

**CSAC Question 5: Plan for special education support for students and a clear illustration of funding to support these resources.**

As of June 10, 2016, the Delaware STEM Academy is currently enrolled with a population of 131 students. Sixteen (16) of those students are identified as a special population subgroup and identified to require additional services as mandated through an existing IEP. As a new school, teachers will receive training in how to implement the PBL platform with fidelity, including making sure that scaffolding is in place to provide personalized learning opportunities and implement services as mandated in the IEP to those identified students. This personalized learning approach will include student success plans that align with the mandated IEP goals for each student to reach grade level reading, math and behavior goals. We have strength with the support of a 1:1 computer based learning environment and the ability to implement strategies in a collaborative classroom setting to close the gap for this subgroup. Strategies include the following:

- Increasing the ratio of staff to students to provide a special education teacher for the full class period in ELA and Math. Additionally, there are schedule pull out blocks to meet the small group instruction requirement of some of our intense students. DE STEM will hire two full time special education teachers and two paraprofessionals to support the special education population of 16 current students.
- Implementing strategies within a student's personalized learning plan to provide scaffolding to students while still presenting grade level curriculum.
- Teachers will use a benchmark assessment in reading, math and science to determine appropriate groupings for student support and personalized learning goals for each subject area.
- Project development will include scaffolding to personalize learning for students needing support in any given area while still exposing them to grade level appropriate curriculum. Teachers will have the flexibility to work with small groups during class time under the collaborative classroom model.
- Additional resources for students will be determined during project development and provided depending on the subject, tasks and activities included in the project. Technology supports are available through the ECHO library with samples of grade level scaffolding to meet the needs of struggling learners.
- Students struggling with activities or behavior will have the ability to work with the teacher or para professional in all classes based on the new staffing formula. The paraprofessional provides support to the students in reading pairs, reading individually, pull out support to read aloud, administer audio versions of instruction in a smaller setting, assist with providing a quiet room for de-escalation to occur for students needing assistance, providing personal assistance care, monitoring behavior during transitions, provide small group instructional support, support implementation of behavior plans and provide monitoring of students needing an alternative setting in our "reflection room".
- Technology supports are also in place connected to ECHO and the Google platform to use components such as the Read/Write feature which allows students access to reading texts that can be modified as excerpts. Students can read, highlight and also listen at the same time. Students can utilize this feature in an inclusive or small group setting.

A typical day for a DE STEM student would be as follows:

Students are provided with a daily agenda of tasks/activities for each class through ECHO (online learning management system) and maintained through the project calendar. Teachers normally display that agenda each day through the smart board and review as needed aloud as a whole group or individually with students. Task and activities can be tailored to meet the needs of each individual student and progress monitored through the system during instructional time and adjusted as needed in real time.

Students are grouped both homogeneously and heterogeneously to encourage team behaviors and participation from all students. Chunks of text are read aloud and shared out to the whole class through the workshop process. Students and groups can participate/be invited to workshops of direct instruction as part of the PBL system of learning. Sticky notes and other textual annotation, such as highlighting, can be used throughout reading texts to improve comprehension, encourage questioning and inquiry, and develop content area vocabulary on challenging words. ECHO supports the use of online technology to provide students with those services online through google programs and are adjusted as needed in the form of printed copy.

Students will receive accommodations on assignment completion time and performance expectations based on their learning needs as mandated on their IEPs. Students will share in opportunities to write about background knowledge and share out their perspectives on various issues within their group setting. Students will engage in researching with their peers, reading aloud in pairs, reading as a whole group, and reading individually. Communication with the special education teachers for IEP strategies; graphic organizers, interactive/online notebooks, drafts/edits on essay writing process, quick writes, whole group sharing of visuals, oral communication and other digital media components available through the ECHO network.

Students needing intensive intervention and pull-out time will be identified through data collection, progress monitoring and formative assessments. The collaborative classroom approach and revised schedule allows specific time for pull out programs to occur and provide the special education teacher with para-professionals as an additional layer of support.

Staff will participate in a weekly ½ day of planned coordination time to focus on project development to meet the needs of our student population. Release time for professional development will be provided during that weekly time to specifically train staff using the modules in New Tech that support a co-teaching model. Our academic New Tech coach will work with the Principal and staff to identify specific needs of training to support closing the achievement gap within the PBL structure. However, the goals above reflect how other New Tech schools with larger populations of special needs students are successfully implementing the model with higher populations over 20% within that same subgroup.

Master Schedule:

| STAFF:   | 1          | 2          | 3             | 4        | 5             | 6            | 7        | 8                           | 9                               |
|----------|------------|------------|---------------|----------|---------------|--------------|----------|-----------------------------|---------------------------------|
| Block    | ELA 1      | SS 1       | Math 1        | STEM     | Sci.1         | WL (.25 fte) | SPED     | SPED                        | Teacher Leader/Dean of Students |
| 1        |            |            | IM II         | STEM     | Prep          | WL II        |          | ED/Compliance Digital Media |                                 |
| 2        | 9-1 & 9-2* |            | Digital Media | STEM     | Earth Science | Prep         | ELA/SS*  | Pull out                    | Digital Media                   |
| 3        | Prep       | Grade 10 * | IM I          | STEM     | Earth Science |              | ELA 10*  | ED/Compliance Media         | Digital                         |
| 4        |            |            | IM I          | PLTW     | Earth Science |              | Prep     | Pull Out                    | Dean of Students                |
| 5        | 9-3 & 9-4  |            | IM II*        | Prep     | RTI           |              | IM II*   | ED/Compliance               |                                 |
| 6        |            | Prep       | IM I          |          | Earth Science |              |          | Pull OUT                    | Dean of Students                |
| 7        | BIO/LIT*   | RTI        | Prep          | BIO/LIT* | STEM          |              | BIO/LIT* | ED/Compliance Students      | Dean of                         |
| Advisory | 9-1        | 9-2        | 9-3           | 10-1     | 9-4           |              | Mixed    | Prep                        | Prep                            |

Please see attached research from New Tech that shows the effectiveness of meeting the needs of special education students in PBL classrooms.

# Empowering Students With Special Needs to Help Others: How Problem Based Learning Made it Possible

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Sue E. Jackson

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*A Case Study Published in*

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# Empowering Students With Special Needs to Help Others: How Problem Based Learning Made it Possible

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## Abstract

This article describes a project that will make a positive impact in today's special education classroom. Teachers will learn how to use Problem Based Learning (PBL) units as a tool to empower students with special needs to become more confident, independent, successful students. It will also shatter the stereotype that students with special needs are not capable of being leaders in classrooms. Students flourish with the PBL classroom setting where many learning styles are actively used to engage all students. Students learn to become life-long learners and productive community members. This PBL unit gives students with special needs an opportunity to shine as classroom leaders. The unit also promotes character building skills that students will take with them throughout their academic careers and into adulthood.

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## Keywords

problem based learning, accessibility

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**Uneven and missing sidewalk sections interfere with mobility**



**Grass has overtaken our sidewalks**

It was a beautiful spring day, and the Physical Education teacher was preparing to take the middle school Adaptive Physical Education class for a walk. The students enjoyed the first block of their walk, seeing the swaying trees and colorful flowers, feeling the warm sunshine and smelling the freshly cut grass. However, their enjoyment was short-lived. The students soon encountered several problems for their classmates who depended on wheelchairs for mobility. Sidewalks in all directions from the school were broken by large, knotted tree roots jutting through them; grass and weeds covered large sections of the sidewalk; and bushes and parked vehicles intruded over the pathways. This quickly ended the excitement for the students who had looked forward to being outside on the first nice spring day.

Both teachers and students began questioning why the sidewalks were so inaccessible. Upon returning to school, students wanted to know who to call to fix the problems. Questions arose, like, “Who do we call to complain?”, “Who is responsible for fixing sidewalks in front of houses?”, “How much would it cost to fix them?”, and “What can we do to help?” They quickly learned that the teachers did not have the answers they wanted.

To find solutions to these questions, three unique classes were combined as one. The first class was comprised of students with moderate to severe mental and physical disabilities, their special education teacher, and two teacher paraprofessionals. The second class was made up of students with mild disabilities, their special education teacher, and one teacher paraprofessional. Finally, the third class consisted of students with emotional disabilities and learning disabilities and their special education teacher. This combined class set out to find the answers to their questions through the problem-based learning process.

The essence of Problem Based Learning (PBL) is taking a real problem and finding a solution. An expanded definition of a PBL unit would be taking an unstructured, real-world problem and allowing students to immerse themselves in the problem to discover solutions (Torp & Sage, 2002). The sidewalk crisis in Crawfordsville lent itself perfectly to such a unit.

We were fortunate to be familiar with the PBL process because of a Technology Innovation Challenge Grant awarded to our school corporation. PBL training sessions were given to all faculty members in the school corporation. All three teachers in-

volved in this accessibility PBL unit had previous individual classroom experience developing and implementing PBL units.

To find additional examples of PBL units and the Technology Innovation Challenge Grant go to:

<http://research.soe.purdue.edu/challenge/>

Key elements of a successful PBL unit include developing cooperative learning groups, transitioning teachers to take on the role of model and coach rather than instructor, and encouraging the students to become independent learners. The combination of these elements encourages long-term learning, enhances problem-solving strategies, and inspires students to take on the responsibility for their own learning. Real life is often unstructured (not the typical sterile classroom environment) and students benefit from adding these real life learning situations to their traditional classroom learning. The goal of a PBL unit is to enable students to solve real-life problems outside of the classroom, a skill that will enable students to be successful in their careers and personal lives.

### **Walkable Community**

A Walkable Community encourages people to use its sidewalks and trail systems for enjoyment, recreation, and daily tasks.

#### **Key factors in a Walkable Community:**

- Sidewalks give you room to walk
- It is easy to cross the street
- Drivers behave well (following rules)
- It is easy to follow safety rules (for adults and children)
- Walking is pleasant

(Pedestrian and Bicycle Information Center, n.d.)

## **The Unit at a Glance**

The PBL was developed during a summer workshop hosted by Purdue University instructors and the Technology Innovation Challenge Grant director. This is when the lessons were developed in the form of a WebQuest, a time frame for the project was set, a rubric was developed, and responsibilities of each teacher were determined.

The PBL unit opened with the driving question, “Crawfordsville, Indiana...How Walkable Are You?” The students were given the job of being Walkable Community Detectives to solve the case (problem). They worked in pairs and small groups to achieve this goal. The WebQuest was structured to allow success for the students as they worked independently.

Printable checklists were included that gave clear expectations, procedures, and points assigned to each task. This left no room for confusion for students and teachers when evaluating.

For examples of the WebQuest and checklists, you can see them at [http://research.soe.purdue.edu/challenge/pbl/04\\_05/accessibility.html](http://research.soe.purdue.edu/challenge/pbl/04_05/accessibility.html)

This PBL unit was unique because of the group of learners involved. The students ranged from those with emotional disabilities, learning disabilities, mild mental disabilities, and moderate to severe mental and physical disabilities. Many of these students have relied on the help of others for much of their lives. For example, students with special needs have received academic assistance, social-emotional counseling, and in some cases, personal care assistance from an early age. This PBL unit enabled the students involved

to actually help others. Throughout the PBL process, they gained problem-solving skills, confidence, and pride.

There are stereotypes of students with special needs as not being capable of taking the lead role in academic projects. These stereotypes were successfully shattered during this project. The students took on the roles of researchers, writers, photographers, reporters, and community activists. Teachers took on the role of facilitators.

Previously, many of the students never saw themselves as proficient enough to take on these professional roles. We found that when we raised expectations, students rose to meet them. This is true for all students, including those with special needs. For example, one student had the following comment to share when asked how PBL has affected her performance in school:

[I've done] pretty good. I've raised my grades up a lot since I was in PBL.... doing projects in front of class, like Power Points and stuff, I'm not as scared as I used to be after I have done PBL. I used to be really scared to get up in front of people.

The PBL project resulted in several positive outcomes to our traditional classroom. Some challenges we faced before even beginning the project were poor attendance, low motivation, heavy reliance on teacher instruction, and poor student attitude. During the PBL process, improvements were seen in each of these areas. PBL classes were held first period on Wednesdays for the first two trimesters of the school year and attendance improved. For example, students who had a history of poor attendance would ask on Tuesday afternoon if the PBL unit was tomorrow. They didn't want to miss a session. We

also saw an increase in motivation from all of the students. They enjoyed the freedom the PBL unit lessons allowed them. This was evident when the students entered the classroom on time, set up their computers without delay, and quickly started working where they had left off the week before.

Students with Oppositional Defiance Disorder who had a history of problems with authority figures did very well in the PBL setting and even took on leadership roles. Two specific students with emotional disabilities took the students with severe and profound disabilities under their wings. They made sure a seat was open for them, greeted them at the door with a smile, asked for their input, and encouraged them with kind words throughout the unit. As one student explained:

It's a good opportunity to help the other kids learn and everything. It's good because you get to know people more and work with them more and make new friends. I like helping them too. Like when I go in the hallways, they smack my hand. We're really good friends now, after we've done the PBL.

We saw a definite increase in positive attitudes. Several students had a generally poor attitude towards school. This attitude changed on PBL learning days. There was an increase in the number of positive comments and a lack of complaints. A combination of freedom from a traditional classroom, working in cooperative groups, and being in charge of their own learning were all factors in the students' improved disposition.

Academic benefits were seen in addition to behavioral benefits because of the PBL unit. Every student involved in the PBL unit completed the required elements of the project. Each student was responsible for re-



search, field trip participation, questionnaires, checklists, and developing a group PowerPoint. A rubric was developed to assess their involvement. Students met every goal they were given. Past classroom experience had shown that many of these students performed less than average on group activities. That was not true with PBL. The students' final grades were well above average on this project.

A goal of special education is to teach students to become more independent in their academic endeavors. This is a natural process in a PBL classroom. Teachers assume a guiding role that allows and encourages students to take the lead in their learning. Our job as teachers was to take the problem the students discovered and put it into a PBL unit form that was workable for our group of learners.

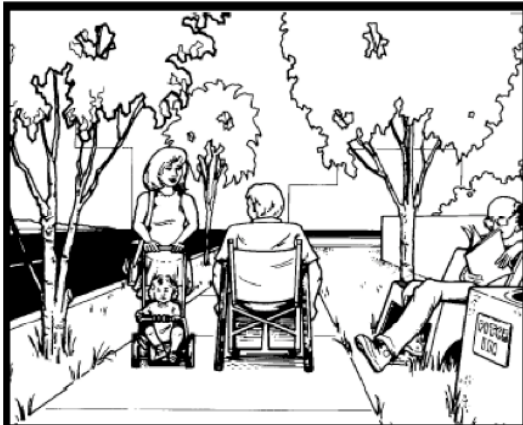
### **Lessons Learned**

As in any project, there are lessons to be learned. Initial obstacles were finding funding for field trips and teacher training. We were fortunate to be given a one week planning session in the summer through Tech-Know-Build, a Technology Innovation Challenge Grant, which allowed Purdue University instructors to work individually with our teachers while developing this unit. This opportunity was invaluable for the success of our PBL unit. Other obstacles we overcame during the actual implementation of the unit were students' time on task and the realization that an optional plan (Plan B) should have been ready to implement when unforeseen problems arose. Keeping the topic narrow rather than too broad was another challenge. We prevailed by giving extra responsibilities for students who completed their work sooner than their classmates. In addition, we developed alternate plans (e.g. hard copies) for

days that the technology decided not to cooperate. And finally, we put our PBL unit into a WebQuest model which was helpful in keeping the students on task and within the parameters of our specific problem. We found it necessary to give the kids a clear beginning and end point from the first time the PBL groups met. Another factor that proved beneficial to the project was having a checklist that the kids could follow independently. Many of our students had attention deficits, short and long term memory deficits, and organizational difficulties. The checklist allowed them to see the large project in smaller, more "doable" pieces. It also was a model for good organization and time management.

### **Positive Outcomes**

We were happy to discover some very positive outcomes from this PBL unit. Initially, we set aside one period a week for our PBL unit to accommodate our schedule as teachers. However, this format provided unexpected benefits for our students. They looked forward to the weekly PBL class time, and their interest stayed high because they weren't saturated with the project for long periods of time. They enjoyed leaving their classrooms to meet as a large group in a different classroom. For the teachers involved, an added benefit was pooling our resources. Meeting in one location allowed three teachers and four paraprofessionals to work with our twenty-three students, a very strong adult-to-student ratio for this type of project. Another benefit to our group of learners was the fact that many learning styles were incorporated in this project. Many traditional classrooms accommodate students who learn well from listening to lectures, writing notes, and taking paper and pencil tests. This is not ideal for all learners (not to mention students with



*Figure 1. Sidewalk Accessibility Sketch*

Used with permission from [www.dot.state.fl.us/safety](http://www.dot.state.fl.us/safety)



This picture was taken by a student on one of our community field trips. The student used a digital camera to capture the image. Students used a city map to locate their designated walking path before beginning their trip. They recorded the data using a Walkability Checklist which asked them to rate five specific areas which needed to be assessed. Information was collected and brought back to school and shared with the other groups involved in the project.

special needs). This PBL unit used visual, auditory, kinesthetic, logical, social, and solitary learning opportunities (Advanogy.com, 2003). The combination of taking community field trips, using audiovisual equipment, researching on the computer, sharing in interpersonal groups, and working on solitary activities within the groups allowed all learners to work in their comfort zones and even venture out of their comfort zones at times.

The students felt great pride in the fact that they were making a positive difference to their classmates and community. One student noted, “We tried to help people. Usually we don’t go out trying to find problems in the community that can help people in wheelchairs. It’s good to help others.”

When we talked to our students regarding how they felt about the PBL unit, there were common themes expressed. One of these themes was that they now felt empathetic towards individuals who had physical disabilities. One student noted that he was not

aware of the difficulty in pushing and/or maneuvering a wheelchair. Another student said he had never thought much about sidewalks before this project. Several students said they used to like the cracks in the sidewalks because they could jump and ramp their skateboards and bicycles on the big cracks and uneven pavements, and now they no longer thought that way. One student explained, “We learned about how the sidewalks were all cracked up and everything, and that we couldn’t get wheelchairs through parts of the sidewalks, and the ramps, and the trees that were growing into the sidewalks.”

At the end of the PBL unit, the common feeling among the class was that they wanted everyone in town to know what they had learned and do something to fix the problem. They felt a need to continue making a difference. This is a passion that arose in them because of the PBL project.

As teachers we measured the effectiveness of the PBL experience in a variety of

ways. First, the enthusiasm of the students involved was important to the project. The students' attendance and positive attitude toward the problem of inadequate sidewalks was evidence of their enthusiasm. The other component we used as a measure was the academic grade the students earned. All students involved received an above average score on the rubric developed for the project. The rubric combined many academic areas including writing, problem solving, and computer skills.

As special education teachers, why do we recommend you implement a PBL unit into your classroom? It was an extremely satisfying experience for all involved. Students who always had a passive role in their education became leaders. Students who had histories of problem behaviors and hostile personalities became caring and compassionate classmates. Students who normally had poor academic performances were given a chance to shine under the admiration of classmates whose challenges were more severe than theirs. All teachers involved had moments of awe and inspiration as they witnessed students performing tasks they thought impossible. The PBL process made this all possible for us, and it can for you too.

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# Perceptions of the Value of Problem-based Learning among Students with Special Needs and Their Teachers

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## **Perceptions of the Value of Problem-based Learning among Students with Special Needs and Their Teachers**

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### **Abstract**

While problem-based learning (PBL) has been found to be effective with gifted and average students (Hmelo-Silver, 2004), little is known about its impact on students with special needs. This study examines the perceptions of middle-school students with mild, moderate, and severe disabilities and of their teachers regarding the value of participating in a PBL unit. The unit focused on the physical accessibility of a low-SES, rural community where the students' school was located. We used the constant comparative method (Glaser & Strauss, 1967) to analyze interview data, and used observation data and artifacts to triangulate interview comments. Among the noteworthy findings were (1) students manifested strong engagement, and (2) students with less severe disabilities developed compassion for students with more severe disabilities.

Keywords: problem-based learning, special education, middle school, accessibility

### **Introduction**

Problem-based learning (PBL) has been advocated by current educators (Gallagher, Sher, Stepien, & Workman, 1995; Gijbels, Dochy, Van den Bossche, & Siegers, 2005; Hmelo-Silver, 2004; Stepien & Gallagher, 1993) as one way to increase inquiry and problem-solving skills among gifted, average, and university students (Barrows & Tamblyn, 1980). PBL is an instructional framework in which students work in cooperative groups to solve real-world, authentic problems. In the course of solving the problems, students learn content and also expand their higher-order thinking skills (Hmelo-Silver, 2004).

Despite its use with gifted and average students, there is little literature that examines the effects of PBL on students with special needs. For the purposes of this paper, we define a student with special needs as one who has specific learning disabilities or other cognitive and/or other physical disabilities and “who, by reason thereof, needs special education and related services” (Individuals with Disabilities Education Act, 2004, p. 2652). In one study, Cerezo (2004) described a PBL unit that was used with at-risk middle-school students. The sample included one student with learning disabilities and 13 students who were at risk for failing science or mathematics. Participants perceived that the unit helped them to succeed in academics and social situations and thus to raise their confidence. Additional literature describes units that seem to employ several, but not all, of the principles of PBL (e.g., authentic context, investigation of a real-world problem). For example, Ervin (2002) described a unit designed for vocational students with special needs that examined the differences in how meat loaf is prepared in different regions of the country and the world. Bottge (2001) described a unit in which students with special needs attempted to determine where a model car needed to begin on a ramp in order for it to reach a set speed and successfully navigate a course. Bottge noted that most students were engaged and able to effectively solve the given problem. This exploratory study was designed to examine the experiences and perceptions of students with special needs and their teachers at a middle school in order to understand the potential of PBL for use with students with special needs.

## Literature Review

### *The Goal of Special Education*

A major goal of special education is to enable students with special needs to perform closer to the level of performance allowed by their intellectual abilities. The reason for this goal is twofold: (1) to ensure success in school and in life for these students and (2) to enable schools to demonstrate adequate yearly progress as required by the No Child Left Behind Act (NCLB, 2001) and the Individuals with Disabilities Education Act (IDEA, 2004). That is, NCLB and IDEA both stipulate that all students with special needs must make continuous and substantial improvement in reading and mathematics achievement in order for a school to demonstrate adequate yearly progress toward the goal of 100% proficiency in reading and mathematics for all students.

### *A Call for New Methods*

Though current instructional methods and strategies (e.g., inclusion, behavioral modification, social skills training) used in special education have shown a significant effect on the academic achievement of students with special needs (Hanushek, Kain, & Rivkin,



2002), many teachers and researchers within the special education community (Ibler, 1997; Pogrow, 1988; Rojewski & Schell, 1994) have called for new methods to help such students make even greater academic gains and to ensure transfer of their learning to new contexts. Ibler (1997), Pogrow (1988), and Rojewski and Schell (1994) argued that the existence of special needs curricula that focus on students' ability to learn facts encourages students to memorize information rather than use the information in new contexts. Means and Knapp (as cited in Rojewski & Schell) wrote that as a result students with special needs are often caught in a "repetitious cycle of basic skills remediation" (p. 235). As such, these students are not able to perform at the higher levels allowed by their intellectual abilities and thus fail to make the continuous and substantial improvement required by NCLB (Browder & Cooper-Duffy, 2003).

*Could Problem-Based Learning Help Students with  
Special Needs Make Greater Improvement?*

By increasing their inquiry and problem-solving skills as well as helping them learn important content, PBL may have the potential to help prepare students with special needs for a world in which success is less dependent on simply knowing content than on knowing how to discover and manage information (Gallagher et al., 1995). There are several reasons why PBL might be an effective pedagogical approach for students with special needs. These reasons relate to three characteristics of PBL: it is experiential, involves cooperative learning, and occurs within a meaningful authentic context.

*PBL is experiential.* During a PBL unit, students must interact with their environments to carry out inquiry and discovery tasks (Stepien & Pike, 1997). Many authors have demonstrated that experiential methods are helpful to students with special needs (Scruggs, Mastropieri, Bakken, & Brigham, 1993; Scruggs, Mastropieri, & Boon, 1998; Udvari-Solner & Thousand, 1996). Frew and Klein (1982) specified a possible reason why:

By engaging in a process of inquiry, students learn more effective ways of encountering their environment, processing information, and acting on it. If we are to fully prepare handicapped students for an independent life in our complex society, we must provide opportunities for them to expand their inquiry and discovery skills (p. 100).

Mastropieri and her colleagues (2001) noted, "many students with high-incidence disabilities will perform similarly to normally achieving students on a constructivist science task, even though they are far behind in reading and math achievement" (p. 135).

*PBL involves cooperative learning.* In a PBL environment, students must work cooperatively (Hmelo-Silver, 2004; Savery & Duffy, 1995). Many authors have noted that instructional approaches that involve cooperative learning have the potential to help students

with special needs increase their achievement levels (Barley et al., 2002; Gillies & Ashman, 2000; Jenkins et al., 2003; Malmgren, 1998; Slavin & Madden, 1989). Adams et al. (1996) also found that cooperative learning can increase the engagement of students with special needs. Upon reviewing research on the effectiveness of educational programs for at-risk students (including those with special needs), Slavin and Madden found that programs that involved cooperative learning were among the two most effective categories of programs. As Johnson and Johnson (1996) noted, students engaged in a carefully constructed cooperative learning experience often exhibit greater effort to achieve.

*PBL occurs within authentic contexts.* PBL has the potential to appeal to students who have trouble learning things that are taken out of context (Hmelo & Ferrari, 1997). Scruggs et al. (1993) noted, "most students with LD have difficulty learning from reading and workbook assignments and benefit from concrete examples" (p. 3). Lee and Songer (2003) found that students at risk for failing due to cognitive disabilities or other reasons have a better opportunity to apply their knowledge in the solving of problems when the problems are based on real world "situations that closely match simple patterns in the knowledge students possess" (p. 944). Given the similarities between the needs of at-risk students and students with special needs, it seems to follow that when PBL is used in the special education classroom the ill-structured problem employed must not only be authentic but must also be similar to other problems with which the students are familiar.

Given the scarcity of literature that explores the use of PBL with students with special needs, we designed an exploratory study to examine how PBL works with these students. Although ultimately we hope to determine the impact of PBL on the academic achievement of students with special needs, this study was designed as a first step toward that goal. That is, we believed it was important to begin by determining the perceptions and experiences of the students and teachers involved in the PBL process because learning gains are unlikely to be realized without student engagement in or enjoyment of the process. Thus, the research questions guiding this study included:

- How do students with special needs and their teachers perceive the value of PBL?
- How do students with special needs feel about collaborating with other students in PBL?
- How do teachers perceive that their students collaborate with students with different special needs?
- How do teachers modify the PBL approach to make it work in a special needs classroom?



## Method

### *Role of Researchers*

The researchers included one graduate student and two faculty members in educational technology, all with specific interests and expertise in PBL methods. The first author worked as a research assistant on a project to help middle-school teachers implement problem-based learning, and the second and third authors were professors who led the same project. In addition, the second author had previous classroom experience teaching students with learning disabilities. The first author participated in the unit as an instructional and technology assistant in the middle-school classroom, enabling him to engage in participant observations. He also conducted all interviews using an interview protocol developed by the researchers. Human subjects approval was obtained from the university's Institutional Review Board prior to the start of data collection.

### *Setting and Participants*

This study took place in Wright Middle School (WMS; note: all names have been changed), a middle school in Brownsville, a small, rural community in the Midwest. WMS had 36 teachers and about 600 students, about half of whom received free or reduced lunches. Four years earlier, Wright Middle School had received a large federal grant that enabled it to provide all of its students with laptop computers and to collaborate with professors and graduate students from a large Midwestern university to help the teachers implement PBL.

The context for the study was a PBL unit on the physical accessibility (i.e., the accessibility of sidewalks, doors, and public places to people with physical disabilities) of Brownsville. Three classes serving students with varied cognitive, emotional, and physical disabilities worked together on the unit for one class period per week for 24 weeks in order to answer the question, "Is Brownsville accessible to you?" A total of five students with learning disabilities (LD), two students with emotional disabilities (ED), six students with mild cognitive disabilities (MiCD; maximum IQ = 70), two students with moderate cognitive disabilities (MoCD; maximum IQ = 50), three students with multiple disabilities (MD), and one student with severe cognitive disabilities (SCD; maximum IQ = 35) participated in the unit. Two of the students with MD could not walk and used wheelchairs. The participating teachers ( $n = 3$ ) had an average of 11 years teaching experience, and all held bachelor's degrees, while one also held a master's degree. None of the teachers had conducted a PBL unit previously, although some of the students had participated in other PBL units in their inclusion classes.

We used maximum-variation sampling (Patton, 2002) to select our interview participants. According to Patton, the maximum variation sampling technique enables researchers to select participants who vary widely in a particular trait or characteristic in order to identify themes that cut across a diverse sample. We used this technique to select students from each of the three classes who worked together for the unit who (1) appeared to like the unit a lot or (2) were noncommittal about their enjoyment of the unit based on teachers' and researchers' observations. The sample included Bobby, a student with MD; Carrie and Jack, two students with MiCD; David and Andy, two students with LD; Sally, a student with ED; and the three teachers—Charlene, the LD/ED teacher; Sarah, the MiCD teacher; and Theresa, the MoCD/MD/SCD teacher. None of the students included in the interview sample suffered from physical disabilities.

### *Procedures*

*The PBL unit.* The 2004–2005 school year was the first year that all teachers at WMS were required to implement at least one PBL unit. The three teachers who participated in this study developed the unit during a week-long summer PBL workshop offered by two professors and two graduate students from the university with which WMS partnered. During the workshop, the teachers decided that the physical accessibility of Brownsville could provide a motivating topic for all of their students and agreed to work together to create the unit.

During the unit, students and teachers went into the surrounding neighborhood and to downtown Brownsville, took pictures and video, and recorded data about the physical accessibility of the sidewalks, crosswalks, and buildings of Brownsville. During the first part of each PBL class session, one of the teachers led the students in a whole class discussion of what had been learned the previous week and what they were going to do that day. Later in the period, the students worked in small groups led by one of the teachers to either go out into the community as described earlier or to complete research and writing activities using laptop computers. One or several members of each student group typed on their laptops while the other members of the group (usually those with more severe disabilities) contributed content or search terms.

### *Data Collection Methods*

*Interviews.* Individual interviews, lasting from 20 to 30 minutes and based on a standardized open-ended interview protocol (one for students and one for teachers), constituted the first data source. The questions for the interviews were created based on a review of the literature on cooperative and constructivist learning and students with special needs. The interviews were taped and transcribed, and member checks were used with the participating teachers. The interviews focused on participants' perceptions of the value and the impact of the unit.

*Observations.* Due to his presence in the classroom as an instructional and technical aid, the first author engaged in participant observations of the class. Immediately following each class session, he wrote field notes that described what he had observed, what the students had done, and any other notable information about the class session.

*Presentation.* The students created a Microsoft PowerPoint presentation that incorporated text, pictures, and video about what they learned during the unit, including findings related to the physical accessibility of Brownsville. The presentation was displayed at WMS's technology night, which was attended by WMS teachers, parents of WMS students, and other members of the Brownsville community.

### *Data Analysis Methods*

In order to answer our research questions, we used a coding scheme to organize the data and then to aid in counting frequencies of interview responses among teachers and students. We used the same coding scheme to analyze the transcripts of the teacher and student interviews so that we could identify recurrent themes. The scheme included 39 codes. The broadest codes represented major concepts, such as teachers' perceptions of roles. More specific codes focused on more narrow concepts, such as how teachers perceived that students' roles in PBL were different from their usual roles. Not all of the codes were valid for both the student and teacher interviews (e.g., codes that categorized teachers' perceptions of students' cooperation were not valid for student interviews). Once coding was completed, we used the constant comparative method (Glaser & Strauss, 1967) to determine themes that applied across cases.

*Triangulation.* The presentation and field notes from the observations were used to triangulate the interview data. The observations provided a check on what was reported in interviews (Patton, 2002). That is, the observation data were used to either provide an example to illustrate and support what was said in an interview or to provide a counterpoint. The presentation was used to provide a check on interview comments in that it illustrated what the students produced and learned. For example, if a student with LD said that he tried to keep the behavior of a student with MiCD under control, the comment could often be confirmed by watching the video part of the presentation (which included examples of the students walking around Brownsville).

## Results

### *How Do Students With Special Needs and Their Teachers Perceive the Value of PBL?*

All participants perceived value in PBL for several reasons. First, all students and teachers who were interviewed enjoyed participating in the unit. They also perceived value in PBL in terms of specific affective outcomes. Teachers perceived that students concentrated

better and showed a sense of compassion. Students noted gaining patience and choosing to help those of lower ability than themselves. These perceptions were confirmed by observations.

Charlene (the LD/ED teacher) perceived that her students gained the most from the unit by acting as co-facilitators for students with more severe disabilities, a perception confirmed by two of her students. David, a student with LD, stated that he liked participating with the students with the most severe disabilities because they were “different” and “friendly.” When asked what he learned during the PBL unit, he stated that he learned “You gotta have patience.” He also learned that it is valuable to help others who are less fortunate than yourself, noting, “It’s good to help others out. . . . You have to think about more than just you. There’s [sic] other people to think about too.” Observational data confirmed that on several occasions David actively sought to help his lower ability classmates control their behavior, focus their attention on the task at hand, and collaborate in class. Even more striking was the contrast between David’s observed behavior during the unit and his behaviors when he was in class with only his fellow students with ED and LD, when he often displayed such inappropriate behavior as yelling.

Sally, a student with ED, also perceived that the unit caused her to want to help people more: “I’ve learned a lot in the past, but I haven’t learned a lot about our community, and it, like, changed my personality on the community. Like, I go around helping people and everything the best I can.” With these and other comments, Sally and David exhibited a sense of compassion that Charlene noted was not exhibited traditionally among students in a special needs class.

Sarah (the MiCD teacher) also perceived that the PBL unit helped her students improve their behavior and social skills, stating, “I saw some maturity from students that I was very impressed with, because I hadn’t had an opportunity to see that in the regular classroom situations.” Observations, which are detailed in the section on collaboration, confirmed the interview data, as students with mild and moderate disabilities often stayed on task and helped their classmates with severe disabilities stay engaged.

Sarah noted that her students’ positive behavior was due, in part, to the fact that they enjoyed the unit more than traditional instruction:

Since this was an activity where they did get to go out and move around outside of the classroom a lot, it was met with a lot of enthusiasm because they got to do something different. . . . it was done on a Wednesday . . . they couldn’t wait until Wednesday, when they could check on the board just what they were doing as far as PBL was concerned.

Sarah explained that students were engaged because the PBL unit concerned an interesting topic, different from what they usually did in class:

They're [the PBL units] not the normal, what do you say, humdrum of education, of doing your math and doing the reading, you know the whole idea is it brings a different motivating idea that they're a part of, which stirs their interest just like it would a regular ed student, because they're [the PBL units] different.

Students also perceived that PBL helped them in areas other than motivation and social skills. Several students ( $n = 4$ ) noted that one of the things they liked best about the PBL unit was working with and learning more about computers. Two students especially appreciated being able to learn about the use of digital still pictures and digital video, and one valued learning more about Microsoft Word and PowerPoint.

Andy, a student with LD, perceived that PBL helped him to improve his grades. He explained that part of the reason was that he felt more motivated in school due to having participated in the PBL unit and that the unit helped him to work better with other students. Observational data indicated that this student interacted more effectively with his classmates as the unit progressed and appeared engaged in the project. Overall it appears that both teachers and students perceived positive value in PBL.

#### *How Do Students Feel About Collaborating With Other Students in PBL?*

The students whom we interviewed believed that collaborating with other students, and especially with students from other classes, was useful in several regards. First, they enjoyed being able to interact with students who were from different classes because they did not normally get to do so. Four students stated that one of the things that they liked most about working with students from other classes on the PBL unit was that the other students were "nice." Carrie stated that one of the two things that she liked the most about PBL were the students from the other classes with whom she got to work. Theresa's (the MoCD/MD/SCD teacher) and Sarah's (the MiCD teacher) students also perceived that collaboration was helpful in that Charlene's (the LD/ED teacher) students were "good students" (Carrie's words), and that the latter really tried to help the former. Observational data indicated that the students with LD and those with ED often tried to help Theresa's students to behave appropriately and tried to work with them while performing Internet searches. The teachers also expressed this perception of the collaboration process.

#### *How Do Teachers Perceive That Their Students Collaborate With Students With Different Special Needs?*

Sarah (the MiCD teacher) and Theresa (the MoCD/MD/SCD teacher) noted that their students became friends with some of the students from the other classes because of the interactions during the unit, and they did not think that this would have happened without carrying out the activities of the accessibility unit. Though observational data

cannot verify the development of friendship, it did indicate that students from different classes were often excited to see each other.

Theresa noted that one of the reasons her students really enjoyed collaborating with Charlene's (the LD/ED teacher) and Sarah's students was because they usually did not get to do so:

Well, usually they are just by themselves in my room in a self-contained classroom, and during this [the PBL unit] they got to go out into another classroom and be with a lot of other students, and they enjoyed doing that. And, in years past, when they weren't doing a PBL unit they didn't have another class to work with.

Charlene and Sarah noted that their students showed caring and compassion for the students from the other classes. Sarah said:

There were some students who maybe felt like they were a little higher level students [sic], but they had the maturity to not flaunt that at the younger kids or the less able kids and saw it as a chance to be helpful and to encourage students who were maybe at a lower level than they were, or maybe were not as physically capable as they were. They saw it as a chance to be helpful to them, and I saw some maturity that I was very impressed with because I hadn't had the opportunity to see that in the regular classroom situations.

Overall, both teachers and students felt that the cooperation between students of different ages and ability levels was very helpful. Teachers perceived that the cooperation was helpful in that it helped foster affective development in their students. This was because the students had to practice interacting with diverse students and teachers and so had the opportunity to advance their social skills in that regard. Students enjoyed the collaboration because the other students were perceived to be nice to talk to and interact with and also were seen as helpful (in the case of Theresa's and Sarah's students).

#### *How Do Teachers Modify the PBL Approach To Make It Work in a Special Needs Classroom?*

Charlene (the LD/ED teacher) stated that one distinguishing factor in the PBL unit design was the amount of guidance students in all three classes needed. Noting that some students needed more guidance than most average students, she explained that the teachers structured PBL class sessions with direct instruction for the first part of the period and small-group work for the remainder:

It was pretty much a traditional class setting for this part [the first part of the period] where I would be in front of the classroom... they definitely had to watch me for instructions and listen to me, just again because some of the kids needed a lot more guidance than others.



Observational data indicated that the direct instruction portion of the class lasted, on average, 15–20 minutes during the unit; however, it was shorter on days when the small groups went into the community to collect data and take pictures and video. In general, the instruction focused on what the students were expected to do during their small-group work. Each week, the teacher leading the instruction first helped students recall what they had done the previous week (as the classes met for the unit once per week). Subsequently, she focused on procedures that the students would follow and provided an overview of the conceptual information that they would be encountering (e.g., curb ramp slope or Americans with Disabilities Act).

Charlene described how breaking the class sessions into different segments helped her students engage because “they were listening, they were doing, they were hands on, and it also allowed them to not have to focus on, ‘Man I’ve got to sit here, I know I can’t get up.’” The other teachers noted that the variety that the class structure offered in terms of small-group work, field trips in the community, and lecture appealed to their students as well. This was corroborated by comments from the majority of the students interviewed ( $n = 5$ ), who appreciated being able to go outside and do different things during the class period. Half of the students ( $n = 3$ ) also noted that they liked being able to do hands-on activities.

While working in small groups in the second part of the period, Charlene and Sarah perceived that their students became co-facilitators, which was noted by several students. Observational data indicated that Charlene’s students tried to keep the behavior of their classmates with lower ability under control and often took the lead during group work. Andy stated that the thing he liked most about PBL was “helping the kids that are in that class.” When asked to specify to which kids he referred, he said that he meant the students from the other two classes that participated in the unit (i.e., those with MiCD, MoCD, MD, and SCD). Sally saw the unit as “a good opportunity to help the other kids learn.” David stated that the students with MiCD sometimes got “out of hand a little bit.” Though he did not state this in the interview, observational data indicated that David attempted to keep his group mates’ behavior under control on several occasions.

### *Summary*

Both students and teachers perceived that the PBL unit on the accessibility of Brownsville was valuable for several reasons. Teachers perceived that PBL was of value to students in that it helped them meet a number of affective objectives. Specifically, all three teachers perceived that PBL helped their students to develop social skills. Charlene (the LD/ED teacher) noted that her students developed greater patience and understanding for others. Sarah (the MiCD teacher) and Theresa (the MoCD/MD/SCD teacher) indicated that their students all made individual improvements on social skills objectives on their IEPs. Sarah and Charlene noted that their students made gains in demon-

strating appropriate behavior. All teachers stated that their students were able to be more engaged and stay more on task during the unit. Sarah and Charlene noted that their students showed greater maturity during the unit than they usually did. The maturity included feeling compassion for those with more severe disabilities.

Students perceived that PBL was of value to them because it allowed them to stay more on task and be more engaged due to its interesting and fun nature. The students with MiCD and LD/ED perceived that the unit helped them to feel more patient with and more compassion for lower ability students. All students also appreciated being able to interact and make friends with students with whom they usually do not get to interact. The students with MiCD also liked PBL because they got to interact with "good students." Students also reported learning content such as definitions of physical accessibility and what properties doors, sidewalks, and other infrastructure need to have to be physically accessible. They also reported learning technical skills including digital video editing, working with digital pictures, and working with Microsoft PowerPoint and Word.

## Discussion

Results of our study suggest that PBL units involving students with varied disabilities have the potential to help students with special needs gain social skills, feel compassion for less able students, gain self-esteem, and stay engaged in their learning. Observational data indicated that the students in the present study were engaged during the unit, and both teachers and students perceived that students were more engaged than during traditional instruction. Many students in this study perceived that they were more engaged due to the fact that they were working cooperatively with other students, which confirms the findings of Adams et al. (1996). Another aspect of the unit that students perceived to be engaging was the fact that the topic of the unit was the community of Brownsville and how it could be improved for the benefit of everyone. Looking at the accessibility of Brownsville was a real-world problem to which the students could relate, which in turn seemed to help make the PBL unit meaningful to the students (Ellis, 1998; Lee & Songer, 2003).

These findings are interesting for several reasons. First, as we noted previously, there is little literature that examines how students with special needs respond to PBL. Our findings contribute to an understanding of how students with special needs value solving real problems in their community. Second, students and teachers in this study valued PBL because of many of its characteristics that have been shown to be helpful to students with special needs, namely, its authentic context (Scruggs et al., 1993), its experiential nature (Scruggs et al., 1993; Scruggs et al., 1998; Udvari-Solner & Thousand, 1996), and its use of cooperative learning (Barley et al., 2002; Gillies and Ashman, 2000; Jenkins et al., 2003; Malmgren, 1998). Third, and perhaps most importantly, our findings indicate that PBL has the potential to



work with students with special needs. Students in this unit were engaged due to the characteristics of PBL listed above, which suggests that students with special needs may be motivated by, and thus engage in, a PBL unit. If this is true, then PBL may have the potential to raise the achievement motivation and, subsequently, the achievement of students with special needs (Stipek, 2002). If this happens, then such students could potentially make the continuous and substantial improvement required by IDEA (2004) and NCLB (2001).

Additionally, many of the benefits that the students and teachers in this study perceived (e.g., improvement in patience, greater compassion for people who are less fortunate) were benefits that students attributed to working with students at a lower level than themselves. This finding is interesting because little literature explores what it means to students with special needs to work cooperatively with students with lower abilities. Osguthorpe and Scruggs (1986) reviewed the results of 26 empirical studies of students with special needs who served as tutors for students with more severe disabilities and/or younger students with special needs. The results of these studies generally indicated that the tutors gained academically and/or socially from serving as tutors.

Perhaps the benefits observed in this study, such as improvement in patience and greater compassion for people who are less fortunate, could be attributed to the dynamics of the interactions between students with mild disabilities and those with more severe disabilities. It was clear during the course of the study that the students with more severe disabilities tended to see the students with mild disabilities as tutors: the latter were perceived to be helpful to the former, and observation data confirmed that the interactions between students with mild disabilities and those with severe disabilities often took the form of the interactions between a tutor and a tutee. While these benefits may not be directly related to participating in a PBL unit, the fact that the unit involved students with various disabilities appeared critical. Still, this occurred within the context of solving a meaningful problem, specifically a problem with which these students could identify. It is possible that the content as well as the context for the PBL unit helped the students develop compassion for others with more critical needs than their own. This suggests a need for more research that examines the effects of allowing students with mild and moderate disabilities to work on academic units with students with severe disabilities. It also would be important to determine if the use of different PBL units had the same result.

Finally, our findings on how PBL was modified to make it work in a special-needs classroom are important in that even in the little literature that examines the use of PBL with students with special needs there is little indication of the strategies that teachers used to make PBL work with their students. Before beginning the study we did not expect that the teachers in the class we studied would break class periods into direct instruction and small group work segments. The PBL literature base does not advocate the use of direct instruction. However, its use in a class with special needs makes sense because students with special needs need additional kinds of support that average,

gifted, and university students—the students who served as participants for the majority of studies on PBL—do not.

### Limitations and Suggestions for Future Research

The interviews for this study were conducted one and a half months after the end of the unit. This delay between the activities of the unit and the interviews may have caused many of the participants, especially the students with MiCD and MD, to be unable to recall specific examples when asked to describe their interactions with other students and their activities during the unit. However, the fact that students with MD and MiCD remembered anything specific from a class that met one period per week ending one and a half months prior to being interviewed is noteworthy. Their teachers stated that normally they do not remember many details from week to week. However, the use of observations helped to triangulate our sources by allowing us to substantiate interview comments.

Future research should focus on the impact of PBL on the academic achievement of students with special needs. It is important to investigate whether PBL has a demonstrable impact on academic achievement of students with special needs. Frew and Klein (1982) suggested that in order for teachers to prepare students with special needs “for an independent life in our complex society, we must provide opportunities for them to expand their inquiry and discovery skills” (p. 100). In regular and gifted K–12 classrooms and in medical school contexts, PBL has been shown to help students not only learn content, but also to expand their inquiry and problem-solving skills (Stepien & Gallagher, 1993; Stepien & Pike, 1997). Thus PBL might be an instructional framework that can help prepare students with special needs for life in today’s complex society. Additional research with special education populations is needed to determine if this is so.

### Overall Importance of Study

This study was exploratory in nature and was not designed to determine definitively if PBL is an effective method of instruction for students with special needs. However, it provided some evidence that PBL can be beneficial to such students in the areas of motivation and social skills. Bryan (2005) and Cartledge (2005) wrote that affective outcomes for students with learning disabilities still receive little emphasis from teachers and schools. It is often assumed that inclusion will address the affective needs of students with mild disabilities; however, little empirical research exists to support that claim (Dyson, 2001; Gresham & MacMillan, 1997). Our finding of positive affective outcomes of a PBL unit involving students with varying disabilities suggests that PBL may offer one means for increasing affective outcomes among this population and warrants additional study (Cartledge, 2005; Gresham & MacMillan, 1997). Berninger (1997) wrote, “A final

myth that needs to be destroyed is that interventions directed to the behavior/mental health and academic domains are mutually exclusive" (p. 332). If PBL can be found to have a demonstrable effect on the academic performance of students with special needs, then perhaps ultimately Berninger's myth can be destroyed.

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