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Transporting Pedagogy:

Implementing the Project Approach in Two First-Grade Classrooms

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In one first-grade classroom, children are planting beans in different cups preparing to experiment with the amount of water and sun they will need to germinate. In another classroom, students are coloring in a worksheet on the life cycle of a seed. Both of these activities were completed in the same school. Both teachers were following the district-mandated curriculum for first grade that included a science unit on "Seeds." Which one of these activities would one expect to find in a gifted program? Which activity allows for higher level thinking? Which activity has a greater opportunity for displaying students' interest in experimentation or the plant life cycle? Which activity fosters curiosity and the love of learning in young children?

During the last 20 years, gifted education has promoted pedagogy that connects learning to students' interests, provides opportunities for students to pursue topics and investigations that are meaningful to them, and encourages creative and critical thinking. In sum, gifted education has been the forerunner of curricular reforms that have embraced higher level thinking skills, problem-based learning, and inquiry processes of learning. The participating teachers in this study implemented the type of

Summary

This study explores how a project-based approach, based on gifted education pedagogy, was implemented in a public school program where the majority of students were from low-income families. The 2 first-grade teachers in this study were able to change their teaching practices to include more strategies commonly found in gifted programs such as brainstorming, creating surveys, and collecting data. The teachers also indicated a greater comfort level with a child-centered and project-based approach to curricular units over the course of the study. In addition, classroom observations indicated students were better behaved when engaged in project and small-group activities, as seen in classroom observations. This paper also highlights several challenges to implementing project-based approaches in the early childhood classroom. Teachers in this study perceived barriers to implementing the project approach that they had been taught in their professional development course. They felt constraints from their school context, as well as from their own beliefs and assumptions about their students. They often had difficulty assuming the role of facilitator and releasing control of learning to the students. However, as the teachers in this study implemented the new approaches, they were able to overcome many of the internal and external limitations that they expressed prior to beginning the units. This study has practical implications for reform initiatives related to the identification of strengths and talents in students who are typically underserved in gifted programs.

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instruction most commonly found in gifted programs into their classroom of predominantly low achievers.

The purpose of this qualitative case study was to explore the ways in which 2 first grade teachers implemented the project approach and transformed their instructional strategies to provide opportunities for their students to display their strengths. The research focused on the question, "What are the issues that arise when implementing the project approach in a setting with a majority of children from low-income homes?" Curriculum interventions for low achievers are certainly not new, but qualitative descriptions of the process and the degree to which they are implemented are rarely described in the gifted education literature. I examined the way teachers challenged their students and identified their strengths using the project approach.

What Is the Project Approach?

The project approach (Katz & Chard, 2000) described in this study resembles Renzulli's (1977) Type III Enrichment. Children pursue answers to their own questions using firsthand resources. They analyze and interpret their data, and they share what they have learned with an authentic audience. Katz and Chard articulated the project approach in three phases. In Phase I, students recall their memories and experiences about a topic and examine their current understandings and misunderstandings related to that topic. This provides a starting point for what the children already know and what they would like to learn more about. Phase II is the inquiry phase. Children pursue answers to their own questions by doing fieldwork and collecting data in many ways. For young children, this involves observational drawings, surveys, interviews, representations of their findings, and data analysis. In Phase III, students share their findings and new understandings with others, including their parents, other students, or any appropriate audience. Representations of students' learning include a variety of products such as displays at open houses, poems, songs, role-playing, books, drawings, or three-di-

mensional models. Discussion, fieldwork, investigation, representation, and display are important features of project work (Katz & Chard, 2000). Katz and Chard stressed the use of the project approach to engage children in thinking and problem solving. Young children learn basic skills within the context of meaningful learning activities as opposed to rote and drill practice.

Literature Review

The project approach is closely associated with Dewey's ideas and progressive education. Dewey described the traditional approach to education as predominantly teacher-centered:

> It's passivity of attitude, it's mechanical massing of children, it's uniformity of curriculum and method. It may be summed up by stating that the center of gravity is outside the child. It is in the teacher, the text-book, anywhere and everywhere you please except in the immediate instincts and activities of the child himself. (Dewey, 1915/2001, p. 23)

Instead, Dewey advocated that school should be child-centered; educational experiences should begin with the interests of the child and be guided by the teacher. Although the progressive education movement declined in the 1930s, and its successor—"open education"—lost favor in the 1970s (Katz & Chard, 2000), the notion of students pursuing their own interests through inquiry was not lost in the field of gifted education. Many leaders in the field of gifted education have advocated curriculum for gifted students that gives them opportunities to pursue their interests, delve into a topic in depth, and promote self-initiated and self-directed learning (Hertzog, 1998). Independent studies and Type III investigations (Renzulli, 1977), where students assumed the role of firsthand investigators, have been substantial components of gifted programs over the last 30 years.

According to Katz and Chard (2000), "As a way of learning, the project approach emphasizes children's active participation in the planning, development, and assessment of their own work; children are encouraged to take initiative and responsibility for the work that is undertaken" (p. 4). The project approach also enhances students' intellectual dispositions. According to Katz and Chard:

> The intellectual dispositions that can be expressed and strengthened during project work include the dispositions to analyze, hypothesize, and synthesize, to predict and check predictions, to theorize about cause-effect relationships, the consequences of actions, to be empirical, to strive for accuracy, and many others. (p. 35)

Research studies on various models of early childhood curriculum (Marcon, 1992, 1995) have demonstrated that children who participated in programs where they were actively engaged in their own learning experiences performed better in fourth-grade achievement measures compared to those children who participated in more formal, teacher-directed instructional models. Most importantly, these studies also showed that students in the less formal, more child-initiated programs had fewer behavior and social problems than those in the more structured academic programs.

Katz and Chard (2000) detailed the benefits of using an optimally informal curriculum. Described as an underlying principle, Katz and Chard asserted that "the more informal the learning environment, the greater the teacher's access to the learners' representations, understandings, and misunderstandings" (p. 49). *Access* to the knowledge of the learner informs teachers about students' entry points into the curriculum. *Access* to the learners' representations, understandings, and misunderstandings facilitates teachers' abilities to recognize strengths and weaknesses so they can differentiate instruction accordingly.

Researchers at Project Zero have been using a series of performance-based assessment activities (Project Spectrum)

based on Gardner's (1985) multiple intelligences to identify strengths and talents in young at-risk children. The researchers maintained that for students who are low achievers, "the instructional approach typically employed is drill and practice, including workbook sheets that require children to practice skills divorced from context and application" (Chen, Krechevsky, & Viens, 1998, p. 61). Using the Spectrum activities in different settings, the researchers concluded that if young, at-risk children are "given the opportunity to work in their areas of strength, they can acquire new skills and appear more competent to themselves and others" (p. 67).

In the early 1990s, Montgomery Knolls Elementary School (a school that served grades pre-K–2) in Silver Spring, MD, received two 3-year Javits grants to identify young gifted children who typically would not be identified through traditional means of assessment. Program administrators identified multiple intelligences (MI) as the theoretical underpinning and chose Spectrum activities as examples of intelligence-fair assessment instruments in diverse domains. All of the teachers in the school were expected to apply MI and Spectrum ideas to their classroom practices. The teachers wanted "to provide rich experiences to all of their students and learn about the different strengths and potentials that each of them possessed" (Chen et al., 1998, p. 121). Not causal, but perhaps related, the authors reported that the number of children identified for the gifted program in the district (which began in grade 2) increased from 27% in 1988 to 51% in 1994. The increase may have been due to their identification systems changing or the students' increased performance because of the Javits grant intervention.

Another sustained attempt at a curriculum intervention for children who are typically low achieving is the Accelerated Schools reform initiative. The goal and philosophy behind the Accelerated Schools is to bring enriching curriculum and higher level thinking skills to all children, not just those involved in gifted and talented programs. An independent evaluation of the Accelerated Schools Reform initiative showed that "the average third grade reading and math scores in the fifth year exceeded

the predicted levels by a statistically significant amount" (Bloom, Ham, Melton, & O'Brien, 2001, p. 4). Furthermore, the evaluators stated that the "largest impacts were observed among students who would have scored in the middle of their schools' test score distribution without the reform and among the schools that had the lowest test scores before launching the reform" (Bloom et al., p. 4).

In Peoria, IL, the project approach is the chosen method of instruction at the Valeska Hinton Early Childhood Center. Serving predominantly at-risk preschoolers through first graders, students ultimately leave the Center to attend elementary schools throughout the district. A 4-year follow-up study indicated the Valeska Hinton students achieved as high or better on standardized tests than their peers at other schools whose teachers did not use the project approach (Brown, 1999).

The project approach, Spectrum activities, and the Javits grant alternative assessment and identification practices share a common goal of engaging students in learning experiences that promote intrinsic interest and motivation, illuminate students' areas of strength, and challenge them to elicit their full potential. Used as intervention strategies, these approaches to curriculum and instruction aim to change teaching practices and teachers' perceptions of their students' abilities.

With intervention studies, it is crucial to understand the degree of implementation. I chose qualitative methodology to provide an in-depth view not only of the children's learning but also of the teachers' implementation process. "Measuring the effects of a change such as a single instructional strategy, a unit of curriculum, or a program model is dependent upon the degree to which the change is actually implemented in the classroom or a school system" (Johnsen & Ryser, 1996, p. 489).

This study focused on the teachers' change process as well as on the curricular intervention. Through interviews and observations, I explored the teachers' thoughts about planning curriculum, providing for individual differences, and changing their style and methods of teaching. I observed how teachers increased their sense of efficacy with the project approach.

Methods

Over the course of one academic year, I was both a facilitator and researcher working collaboratively with the teachers to change their instructional style of teaching and to document the changes in practice and in their ways of viewing their students. Although the primary focus of this case study was the teachers, the case was bound by the contextual factors of the school, the district, and the community.

Intervention

The intervention consisted of three components: professional development, changes in curriculum and instruction, and assessment through documentation strategies. In transferring the pedagogy from a private early childhood gifted program to this public school setting, the original intent was to replicate instructional methods (not necessarily content) as much as possible from one site to the other. One goal of the study was to discover what could and could not be replicated and why.

Professional Development. The professional development component focused first on offering the teachers training in the project approach (Katz & Chard, 2000). The 2 participating teachers attended a weeklong workshop with approximately 50 other teachers from around the country on the project approach presented by Katz and Chard. A stipend from a Hollingworth Award received from the National Association for Gifted Children paid for their participation. The second component to their professional development involved ongoing discussions about their implementation as I observed their classrooms. Research on professional development suggests that, "Teachers need professional development that extends far beyond the one-shot workshop; they need opportunities to learn how to question, analyze, and change instruction to teach challenging content" (U.S. Department of Education, 1996, p. 1).

The purpose of providing professional development to 2 teachers was to enable them to develop a collaborative relationship on site for implementing the intervention. Working with a partner reduces a teacher's feeling of isolation and provides opportunities to share and seek feedback (Jakicic, 1994, as cited in Dettmer & Landrum, 1998).

Changes in Curriculum and Instruction—"Gifted Pedagogy." Although the project approach was not designed exclusively for gifted students, the phases of project work were pedagogically similar to the type of curriculum development that often is found in gifted programs. The inquiry process works particularly well to challenge all students and the project approach encourages students to work in their interest areas and develop new interests. Within the project approach, there is also an emphasis on thinking, problem solving, reflecting, and evaluating one's work. Learning is authentic in the project approach because students are encouraged to work in small groups and seek answers to the group's questions, make predictions about what the answers will be, and debate issues related to the work to be accomplished. In the process of finding answers to their own questions, students report what they have learned to real audiences. This stands in contrast to how children with significant deficits in academic subjects or children at risk for academic failure typically are taught. They often receive direct instruction with an emphasis on practicing basic skills rather than approaches that incorporate a more constructivist view of learning.

Underachievement, particularly in settings where the majority of children come from low-income homes, has been attributed to students' alienation from school, rote and drill activities that are isolated and meaningless in the lives of these students, and low teacher expectations (Kohn, 1999).

Assessment and Documentation. Documentation plays a key role in project work. In this study, the purpose of documenting students' project investigations was two-fold: to share with the students and others the story of the project work in phases, and secondly,

to highlight the engagement, strengths, and abilities of the children. As stated by Malaguzzi,

> All people—and I mean scholars, researchers, and teachers, who in any place have set themselves to study children seriously—have ended up by discovering not so much the limits and weaknesses of children, but rather their surprising and extraordinary strengths and capabilities linked with an inexhaustible need for expression and realization. (Edwards, Gandini, & Forman, 1993, p. 72)

The documentation method of studying children in action during their project investigations is designed to enhance teachers' appreciation of children's intellectual strengths, an especially important process for teachers of children from low-income environments. When project investigation activities are documented, students and teachers have opportunities to reflect upon the learning experiences. Photographs and documentation boards provide evidence of engagement and conversation, revealing students' interest, understanding, and skills related to a particular topic (Helm, Beneke, & Steinheimer, 1998).

Context for Study

Setting and Participants

The School. The school district was in its first year of a court-ordered Controlled School Choice plan. The plan was designed to evenly distribute the minority students in schools throughout the district. Pinehaven was a new building, replacing one of the oldest schools in the district. However, 90.8% of its student population came from low-income homes, giving it the distinction of having the highest mobility rate in the district. In the first year of the Controlled Choice plan, this school was significantly "underchosen" compared to other schools. This meant that more parents were choosing to send their children to other

schools that had a history of higher achievement. In particular, parents of White children were avoiding the school. The African American enrollment at the time of the study was 58.4%. The previous school also had a history of having the highest percentage of low-achieving students in the district. It was almost placed on a State Watch plan the year that I began the study. However, because the school was new, the State did not add it to the "Watch List."

All of the schools in the district were asked to develop a specialized plan to offer different curricular options for families. The teachers at this school were in the process of researching and choosing a curricular theme for their school.

Two Participating First-Grade Teachers. Karen had more than 20 years of experience teaching first grade. She assisted Janice, the younger teacher in developing first-grade activities. Janice was in her 8th year of teaching. Karen teamed well with Janice, and their students often did the same activities (had the same centers, studied the same topics, and used the same worksheets). Karen was accustomed to working with university professors and had received a great deal of professional development over the years. She showed a continued interest in professional development throughout the study. She attended a literacy conference and wanted to visit sites where project work could be observed. She supervised two different student teachers during the year in which I observed her class. However, she said that she could not change her whole classroom. She had set ways of doing reading and math. She thought that she could implement project work during science and social studies time. Indeed, that is when most of her project work took place.

Unfortunately, Janice became ill just before the summer workshop and missed the first full day of it. She and Karen also did not stay overnight at the conference and therefore missed some night sessions.

The two participating teachers probably did not understand all of the information about the project approach during that initial weeklong workshop. Conference participants engaged in

a short project investigation with a small group of adults. Karen and Janice told me that they did not particularly enjoy working with their group, nor did they enjoy the topic of their project investigation. Karen said it would have been a good idea to talk more specifically about implementing the project approach with young children instead of engaging in the project work themselves. Their small group had difficulties working together. Thus, their professional development experience was not entirely positive.

The Classrooms. Both classrooms looked fairly typical. Birthday charts and an alphabet word wall were standard fare for classroom displays. In the morning, the class spent at least 15 to 20 minutes on calendar activities that applied math concepts such as counting the days at school, finding patterns in the numbers, charting sunny or cloudy days, and determining what day of the week came before and after the present day. The district required a balanced literacy time period and teachers had "Center Time" that included alphabet, writing, and art activities. Karen's room deviated from the traditional by having lists around the room that encouraged students' fluency and creativity. Some examples of these lists include: *Ways We Can Use Water*, *Things That Have Wheels*, and *Things That are Red*. Karen also allowed her students to get books from the room and read when they finished early and had to wait on the others.

Janice once laughed at her own teaching style, "I'm not a worksheet teacher," she said as she showed me the booklet of worksheets that she gave her students to color for Thanksgiving (personal conversation, November 24, 1999). Her ability to laugh at her own contradiction highlighted her willingness, yet difficulty to change her practices. Both teachers seemed to feel comfortable giving their students worksheets. However, some of these focused on creative thinking activities.

Both teachers encouraged students to follow directions through art projects and worksheets. They enjoyed some of the "cute" projects that are typical in early childhood classrooms

such as an Appleman, a Johnny Appleseed puppet, and a Candy Corn Man.

These 2 teachers most often taught integrated units. They had files of resources including poems, books, and activities for topics that they had previously taught. For both teachers, engaging in the inquiry process with their students was new and challenging.

The students in both classrooms were predominantly African American. The teachers had 18 to 20 students, with some mobility throughout the year. Some of the students in each room left for Title I reading, Reading Recovery, and to see other specialists in the school, including the social worker, learning disabilities teacher, and behavioral specialist teacher. The teachers referred several of their students for special education services as the year progressed. Students generally left the room during the Center Time. A speech and language specialist came into the room and gave half-hour lessons to encourage language development. In each room, the teachers were concerned about the family lives of some of their students. Throughout the year, both of the teachers shared with me that some of their students had major academic, emotional, and behavioral problems.

Data Sources and Data Collection

A variety of data sources corroborated the findings. Data included field notes of observations, interviews, documents related to the teaching activities (e.g., lesson plans, worksheets, and printed instructions for students), and student products placed in portfolios. I observed on a regular basis when the teachers were engaged in project work. I observed the teachers a total of 74 times between September and May. The duration of each observation was 15 minutes to 145 minutes with an average visit of 60 minutes each time. From January through March, I volunteered during Center Time in Janice's room. I was interested in seeing whether the teachers used teaching strategies from the project approach at times when they were not engaged in projects.

Observations. Observations ranged on a continuum from nonreactive to reactive: nonparticipating to participant observer. During my volunteer time, I actively assisted children to complete the tasks that they were assigned. During the project investigations, I mostly documented the activities of the students and the teachers. I shared with the teachers my typed field notes of children's ideas and responses and photographs that they could use for displays.

Interviews. I held informal conversations with the teachers briefly after most visits to discuss the activities that I observed. I also brainstormed with the teachers ways to implement some project activities. At the end of the first project, and again at the end of the second project, I interviewed both teachers to learn how they thought the project went, and what they might do differently next time. I taped and transcribed the formal interviews. Casual conversations with the teachers were summarized in field notes.

Student Portfolios. Student portfolios were part of the research design to document the students' responses and completed products. The portfolios provided a context for inferring the learning that occurred for individual students. Student achievement was assessed through the work sampling and documentation of their experiences. Teachers collected children's responses to various project activities such as memory stories, thank-you notes, and the writing of mini-books to gain a better awareness of what the children were learning and understanding. For example, students' observational drawings of the chicks demonstrated students' awareness of the details they saw in the growth and development of the chicks.

Data Analysis

Data analysis is "inductive for the naturalist, in contrast to the focused and deductive analysis common in conventional inquiry" (Lincoln & Guba, 1985, p. 224). Data analysis occurred during

and after data collection. I coded data from field notes, documents, interviews, and portfolios according to emerging themes, issues, or concepts. Coding occurred as described by Glesne and Peshkin (1992): "Coding is a progressive process of sorting and defining and defining and sorting those scraps of collected data (i.e., observation notes, interview transcripts, memos, documents, and notes from relevant literature) that are applicable to our research purpose" (p. 133). Data were chunked, analyzed, and categorized, throughout the study. Twenty-five coding themes were categorized into salient themes that were reflected in the discussion and implications sections. Some examples of coding categories included the following: about the child, barriers, behavior, extrinsic rewards, following directions, content, engagement, small groups, teacher efficacy, and time management (see Table 1).

Establishing Credibility

Instead of using the quantitative term *validity* to describe the truth-value of this study, the term described for qualitative studies is *credibility*. Prolonged engagement, persistent observation, and triangulation (Lincoln & Guba, 1985) were three methods that I used to enhance the credibility of the study. Prolonged engagement occurred over the course of 8 months, August through May. Triangulation of the data sources included field notes, interview transcripts, documents from their teaching, and photographs. Engaging participating teachers in constant dialogue about the observations provided ongoing member checks for the coding, analysis, and writing stages of the study.

Researcher Bias

In qualitative studies, it is important to examine researcher bias because the researcher is the primary instrument for data collection. I share my biases as they related to this study. I hypothesized that the curriculum intervention proposed would show many advantages to the existing public school curriculum—most

Table 1

Categorized Coding Themes

Salient Themes	Coding Categories
Barriers to Implementation Perceived and Real	Deficiencies Within the Child
	About the Child
	Behavior Issues
	Skills Children Need
	Teacher Difficulties
	Control
	Lack of Resources
	Teacher Efficacy
	External Barriers
	School Context
	District Policies and Curriculum Mandates
Content	Content in Teacher's Activities
	Content From Karen's Field Notes
	Content From Janice Field Notes
Pedagogy	Process of Implementation
	Child-to-Child Discussion
	Small Groups
	Documentation
	Engagement
	Evaluation
	Fluency
	Time Management
	Worksheets
Qualities of Classroom Life	Values
	Systems of Rewards and Punishment
	Following Directions
Subjectivities	My Influence
	Missed Opportunities
	Intellectually Engaging for Teacher

significantly, evidence of children's interest and positive attitudes toward school, evidence of feelings of confidence in learning, and significant growth in children's abilities. I realized the complexity and difficulty of the tasks that I asked the teachers to perform when I expected them to model the curriculum of an early childhood gifted program in their own setting. From experience, I knew that the process of change would not be easy for participating teachers, and that they would go through a growth process fraught with challenges, disappointments, and frustrations. Yet, I hoped that they would emerge with success stories.

Descriptions of Project Investigations: Seeds and the Pond

Over the course of the academic year, Karen implemented two project investigations: "Seeds" and "Chicks." Janice also implemented two projects: "Seeds" and "The Pond." Between project investigations, both teachers taught a voluntary unit on quilts and a required "science tub" on the sun, the moon, and the stars. The project on seeds lasted roughly from the second week of September until Thanksgiving in both classrooms. The projects on chicks and the pond started at the end of March and lasted until the end of May. In the following pages, I describe the implementation of these projects to give the reader substantial examples of the content and activities that the teachers presented to students in their classes. The children's names are disguised with random letters.

Seeds

Both teachers began their project on seeds by asking students to brainstorm their memories about seeds. Janice's students shared the following experiences:

Apples have seeds. —T
Apples have seeds. —D

Apples have seeds. —A
Apples have seeds. —S
Pumpkins have seeds, but I take them and throw them away. —H
Pumpkin seeds grow. —K
Sunflower seeds can be eaten. —D
Tomatoes have seeds. —A
Kiwi has black seeds. —M
Lemons have white seeds. —M
Watermelons have black seeds and white seeds. —E
Red cherries have seeds come out red because they are juicy. —M
Peaches have big seeds. —W
Seeds come from flowers. —P
Flowers have seeds. —R
Ron helped put seeds in the birdfeeder. —R
Birdfeeders have seeds. —D
Pineapples have seeds. —T
Oranges have seeds —J. (class observation, September 24, 1999)

Janice asked the students when they finished brainstorming, "What are pineapples, oranges, strawberries? What are they?" Some children called out "food," while others called out "snacks." She supplied the word, "fruit." They had some discussion over whether or not oranges and lemons had seeds. They were interested in the size and color of seeds. Most students shared their experiences with apple seeds.

Two days later, Janice asked the students to sketch their memories about seeds with pencils. Janice walked around the room and reminded them not to use markers. She asked one child, "What does your super hero have to do with your memory of seeds?" She commented, "A seed of a peach has lots of lines on it. Strawberries have lots of little seeds." When they finished the activity, she gave five children an opportunity to share their memory drawings. Janice remarked to me afterward that she

liked having the children share their work and that she did not have them do that very often.

Introducing the Seeds project in Karen's room produced similar memory experiences. Karen also integrated seeds into her math class with story problems about seeds, "Johnny Appleseed planted four seeds on Monday, five seeds on Tuesday, and two seeds on Wednesday. How many seeds did he plant all together?" (class observation, September 24, 1999).

In the first week of October, both teachers sent a survey home asking parents to help their children locate seeds in and around their house. Initially, Karen told me she was so disappointed that only four surveys came back (personal interview, October 4, 1999). However, after she started tallying everyone's results, more surveys were returned.

The teachers introduced various books on seeds, plants, and roots during story time. Karen said some of her students did apple experiments. She asked the students to estimate which apples had the most seeds: green, yellow, red, or light red apples? She also used size as a variable, "Which has more seeds, a big apple or a little apple?" The students estimated by using tally marks and then they cut open the apples and counted (class observation, October 20, 1999).

Janice's class also estimated the number of seeds and then cut open apples. Janice said some children estimated 100. She said that she asked the children, "Which would have more—a big apple or a little apple?" She told me that all of the children said that the big apple would have more seeds. In her activity, the big apple had four seeds and the little apple had seven seeds. She reported that they learned concretely that "bigger doesn't mean has more seeds" (class observation, October 20, 1999).

Both classrooms had a collection of seeds brought from the children's homes. One parent sent in a buckeye and was very concerned when she came to school and did not see it in the seed collection. Karen selected the following two questions to focus on Phase II of the project: How do seeds grow, and how do seeds get inside an apple? Janice picked questions that *she* could answer:

1. Does the squirrel eat an acorn without cracking it?
2. How do seeds grow?
3. What kind of tree does a buckeye come from?
4. How do seeds get inside of the fruit? (class observation, November 8, 1999)

In Phase II, the teachers invited an expert from the Cooperative Extension Office to talk about plants. Students planted seeds in paper cups and experimented with putting some of the cups in the closet, near the window, or with or without water. They also planted seeds (onions, carrots, radishes, and grass) in a container that provided a clear side to view the plant growth. The teachers read a book that explained the relationship of stigma to seeds. Karen was not sure that the children understood that relationship. One time she told students, "Draw seeds you can eat." One child drew a banana and surprised Karen. She said, "We didn't even do that!" (personal conversation, October 25, 1999).

Both teachers took students on a walk around the building to look for seeds. They made observational drawings of their experimental plants. Students included new vocabulary words about seeds in their captions to their pictures. When Karen discussed their experiments, the children were attentive and responsive. She asked, "Why is the grass in the closet a different color?" One child answered, "Didn't get no chlorophyll?" (class observation, November 8, 1999).

Both teachers supplemented their project work with worksheets. One worksheet was entitled "Wandering Roots," and had four sentences on the top about roots. It had the following directions: "Write the word roots, trace the roots with brown. Draw more roots, and color the sunflower plant." The bonus box on the paper asked the children to draw a big tree, to draw the roots under the ground, and to write a sentence that "tells how roots help the tree when the wind blows."

The teachers displayed their project work in the hall. At the end of November, both teachers culminated their project by making an oversized (Big Book) class book. Each laminated

page detailed children's experiences with seeds. One example is included below:

> When we planted seeds we had to water them. The radishes grow first and the onion seeds grow last. The beans molded. We put them by the window. (class observation, November 29, 1999)

The vocabulary that was introduced in the seed investigation included words that were not typical for first graders (e.g., shoots, seedlings, seed coat, texture, chlorophyll, stigma, pollinated, and pollen).

Reflections About the Seed Project. Both teachers commented positively about implementing the project. They said they did more hands-on activities and the children were more involved. Karen said, "The kids actually question more and enjoy more when they can touch and feel" (personal interview, May 16, 2000).

Janice said, "I think that they got a lot more out of it because they were actually able to stick their hands in the dirt and . . . I think that having to do something at home was something new for the kids" (personal interview, February 2, 2000). Janice commented that every year she sends a note home and asks children to bring in seeds from home. She said she has never had a response to that note. Since they walked around the school yard looking for seeds, the children became more aware and she commented,

> Because we did take them out and try to do a seed collection, then it kind of sparked an interest and they started bringing things that they see at home. Kids even went through their cupboards and like some of my seeds in my collection are seasonings. (personal interview, February 2, 2000)

At the end of the seeds project, Karen said she was not going to start another project until spring. In January she was planning

to do a unit on quilts. In the spring, Karen facilitated a project on hatching chicks. She incorporated many features of project-based learning, including observational drawings, predictions, experiments, data collection, and sharing the findings.

At the end of the chicks project, Karen told me in an interview that she was not sure how much they were learning. She said that assessment was hard for her, but that she did not really assess much with the other ways that she taught science. It was difficult for children to take paper-and-pencil tests because they could not read. She said the children became attached to their baby chicks and really enjoyed having them in the class (personal interview, May 16, 2000).

The Pond

In the spring, Janice began a project on ponds. Janice introduced the Pond project by asking the children what they needed to live. She listed the children's responses: water, air, food, shelter, and sun. She starred the first four items. Then she said that the four things she starred were part of their "habitat." She told them that they were going to talk about one special habitat, ponds. Then she said, "I'd like for you to think about a pond or ponds and I'd like for you to tell me some experience you've had with a pond or ponds." She called on Jim, "Jim, tell me some experience you've had with ponds" (class observation, April 18, 2000).

The children each gave her their experiences or things they thought they knew. They mentioned animals that lived in ponds and included alligators, hippos, an octopus, fish, turtles, tadpoles, and snakes. One child said a "catfish lives in a pond." She wrote their ideas on Post-it© notes and stuck their notes on chart paper to create a web of experiences. Their opportunity to share revealed some of their misconceptions and their experiences. I noticed one child remained by the chart paper to reread the students' experiences once everyone else went back to their seats to start their math (class observation, April 18, 2000).

As part of the pond investigation, Janice borrowed a turtle from the local science center to live in her classroom. She wrote

on the chalkboard in the front of the room, "What do turtles eat?" Children listed worms, bugs, and plants. There were tally marks under worms and strawberries indicating their predictions. I came back several times during the project and watched the turtle eat. Janice convened a circle of students in chairs and put the turtle on the floor with the food spread apart. Each time, she asked the children to predict what the turtle would eat first, the fruit or the worm. Each time, the turtle headed for the worm first. Janice said she wanted to capture the turtle eating the food on camera. Janice offered more experimental conditions with different fruits. Given a strawberry or an apple, the turtle chose the strawberry. One child wanted to disguise the apple by rubbing strawberry juice over the apple. Their interest and desire to experiment was evident (class observation, May 12, 2000).

Janice integrated writing and reading activities into the pond investigation. Students wrote stories about Winnie the Pooh going to the pond and read fiction and nonfiction books about turtles. The highlight of the project was the field trip to the experimental ponds at the university. Two biologists guided the class around 22 experimental ponds. One guide let them touch a fish as she explained how fish breathe and live in the water. Another guide let them stick their hands in pond water and feel the living organisms, including dragonfly larvae. The guides provided many details about aquatic life: They explained how fish breathe under water, that they have slime on their body for protection, and that they swim under water with their pectoral fins. The guide also told the children that fish scales have rings to tell their age, just like trees. When the children returned from their field trip, Janice asked them to tell their guides in their thank-you letters some of the things that they had learned. Janice said that she could not get the kids to stop writing. They wrote all afternoon! The students' letters were detailed:

> I like the fish, frogs and geese. The fish I touch was slippery and gooey too. Thank you for having my class. Love, M

> I really liked picking up the dragonfly. Thank you for letting us comes. Thank you for inviting us to see the ponds. I'm sorry you didn't catch a frog. I really like picking up the frogs. You did pretty cool stuff. From J. (class observation, May 18, 2000)

Before the turtle went back to the science center, Janice's students made turtle-shaped books with approximately five pages of written material in each of them. No students copied from a book to write their sentences (class observation, May 22, 2000).

During my last observation of Janice's room, I saw an invited guest speaker talk about toads and frogs. The children asked various questions about her pet frog. Janice also brought another type of frog in her room that was previously upstairs in another teacher's room. Clearly she was interested in having the children observe the animal in her room. She said she enjoyed having the visiting turtle named Tre in her room. The students were highly motivated to write about their field trip, guest speakers, and guest "pets" (class observation, May 25, 2000).

Discussion and Implications

Perceived and Real Barriers

Teachers perceived barriers to fully implementing a project approach. Some of these barriers were external, such as the district curriculum and policies. Others related more to internal factors such as belief systems about teaching, their assumptions about children, and values—what I term, "the intangible qualities" of classroom life. Teachers had difficulty implementing all of the components of the curricular intervention that were initially planned due to perceived outside constraints such as the policies of the school, district, and state. It was also challenging for them to "give up control" and assume the role of a facilitator. They felt that their population of students made it difficult for them to teach using some of the strategies that are integral to project

work. They overcame these barriers with certain components of the project approach. This indicates that certain strategies may be more easily transferred to all children than others.

Elements of Project Work Integrated Into Instructional Practices. Both teachers implemented elements of project work such as brainstorming memories and experiences, making observational drawings, documenting children's work, and having students collect information through surveys. Janice said in her interview,

> I feel more comfortable, and even though we haven't done a project with the quilts, I've approached it in a lot of the same ways as far as you know having the kids tell about their experiences, if they have any, and letting it be child-centered and we took and we did a quilt survey. They came up with the questions. They generated the questions for the quilt and they were better at it because they knew but like we did this, first of all, do you have any quilts at your house, and then they wanted to know what colors were in the quilt, because those are the things that we were looking for in our quilts. I'm sure I'll do things differently because you always do. (personal interview, February 2, 2000)

Answering researchable questions in small groups was the hardest component of the project approach to implement for Karen and Janice. Small-group work gives authenticity to the learning because the students report what they learn to each other. Instead, teachers selected researchable questions for the whole class to pursue. Both teachers felt that the behavior of their students and the worry about losing some control of the topic may have prevented them from working in small groups. Karen said she would have liked more small groups,

> I think I can actually work with a small group better because you can keep them focused. You know six children around you, the only problem there is what do you

> do with the other 15 or so that are at their seats while you're working with those six kids? But I can give it more attention when they actually or—even the children that are afraid to ask questions, I think in a small group they ask questions more than if they're in a group of 20. (personal interview, May 16, 2000)

Karen also said it was hard to let students work in small groups because she did not feel they were capable, "It was hard because they were so young, they couldn't do research on their own. They didn't have the abilities." She said that she felt that she was supposed to allow them to explore on their own, "I felt like I was supposed to be doing that" (personal interview, May 16, 2000).

Janice said she was apprehensive at first about "letting the kids kind of be the director of this whole thing" (personal interview, February 2, 2000). But she admitted becoming more comfortable with that style of teaching.

District Curriculum and State Mandates. Both Karen and Janice worried that they would not cover their required curriculum if they spent too much time doing project investigations. At one staff meeting, the teachers talked about using the consumables in the science tubs so that they would not get in trouble from the district office. They chose topics that students could investigate first-hand for projects and the other topics they taught using a unit approach. The duration for the projects that I observed was 2 to 3 months. Each of the units lasted about 3 weeks.

Aligning Curricular Approaches With District and School Policies. Teachers used the district policies for behavior management: rewards and punishments. They turned cards for behavioral offenses, gave keys for school recognition, and stars for good behavior in class. In several instances, teachers stopped good discussions to present children with stars and keys. This was a common statement during project work, "I see some people earning keys, and I need to get up and get my keys to jot down their

names" (class observation, November 17, 1999). The culture of positive and negative extrinsic rewards runs counter to children being in charge of their own learning and being motivated to learn because something is intrinsically interesting to them. Even when children were intrinsically interested (such as when watching the turtle eat), as soon as the teacher singled children out for being good, other children inferred that they were bad—causing an even greater disruption to the learning process. Examining discipline systems and classroom management practices that promote the intrinsic value of learning instead of working for stars, stickers, or keys is a critical and significant factor to consider when implementing a curricular-based reform that rests on fundamentally different principles than the extrinsic reward systems that are popular in public school culture. Praise for hard work, thinking critically, being creative, and working independently was less frequent than praise for following directions. Values in the school context and culture should be examined. Compatible systems need to be in place to promote an environment of inquiry, challenge, and emergent curriculum (Hertzog, 2005).

Characteristics and Behavior of Students. Both teachers said that the characteristics and the behavior of their students might have kept them from doing more small-group work or letting them go beyond the teacher's questions for investigations. I witnessed a recursive cycle of behavior. When the children misbehaved, the teachers would give them worksheets to "calm them down." They would leave worksheets with substitutes. However, the children behaved most poorly when substitutes were in the room (observations over the course of the year). Karen commented to me that in January, the children were the worst behaved all year. They did not do projects in January. During my visits to the classroom when the children were engaged in project work, I witnessed little misbehavior. The teachers had difficulty balancing what they perceived as student needs with project activity time. They felt their students needed help from many different people including reading specialists, social workers, and counselors. They felt

the urgency to teach them basic skills first before giving them project activities. They did not feel that the students could be successful at project activities without the basics.

The assumptions that teachers have about their students relate directly to their expectations of them. District administrators felt that they needed to raise teachers' expectations of their students to increase student achievement. The project approach has potential for doing this because it allows teachers to see more clearly that their children are truly capable of engagement and learning. However, taking the first step into project activities was a difficult one for these teachers.

Time Consuming. Teachers felt that implementing this type of curriculum was more challenging and time-consuming than leading students through units. Both teachers noted that not only did projects take longer to conduct with students, but they also required more preparation time. Janice worked on the weekend to create a project display, and Karen often stayed late after school making the displays. They also developed film and purchased materials for classroom use. Karen said in her interview that she did not believe many of the other teachers would put so much time into their teaching.

Examining the use of time is critical in any setting. The teacher's time is spent differently as a facilitator than as a direct instructor. Facilitators organize expert speakers, plan different places to pursue fieldwork, or design ways to demonstrate new knowledge.

Most teachers in gifted programs already see their role as facilitators of learning and have developed skills to guide children through inquiry. Allowing students to pursue their own questions and interests is a key difference between content-coverage instruction and inquiry-based instruction. How teachers see and manage their roles may be a key factor to transporting pedagogy from gifted education into general education.

Internal Factors—Changing Teaching Practices. Changing one's own teaching practice takes time, hard work, motivation, and a

style of experimentation. Teachers needed to be able to implement project work slowly in their classrooms. In midyear, Janice said, "I feel like I'm 'winging it'—doing anything to get them to think" (personal interview, February 2, 2000). As the teachers felt more comfortable with different aspects of the project, they became more willing and interested in taking on new tasks. Both teachers often asked me if they were "doing it right." They recognized when they were and were not doing project work, however the teachers were unsure if they were doing the project work correctly. They knew when they wanted to document the children's experiences with photographs. At the end of Janice's pond study, it was evident that she valued the students' questions, their responses to predictions, and their own personal stories about their experiences. Janice and Karen seemed to enjoy the students' questions and curiosity.

The teachers definitely felt that students were more engaged in project investigations than in other parts of their day or curriculum. Both teachers told me they were surprised at some students' level of involvement. They did not realize that those particular students could become so engaged in learning.

Assessing Learning. Assessing what students are learning through project investigations is a challenge. Both teachers told me they were not sure if the children learned more by doing the projects. Yet, as Karen said, she never quite knew what children learned through units either (personal interview, May 16, 2000). Teachers believed they must cover district curriculum and state mandates. They assumed that by presenting more information, students would learn more. Thus, the issue, not unique to discussion here, must be raised whether children learn more by covering more topics or by "uncovering" fewer topics. The value of in-depth learning is at the heart of Renzulli's (1977) Type III project investigation, and Katz and Chard's (2000) conception of the project approach. In-depth inquiry is a critical component of some gifted education models, giving students opportunities to pursue their own questions and their own interests.

Making Explicit the Intangible Qualities of Classroom Life

Teachers using the project approach explicitly show they value the processes of learning as well as the products. They also demonstrate to their students that they value their thinking and questioning. The language of thinking is pervasive in classroom discourse.

Compatible Classroom Management Systems. Pinehaven built its behavioral policies around external reward systems. Classroom management systems compatible with students' ownership in their own learning include disciplining students for natural consequences. Phrases such as the following might be given to students: "Listen so you can hear Beth's ideas," or "Finish so you can share what you've learned." Extrinsic reward systems also were seen as incompatible for developing students' autonomy when implementing the project approach schoolwide (Hertzog, 2005). If students had more autonomy, many more opportunities for students to reflect on their own learning would be present, and teachers would be able to provide extended blocks of time for students to work in-depth on projects of their interest.

Compatible Belief Systems. In most gifted programs, Brandt's (1998) conditions for powerful learning are evident. First and foremost, "students learn well when what they learn is personally meaningful, when they can learn in their own way, have choices and feel in control, and when they use what they already know as they construct new knowledge" (Brandt, 1998, p. 12). For students to take control of some of their own learning and to construct new knowledge, teachers need to provide choices and opportunities. These are very different tasks than those of teachers who want their children to complete worksheets that demonstrate mastery of basic skills. Research supports better long-term results for students who are active learners, have choices about their own learning, and who become socially competent in their early years (Katz & Chard, 2000). Therefore, educators must

place value on the long-term goals of education, and not a priority on short-term standardized test scores.

Insights for Future Research

This research initiates more discussion as to why teaching strategies found in gifted programs are difficult to integrate into general education classrooms. Perhaps the demands on the teachers are too great in most general education classrooms. Saracho (1993) articulated six roles of the early childhood teacher: decision maker, organizer of instruction, curriculum designer, diagnostician, manager of learning, and counselor/advisor. Implementing project work and choices for children requires expert skills in each of those roles as well as a balance of all of them. Perhaps because the teachers saw the children as needing help and as being so incapable of working independently, they could not spend equal amounts of time in all roles. Instead, the teachers may have spent more time as counselors, decision makers, or managers of learning than as curriculum designers or as diagnosticians, which are critical to providing the context for inquiry-based learning.

The teachers did in fact change their teaching practices and created opportunities for students that probed their thinking and displayed their capabilities. It is well documented in the literature on reform that changing teaching practices and school climates is complex and difficult (Fullan, 1991, 1993). Not only did this study illuminate that complexity, but it also highlighted the intangible aspects of the curriculum and instruction that present barriers to changing teachers' behavior.

Two strategies that were particularly difficult for these two teachers to implement were giving students choices and working in small groups. These strategies are integral to differentiating instruction in general education classrooms. These findings may reflect an insight as to why differentiating instruction may be difficult for general educators.

Limitations

As a qualitative study, the findings cannot be generalized to other settings. However, the study does provide insights that may lead to a deeper understanding of how teachers decide to make changes in their curriculum and instruction. The common themes that arose out of this study are similar to research emanating from related fields. The 2 teachers may or may not be typical of all first-grade teachers, but their context is real and one that may be relevant to other settings. The most serious limitation involves the complexity of classroom life and the difficulties that I had as a researcher capturing all of the factors that played a role in the implementation of the project approach in this school setting.

Conclusion

On the whole, both teachers were supportive of the project approach. They spoke positively about the behaviors they saw in children when they were engaged in project work. They noted students' engagement and interest in their work when they were doing project activities. These are behaviors that are used to identify gifted students: interest, motivation, engagement, and curiosity. The project approach brought out these positive behaviors in children who did not typically exhibit them. Teachers were excited about observing these behaviors, and they actively worked to document the engagement and the activities of their students.

Most teachers in general education classrooms do not have the curricular flexibility that teachers have in gifted programs. Perhaps it may be a cornerstone feature of gifted programs that the "what to teach" is not often predefined. For educators wishing to make general education classrooms more like gifted classrooms pedagogically, flexibility in the content must be a component and a targeted area for changing teaching practices. Developing

a project on a topic, but giving students choices within that topic is one way to implement flexibility for students.

Because changing teaching practices is inherently linked to changing teacher belief systems, it may be important to transport the intangible belief systems, goals, and values that teachers have about their students in gifted programs into all classrooms. Although the intervention was not implemented as wholly as intended, it was not totally unsuccessful. Based on these teachers' experiences, the school chose to become schoolwide project-based for the following year, giving support for the type of goals that were intended with this study: the improved achievement for all children, and the increased probability of recognizing the strengths, interests, and talents of children typically underserved in gifted programs.

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