professional development. His term of free-choice learning recognizes the unique characteristics of non-sequential, self-paced and voluntary professional development (Falk, 2001).

Teacher 1 thrived on being able to plan and personalize professional development needs to match his personality traits and learning style. Lohman & Woolf also referred to self-directed professional development as another form of environmental scanning (Lohman & Woolf, 2001). In this case, one teacher continuously scanned possible sites that could add to his knowledge of the scientific topic that was previously unfamiliar. He made direct contact with outside environmental engineers, organizations and energy conservationists. Students were taken to organized field trips for a first hand opportunity to reinforce curriculum.

Arguments have been made that self-directed professional development standing alone cannot be long-lasting. Fullan, Darling-Hammond and Sparks agree that while

communication takes time, that the sharing of information pays off (Fullan, 2006; Darling-Hammond, 2005; Sparks, 2007). A study conducted by the North Central Regional Educational Laboratory found that effective models of professional development should include a clear plan that documents goals and objectives (NCREL,1999). The plan should be research based and promote continuous learning. Teacher 1 participated predominantly in self-directed professional development that did not have clear and documented goals and objectives. Previous researchers agree that without good pedagogy, the knowledge obtained in professional development is less deliverable and therefore, wasted. However, the information and content knowledge that he gained from his self-directed professional development did produce noted enthusiasm and interest in his Renewable Energy class. It must also be noted that the self-directed professional development attained by this teacher was predominantly web-based. These resources are more prevalent and commonly used today than ever before, and will continue to be more ubiquitous as more sophisticated methods of delivery and scaffolding opportunities become available.

In this instance, in order for Teacher 1 to develop longer lasting and sustainable change in practice there would need to be a "next step" for him. A "next step" plan was not in place. Like this researcher, Lohman & Woolf found that web-based self-directed professional development or "environmental scanning" (Lohman & Woolf, 2001). created a more global view of classroom instruction. Unfortunately, this teacher did not continue to develop an enhanced self-directed professional development plan. In this case, long-term self-directed professional development did not provide longer-lasting

professional development opportunities, thus minimizing longevity. Teacher 1's students were subjected to renewable energy issues throughout the world as well as local issues that were relatable in a very personal way. Connecting to worldviews proved important to student learning and student interest. In this case, immediate self-directed professional development proved to be very positive for this teacher. It allowed him to engage the students in a topic that both be and his students found meaningful. He did experience change in practice, however, without a collaborative implementation or thought partner and in the absence of a coherent and defined plan, the change was not long-lasting, and did not map to additional subject matter knowledge or teaching practice.

At the end of the year, all after-school students in this class were particularly interested in science instruction, and refer to themselves as "Women in Engineering".

District-directed Professional Development

District-directed Professional Development is primarily focused on increased content knowledge within specific content areas (Sparks, 2002). Most of directed (stand alone) methods acknowledge that the transfer of new skills and knowledge into teacher practice requires further additional learning opportunities, and that there are limited additional opportunities provided. Unlike intervention or self-directed forms of professional development, district directed professional development provided a wealth of information in a very short time. The information was dispensed rapidly and was skewed towards increasing what the teacher knows rather than what to do. This newly found knowledge was implemented through the completion of a series of model kits,

which were made available following the conclusion of the professional development session. While it provided instant access to content and materials it was limited in its' ability to connect to a long-term goal.

Teacher 3, in addition to after school science, also provided school day science instruction at the elementary level. His professional development plan both in and out of after school time was focused exclusively on district directed offerings. In this particular case, the researcher found that the district directed professional development was centered on provided model kits that came with specific directions for and guides to implementation. The kits provided the teacher with an instantaneous basic knowledge for a little known curriculum. Despite district-directed professional development's many strengths, the exclusively content focus-driven workshops did not provide gradual learning or continuous support for either the after-school teacher or the students. Additionally, while it is effective at increasing basic knowledge and provides a template for implementation it does not provide for the activation of higher level questioning or thinking skills. With the work being viewed as finite in nature, it does not foster, and is some cases even precludes, the development to extend beyond what it given by its design.

The series of one-shot workshops and menu-driven conferences available to teachers are often not available to those who provide after school support. At the time of this study, district-directed professional development was not generally provided to youth workers or non-teacher certified extended day staff.

Model kits do not provide an opportunity for in depth study or exploration of a particular subject area, nor does it utilize the power of collaboration and incremental

change. Professional development of this type might further be enhanced by university classes or self-initiated on-line study coupled with a collaborative teaching team which actively shares and engages in reflective practice.

Intervention Professional Development

Intervention Professional Development offered teachers who were both familiar and unfamiliar with science curriculum an opportunity to grow in understanding, ask questions and make adjustments in practice where needed. "Collaborative professional development results in curriculum that is tightly mapped to standards – well aligned and well sequenced" (Brochu, 2004 p. 14) When a community can utilize each other's strengths, it can more rapidly adapt to changing needs and better leverage the resources available. When conversations happen around what the best shared practices are, then people can become more innovative. The support given by outside concerns can be invaluable. Collaborative efforts enhance student learning and staff development by offering both innovative instructional materials and classroom assistance (Urban Ecology, 2009).

Teacher 2 and Teacher 4 participated in Intervention Professional Development in conjunction with the Urban Ecology Institute of Boston College. They received the same type of support in terms of workshops to develop content knowledge and in class support for pedagogy and implementation. Teacher 2 held a degree in Molecular Biology and participated in math and science instruction during the regular school day. Teacher 4 held a degree in Psychology and worked as youth worker exclusively during the

afternoon hours. Although each had what they categorized as a very positive experience, each gleaned different information and took away different lessons from essentially identical professional development. They both highlighted the partnership as being the key element in the overall effectiveness of intervention professional development. In the case of Teacher 2 it was to have a colleague with whom to brainstorm and for Teacher 4 it was a more a mentor or guide level of interaction. Teacher 4 was very attuned to the idea of providing more fun with and more exposure to science learning than connecting those activities with student outcomes. Teacher 2 had a primary focus on the student outcomes and saw the changing lessons structure to be critical to generating that improvement. Both teachers were interested in creating an opportunity to learn in a different way and utilized the benefits that intervention professional development provides.

In this case, intervention was provided by Boston College through their Urban Ecology program. While the connection was short-lived, only one year long, the professional development offered by Urban Ecology Institute provided for and sustained continued professional growth for Teachers 2 and 4, both through their connection with program staff and each other. This professional development and the resulting collaborative work generated more interest in the expansion and continued development of the science program at PAS. This intervention promoted capacity building within the program by creating a collaborative team of teachers who were able to serve as resources not only to the collaborative team, but to the entire program staff as well. This expansion in capacity can generate long-term and sustainable change in the program as a whole.

Implications/Recommendations for Practice

While what drives the desire to engage in professional development may be similar, how an individual chooses to engage with and benefits from professional development are as varied as the individuals who participate. How effective we are at meeting that common goal has less to do with finding the "best form of professional development" and more with finding the "best fit professional development." There is no best form of professional development when viewed with regard to their effectiveness in enhancing teacher practice leading to improved student outcomes. There is a time, place and person for which each of the forms of professional development will generate the greatest change in teacher effectiveness and thereby student performance.

What this study has underscored is the necessity of a complete and honest assessment of staff needs and abilities with respect to learning styles and content knowledge. Without an accurate needs assessment a district or program will be expending resources to no end. If the professional development offered is not aligned with the staff needs, then it is at best an inefficient and at worst an ineffective use of resources. What and individual teacher needs and will benefit from is a function of their education and work experience and their personal learning style.

The teachers who participated in this study, though sharing a common goal, had very different needs for their own learning and support. All forms of professional development will work for someone. There are some that are effective with all learners, some are more or less efficient, but there are some forms of professional development

that can be ineffective, even detrimental to a particular recipient. When the forms of the professional development are assessed by there ability to impact specific types of teachers it may allow a school leader to better plan their overall professional development strategy.

Self directed professional development is effective with teachers who are highly experienced and motivated and who are more independent in nature. There are some teachers for whom working collaboratively is difficult and not their preferred method of operation. These teachers seek out this form of development. This study has shown however that it is indeed possible to begin to modify the thinking of so minded individuals to better incorporate collaboration into their work. While this form works well for a select few, it is for equally as many completely ineffective and has the potential to damage. For a new teacher who lacks experience with the learning process as well as content, irrespective of how independent their nature might be, they can not obtain what they need in isolated study. In a manner of speaking, they do not know enough to know what they need to learn.

District directed is a middle ground in terms of involvement and connection. This form allows any learner to come into the development program and instantly connect with the knowledge that they need. Further, they have at least physical proximity to another learner with whom they may choose to engage. The independent nature of some can find a home in the format as well as those who are seeking a deeper level of assistance.

Intervention professional development is the apex of facilitating collaboration and fostering accountability through communication. This form is most adept at creating a collaborative learning environment and building sustainable learning. While it may take some additional time, it does move learners to the point where they can recognize the value of collaboration and accountability. This idea is supported by the findings of this study; the teacher with the deepest science knowledge and the neophyte who had yet to become a teacher, engaged in the same intervention professional development program and praised its presentation and the impact on their practice. This form of professional development truly allows each participant to find their own level and work on their needs in a supportive environment. The professional development can be as directed or as self guided as the desires and abilities of the participant changes. Intervention Professional Development is the most flexible in its application, it is however the most difficult to coordinate and facilitate.

This study made clear that sustainable change is best facilitated by ongoing collaboration, not only with development providers but also amongst the practitioners themselves. It is within the context of these collaboratively working groups that a shared vision for change is developed and a needs and ability assessments can be conducted and discussed in response to that vision. This collaborative discussion can then serve as the basis for the ongoing professional development plans for each individual member of the group.

Limitations of Study

This study was limited by the bias of the researcher, the small sample size and the validity and reliability of findings. Investigation of collected data demanded careful understanding of both the participants and the students taught. What was being observed is also considered a limitation of the study. As Merriam wrote, "What is being observed are people's constructions of reality – how they understand the world" (Merriam,1998, p. 6). Repeated observations producing the same results are considered more reliable observations (Merriam, 1998). Researcher bias was one of the most significant limitations. The main tool to counteract the influence of researcher bias was to take as objective field notes as possible. When making observations, the data collected were not about the thoughts of the researcher, but rather occurrences. The process of making meaning from data will be undertaken during interviews and meetings. In so doing, the infiltration of researcher bias can be reduced. "The qualitative researcher runs the risk of identifying with one or more participants or being judgmental towards others" (Gay & Mills, 2006, p. 423). The researcher's challenge was to be aware of this limitation. Time was a limitation in that the study was conducted over an eight month period. Limitations also included the single site and small sample size due to the size of the after school program and the availability of only five teachers at the site. A small highly detailed study can develop limited generalizations, which can be corroborated by analysis of the artifacts; however, the sample did not provide adequate information for replication and thus could not be generalized to other schools. The information obtained through

this study can, however, be used to inform the development of similar processes to increase teacher capacity.

Future Research Recommendations

To enable this research to be further verified and transferable to programs beyond the scope of this study the next step would be to scale up in terms of sample size and study period. While the data collected in this study give strong indication as to the effectiveness and role of the three most prevalent forms of professional development, it could be enhanced by increasing the number of participants in each type of professional development. This addition would allow the changes to be inextricably linked to the form type by enabling the researcher to lessen the impact of individual variation. By extending the time period of the study the changes that are perceived to be indicative of long term and sustained chance could be verified conclusively with empirical data.

After school programming professional development planners face a unique set of challenges both financial and temporal. Many of the offerings that are most effective and sufficiently supported are high cost options. Additionally, the timing of the development is often structured to accommodate teacher schedules that preclude the sessions from being offered during the school day when many after schoolteachers would be able to attend because of the availability of substitute coverage. As such, many after school staff members are unable to access the full range of options due to financial and/or time constraints. It is therefore imperative for the director to accurately assess the levels of knowledge and needs of program staff in the context of availability of resources and coordinate the effort to maximize effectiveness. It is helpful, and may be in some cases

necessary, to explore online learning communities to incorporate into the structure of the professional development program and goals as a lower cost, easier access and highly adaptable option.

To further the work begun by this study, a suggested next step for future research would be to map the student outcomes both in terms of engagement and in terms of performance to the degree of implementation of each of the forms of professional development. This would provide another dimension by which to analyze the impact of each of the forms as well as correlated the effectiveness to the fidelity of the implementation with respect to the intended deliverable.

An interesting and far more complex set of questions, which could be addressed in a follow-up study, can be found in the identification and alignment of personal indicators to a "best fit" form of professional development. This study has indicated the strengths and weaknesses of the respective forms of professional development and provides the background knowledge necessary to form a large-scale professional development plan for a program that encompasses numerous participants and needs. If it is possible to map a series of related indicators to assist professional development organizations and school systems to identify the most efficacious forms of professional development to a specific prototype, then the allocation and use of financial and human resources can occur in the most efficient and effective manner. This would require a large-scale study in which personality and professional profiles were generated and correlated to the individuals' perception of the value of the professional development and the observed change in practice.

Leadership Reflection

Ronald Heifitz succinctly stated one of the largest challenges found in leadership were the following:

> "Opportunities for leadership are available to you, and us every day. But putting yourself on the line is difficult work, for the dangers are real." (Heifetz, 2002, p. 236). We all as leaders have the opportunity to assume greater responsibility for and accountability to the work that we do. It is indeed at times a challenge to take risks in the hope of achieving something greater that you possess. There is an inherent instability in the process of leadership. It is however out of this instability that creativity, ingenuity and effective changes in practice can occur. We as leaders acknowledge the risk and assume it because, "the work has nobility and the benefits, for you and for those around you, (that) are beyond measure"(Heifetz, 2002, p.236)

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It is this knowledge and the data collected during this study that have impacted my thinking on effective leadership.

At the beginning of my journey, I knew that there were many personal benefits to be realized by conducting this study. One benefit was the opportunity to work closely with a dedicated and diverse group of adult learners who were focused on improving student achievement. They provided me with numerous new perspectives on long-standing and seemingly intractable concerns. My interactions with them further allowed me to examine and refine my skills with respect to building a stronger after school community by focusing on teacher growth through professional development opportunities. This study provided me with lenses with which to examine my views on assessing and addressing the needs of those who I am called to lead.

Looking at the pool of study participants, I saw individuals who had the potential to be much stronger teachers and some who could assume the role of lead teacher with district level responsibilities. At first, participants did not necessarily share this vision of their

becoming either a stronger teacher or a potential district leader for after school time. They were focused on how they could get more time for their students to learn. They saw this as an opportunity for them to give their students better access to curriculum that was not presented in out of school time under normal circumstances. My vision was for them to become far stronger teachers, begin to see themselves as leaders within their learning community and seek further opportunities for development after the study period ended. My original plan was to offer a variety of professional development experiences that might show participants multiple points of entry into providing opportunities to learn in a different way. Leading in this context meant that I had to indentify the needs and provide a detailed prescription for "fixing" all concerns.

Initially, it was critically important to create and form a group who felt as passionate about extra time to learn as I did and who had the tools to communicate with one another efficiently. I realized through the study participant selection process that there was little which had been done to engage after school teachers and have them commit to personal professional development to impact student learning. To many, after school was simply a safe environment where students could complete their homework and have a little fun along the way. My position was that extra time to learn science in a different way could be exciting, engaging and generate change in practice beyond the scope of the after school science class.

Starting with curriculum that was foreign to most, ensured that people would see the need for professional development. I did not need to, in this instance, provide a rationale for embarking on professional development. In some cases, when teachers

believe that they possess the requisite knowledge, they can become intransigent. I knew that buy-in would not be a problem for this study as all participants were dedicated to the needs of students and, through professional development, teachers would gain the knowledge needed to effectively teach the new courses. Because this study was outside of the regular school day, there were no district curriculum guidelines to consider or professional formal evaluations to complete. It was an opportunity to challenge preconceptions and examine expectations with respect to after school vision. What could be done differently? What could be done better?

"As the quality of relationships strengthens, the quality of thinking improves" Senge, 2006, p. 280). The more opportunities we had to meet, the stronger and more formal our collective vision grew. As Senge further stated, "Visions spread because of a reinforcing process of increasing clarity, enthusiasm, communication and commitment. As people talk, the vision gets clearer. As it gets clearer, enthusiasm for its benefits builds" (Senge, 2006, p. 211). In this case, that was true. When given the opportunity to reflect on practice and share professional development experiences through well defined and clearly established communication channels, the team was able to talk freely about their successes and share their challenges and frustrations.

As leader, I knew that it was important for me to model the values that I had developed for myself and wanted for the teachers in the study. I knew that extra time to learn was an essential element for many of the students who attended PAS, but I was careful to realize that not every teacher felt the same way. As leader, it was up to me to

model group expectations and provide a structure and space for our time together as a study group.

I knew that constant affirmation of presence, both in formal and informal Settings were important starting points. Meetings, where participants were able to bring to the table all their authentic individuality and personal talents, were a must. Dr. Robert Starratt points out: "The work of learning will be different for each child because of the unique life history that child brings to the task" (Starratt, 2004, p. 93).

This statement also holds true for working with adult learners. By identifying first the teachers' needs and learning styles they, in part, self selected their development choices. From this starting point the work shifted to focusing on individual student needs, and student learning in general. As we progressed, we had numerous discussions and it was often necessary to remind one another that all comments and concerns had significant value and help to develop a shared knowledge base and common frame of reference to promote free exchange of information and ideas.

Initially, the meetings were muted. There was little excitement about student learning, teaching a new curricular strand or enhancing the PAS program as a whole. After several months of focusing on individual professional development, developing a collaborative network that focused on student learning and unearthed participants' personal and professional views on the task at hand, the meetings took on a tone of exuberance that was difficult to restrain. Meetings had become a place where each member of the team was willing to share personal thoughts and ideas on the subject of students learning a new curriculum in an exciting way. Furthermore, the meetings also

began to foster the professional well being of the participants by providing them with a non judgmental forum in which to clarify their thinking and planning. Through recognizing personal values and positive communication, by the end of the study, all teachers came to meetings with things they learned through various types of professional development. They were ready to share new ideas with regard to instruction, and a variety of plans for special field trip experiences. Teachers were energetic and excited to be able to show students how exciting learning a new subject could be.

Enthusiasm breeds enthusiasm. As they became more excited about what they learned and how it could impact student learning, I became more excited about the possible ways that additional professional development could be used to further and deepen the impact on instruction. This enthusiasm did not limit itself to the professional staff. As the students and the families saw not only the excitement that their teachers had, they saw it as purposeful, meaningful and directly related to their learning. Each individual discussion and group meeting led to a stronger after school community, a more-defined vision and levels of excitement far in excess of anything previously identified.

The study participants recognized at the end of the study period that whatever form of professional development in which they chose to engage, all professional development opportunities have the capacity to build more content knowledge than they originally possessed. They cited the impact on their practice as coming from their conversations and collaboration with their colleagues and collaborators. Their most effective and impactful feedback that led to substantive change came not from my

guidance or suggestion, but rather from their interactions with their peers. This has some implications on my practice as a leader.

While collaborative teaching and learning has always been a part of my leadership style and vision, it has now taken upon a more central role. It has demonstrated the level of importance of establishing and maintaining a collaborative network of support. One of the most direct ways that I can make the resources allocated to professional development is to incorporate them in this context. As such it guides me to select options for professional development for the staff that incorporates this practice explicitly into its structure. As a leader I have to be able to identify and recognize the varied needs of the staff I am called to lead. I have to assess and plan how to best meet those needs and move them to a place where they are able to enter into a working relationship with their peers that will generate sustainable and continuing change.

This study has also illuminated my continued needs as a developing leader. If I have observed that teachers learn and work best with a collaborative network of support and that the same pattern is seen when we work down a level in the organization to the students, why would the same not be true of the next level up? As a leader I need a supportive network of collaborative peers from whom and with whom I can solicit new ideas and support my best practices.

In retrospect, it would have been an even more meaningful and productive experience for all had we spent more time meeting and working collaboratively. Although I was happy with the results of the team, they made, in most cases, remarkable progress and student learning was deeply impacted, I believe that there are a number of

ways in which I could have better orchestrated and managed the study participants. I need to have an even better grasp on the learning styles and personalities of the teachers I guide. I must be able to guide them to the most efficacious forms of professional development for them at that moment. Further, I must find ways to incorporate all the various forms of professional development into a program wide vision and collaborative team. Each form of professional development lends itself to building a shared knowledge and communication of ideas to varying degrees. As the leader, I must contextualize all of the learning that takes place in the disparate forms into our shared knowledge base and vision.

This study has helped me formalize my views and understanding on the various available forms of professional development, and it has also helped me assess my practices as a leader and informed my views on leadership on the whole. I am responsible for finding and connecting my staff with the resources that they need to work and learn successfully. As such, I must remain committed to ongoing professional development both for my staff and myself.

Conclusion

As previously mentioned, the change process, particularly when focused on student results, is most successful when teachers are included in the creation of a meaningful plan that includes complex discussions around problems, solutions and prescriptions. Educators can become dependent on outsiders particularly when looking for solutions to their problems. Professional development that centers on dialogue and

interaction between groups of teachers can both deepen and highly influence teacher knowledge and understanding (Sparks, 2002, 2007).

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Appendix A

Introduction to the study

Introduction to the after school program and its history.

The interview process: Semi-structured

- Describe the benefits, if any, you see in adding science to the after school program.
- What is your perception of student interest after the initiation of science instruction within the project?
- How does the effect of professional development play a part in teaching and learning in the regular school day?

Other questions:

- Why did you volunteer to teach science and be a participant in this research study?
- What perception do you have regarding science instruction at this school?
- Why is the study of science significant to the education of students?
- Do you feel that your teaching will be affected by teaching science in the after school program?
- Do you feel new methods of delivery will be needed to address student needs in the teaching of science.
- What level of confidence do you have regarding teaching science?
- What professional development do you feel you need for the new task of teaching science in the after school program?

- How do you feel about participation in intervention professional development? What are the pluses and minuses of this method of professional development?
- What are your thoughts about self-initiated professional development? What are the benefits or minuses in self-initiated professional development?
- What knowledge do you have regarding district-directed science professional development?

Personal Visions

- Please talk about your present views of the after school science program.

Please talk about your vision of what the ideal after school science program would look like

-
- If you could change science instruction in any way, what would science instruction look like in the after school program?
- In your opinion, what "next steps" need to be taken to ensure that students are optimally involved in science instruction?
- Is there any further information that you would like to discuss or add?

Thank you for your participation.

Appendix B

Closing Interview Questions

1. How has your attitude about teaching science changed from the beginning of the project?

2. What is your perception of changes in student interest after the initiation of science instruction within the project?

3. What changes have you made in your lesson development and lesson implementation?

4. What changes do you plan to make in your lesson development and lesson implementation?

5. What form of science professional development have you most recently participated?

6. Which form of professional development has proven most effective in improving your teaching practices?

Appendix C

Informed Consent of Participating Adult Interviews

To: After School Staff

From: Jonna Casey

Re: Dissertation Project

I would like to include you in my after school leadership project involving the teaching of science in out of school learning tome. My research will be used in a doctoral study at Lynch School of Education at Boston College, Chestnut Hill, Massachusetts.

Purpose of Study

I would like to deepen my knowledge of how extra time to learn can benefit students studying science. I will begin to explore alternative methods of teaching science subject matter in a variety of different ways. I feel your input in the area of science is very important, however, there will be no consequence if you should decide not to participate in this study.

Procedures for Interviews

- I will meet with each participant individually to ask questions pertaining to the curriculum practices currently being used at the school.

- Each week, members of this project will be asked to meet collectively to discuss methodology and practices considered in building afternoon programming based on current Massachusetts Department of Education Science Frameworks.

All answers will be confidential and used only for the purpose of this project.

Personal Benefit

All meeting times will be paid at the rate of $25.00 per hour. I ask that you plan to meet at least 1 hour per week until the end of the project. $50.00 gift certificate will be paid to each participant upon the completion of this project. The estimated time of completion is early May. There will be no cost to participants.

Risks

No physical or loss of privacy risk is expected. If audio tapes are used, they will only be kept for the purpose of this research.

If you require additional information, please contact Jonna Casey at 781-334-5530 or Boston College at 617-552-8000.

Consent for
Transforming Teaching and Learning Practices in After School Time Focusing on the Teaching of Science by Jonna Casey

Researcher
Jonna Casey, Boston College doctoral students and Program Director.

Please note that participation in my project is completely voluntary. If you decline at any time, all information will be kept confidential.

Signature of Participant: _____

Date:_____

Signature of Researcher – Jonna Casey: _____

Date: _____

Appendix D

Guiding Questions for Small Group Interviews

1. What changes in understanding are significant when teachers are making adjustments to their practice?

2. What elements of professional development most influence change in practice?

3. What instructional supports are needed to enable the after school science program to be effective?

4. To what extend does professional development change teacher perceptions of best practices for diverse learners?

5. What overall effect did the additional professional development support have on the teachers?

6. What instructional practices found in existing programs have proven to be effective?