RUNNING HEAD: PBL and Special Needs

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

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 examined the perceptions of students with mild, moderate, and severe disabilities, and their teachers, regarding the value of participating in a PBL unit. All participants described specific impacts on students' affective development, including the expression of compassion for students with varying levels of disability.

Introduction

In order to help students meet 21st century challenges, the principal of Wright Middle School (WMS) required all teachers to involve their students in at least one Problem-Based Learning (PBL) unit in the 2004–2005 school year. Special education teachers at WMS (Note: all names are pseudonyms) worked together to facilitate a PBL unit for their learners with various special needs. For the purposes of this paper we define a "student with special needs" as a student 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 this study, we examined the experiences of students with special needs and their teachers at WMS 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 math achievement in order for a school to demonstrate adequate yearly progress towards the goal of 100% proficiency in reading and math 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 been shown to have a significant effect on the academic achievement of students with special needs (Hanushek, Kain, and Rivkin, 2002), many teachers and researchers within the special education community have called for new methods to help such students make even greater gains in academic achievement, and to ensure transfer of their learning to new contexts. For example, Ibler (1997), Pogrow (1988), and Rojewski and Schell (1994) have 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 Student with Special Needs Make Greater Improvement?

Many authors have proposed the use of PBL to increase gifted, average, and university students' inquiry and problem-solving skills (Hmelo-Silver, 2004; Gijbels, Dochy, Van den Bossche, & Siegers, 2005; Stepien & Gallagher, 1993). 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 inquiry and problem solving skills (Hmelo-Silver, 2004). By increasing students' inquiry and problem-solving skills, PBL could help prepare students for a world in which success is less dependent on simply

knowing content than on knowing how to discover and manage information (Hmelo-Silver, 2004).

There is little literature that examines the effects of PBL on students with special needs. Cerezo (2003) described a PBL unit that was used with students with LD and other at-risk students. The students 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 of the principles of PBL. For example, Ervin (2002) described a unit designed for vocational students with special needs, who examined the differences in how meatloaf 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.

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 (Hmelo-Silver, 2004). 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 et al. (2001) wrote, "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). Adams et al. (1996) also found that cooperative learning can increase the engagement of students with special needs.

Authentic context. PBL has the potential to appeal to students who have trouble learning things that are taken out of context. 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 of failing due to cognitive disabilities or for 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 also be similar to other problems with which the students are familiar.

Given that little is known about how students with special needs respond to PBL, this study was designed to answer the following research questions:

- 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? What are their teachers' perceptions of the collaboration?
- How do teachers modify the PBL approach to make it work in a special needs classroom?

Methods and Data Sources

Overview

We observed and interviewed both students and teachers who participated in a PBL unit. The participants included 19 students with special needs from three classes at Wright Middle School led by three different teachers who participated in a PBL unit on the accessibility of Brownsville, a small rural community in which WMS was located. The data sources included transcripts of interviews conducted with the three teachers and a maximum-variation sample of the students involved in the unit (n=6), field notes taken immediately following observations, and the final product that the students created.

Role of Researchers

The researchers included two faculty members and one graduate student in educational technology, all with specific interests and expertise in PBL methods. 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, enabling him to

engage in participant observations. He also conducted all interviews using an interview protocol developed by the researchers.

Setting and Participants

The context was a PBL unit on the accessibility of Brownsville. Three classes, serving students with varied cognitive and other 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?* Students and teachers went out 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. Then, later in the PBL class period, the students worked in small groups to complete research and writing activities. A total of five students with learning disabilities (LD), two students with emotional disabilities (ED), six students with mild cognitive disabilities (MiCD), two students with moderate cognitive disabilities (MoCD), three students with multiple disabilities (MD), one student with severe cognitive disabilities (SCD), and their teachers participated in the unit.

We submitted our research protocol to the university's Committee on Human Subjects and obtained approval. We used maximum-variation sampling (Patton, 2002) to select the interview sample for the study because we wanted to interview an equal number of students, with various disabilities, who appeared to 1) like the unit a lot or 2) were non-committal 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, who taught

students with LD and ED; Sarah, who taught students with MiCD; and Theresa, who taught students with MoCD, MD, and SCD.

Data Collection Methods

Instruments and data sources

Voluntary interviews conducted during the 7th to 10th weeks of the 3rd trimester constituted the first data source. The interviews were taped and transcribed, and member checks were used with the participating teachers. Field notes, written immediately following each PBL session, constituted the second data source and students' presentation about the accessibility of Brownsville was the third.

Data analysis methods

In order to answer our research questions, coding was used to analyze the interview transcripts. We developed a coding scheme to organize the data, and then to aid in counting frequencies of interview responses among teachers and students. Not all codes were valid for both student and teacher interviews.

The presentation and field notes from the observations were used to triangulate the interview data. The observations provided a check on what is 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 help illustrate what the students learned.

Results

How do students with special needs and their teachers perceive the value of PBL?

In general, students and teachers 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 teacher of students with learning and emotional disabilities, 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 that "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 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 traditionally exhibited among students in a special needs class.

Sarah, the teacher of students with mild cognitive disabilities (MiCD), 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 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 noted that one of the things that they liked best about the PBL unit was working with and learning more about computers. 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? What are teachers' perceptions of the collaboration?

The students that 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 and Sarah's students also perceived that collaboration was helpful in that Charlene's students were "good students" (Carrie's words), and that the latter really tried to help the former. Observational data indicated that Charlene's students often tried to help Theresa's students to behave appropriately, and also tried to work with them while performing Internet searches. The teachers also expressed this perception of the collaboration process.

Sarah and Theresa noted that their students became friends with some of the students from the other classes because of the interaction 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 that her students really enjoyed collaborating with Charlene's and Sarah's students was because they usually don't 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 through their collaboration with other students, 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 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, Charlene 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.

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.'"

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.

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 students develop in the areas of:

- Social skills – e. g., patience (all students)
- Behavior – e. g., lower incidence of inappropriate behavior (ED, LD, MiCD)
- Staying on task / being more engaged (all students)
- Maturity – e. g., feeling compassion for those less fortunate than oneself (ED, LD, MiCD)

Students perceived that PBL was of value to them because:

- Since it was interesting and "fun," it allowed them to stay more on task / be more engaged (all students)
- It helped them to feel more patient with and more compassion for lower ability students (MiCD, ED, and LD)
- In PBL, they got to interact and make friends with students with whom they usually don't get to interact (all students)
- In PBL they got to interact with "good students" (MiCD)

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 and 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 during the unit 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 can 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 our 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. That students in this unit were engaged due to

the characteristics of PBL listed above 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).

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 student 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 of 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. So 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 dynamic 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 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 that more research needs to examine 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, and students with special needs do need certain 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 noted 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 researchers should focus on the impact of PBL on the academic achievement of students with special needs. It is important that PBL be investigated as to whether it 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 not only help students learn content, but also to expand their inquiry and problem-solving skills (Hmelo-Silver, 2004; Gijbels, Dochy, Van den Bossche, & Siegers, 2005; Stepien & Gallagher, 1993). 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 Berninger’s myth can ultimately be destroyed.

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