Using Problem-Based Learning as a Tool for Learning to Teach Students with Special Needs

By: Barbara Levin, Katherine Hibbard, & Tracy Rock

Abstract:

This article describes how Problem-based learning (PBL) was used as a pedagogical tool to help prospective teachers (a) define various disabilities, (b) learn teaching strategies for inclusion settings, and (c) value collaboration with other professionals. Qualitative and quantitative data are reported about the influence of the PBL experience on 44 preservice teachers during a semester-long PBL experience. Our findings indicate that engagement in PBL can help prospective teachers begin to acquire the knowledge, skills, and attitudes needed to work with children with disabilities in a problem-solving atmosphere that models and emphasizes peer collaboration.

Article:

Teacher educators employ many forms of pedagogy in order to foster the knowledge, skills, and dispositions that prospective teachers need to be successful in diverse classrooms. Many of those methods focus on direct instruction but other forms of pedagogy can be used to engage learners more actively and to promote the application of knowledge gained to classroom practices. In our work with preservice general education undergraduates we felt the need to use methods that would help prospective teachers apply what they were learning in order to be better teachers of students with special needs. We also needed methods that would help teacher candidates who would not take a special education course develop important skills and positive attitudes for working with students with disabilities and for collaborating with other professionals to meet the needs of their students with disabilities.

Problem-based learning (PBL) is one instructional approach that encourages teachers to apply their developing knowledge base to real-world issues as they try to solve complex problems and dilemmas related to teaching and learning (Dean, 1999; Gerber, English & Singer, 1999; Levin, 2001; Pierce, 1999; Sage, 1999; Shumow, 1999). It is also a method that allows participants to practice needed skills, such as working in groups, collaborating, sharing information, and problem solving, as they apply information they gather to real-world, practical problems (Levin, 2001).

Defining Problem-Based Learning (PBL)

Problem-based learning is a pedagogical tool for organizing portions of the curriculum around ill-structured problems, which are found often in educational settings (Delisle, 1997; Jacobson & Spiro, 1995; Spiro & Jehng, 1990; Stepien, Gallagher & Workman, 1993). The problem to be solved must be a complex question, task, or issue that begs for resolution through inquiry. It must be a realistic problem and situated in a relevant context (Bransford & Vye, 1989; Delisle, 1997), especially if the knowledge gained is to be applied later. Resolution of the problem usually includes a range of alternatives that are ascertained through the application of new knowledge and reasoning, not simple formulas. The role of the instructor is that of a guide and facilitator, rather than as the source of knowledge or as an information-giver (Delisle, 1997; Stepien, Gallagher & Workman, 1993).

Somewhat like other instructional approaches (project-based learning, simulations, in-box activities, case methods, discovery learning), PBL poses dilemmas or presents problems that beg to be resolved, actively involves participants, occurs in large or small groups, and encourages discussion. Unlike other more didactic instructional methods, using participant-centered PBL requires learners to pose their own questions, research answers to these questions through reading and from human resources, share information with others engaged in the PBL unit, and prepare a final product or presentation to the group of learners that represents a resolution to the problem. Engagement in PBL always requires students to synthesize and construct knowledge in order to resolve problems (www.imsa.edu/team/cpbl/cpbl.htm). PBL may span from two to five class periods or be integrated into a semester-long course (DeLisle, 1997; Gerber et al., 1999; Levin, Hibbard & Rock, 1998).

PBL has been used and evaluated positively at medical schools in the United States and other countries for several decades (Barrows & Tamblyn, 1980; Nooman, Schmidt & Ezzat, 1990). The goal for using PBL in medical education is to help prospective physicians learn and remember needed clinical science content, develop and use appropriate problem-solving skills, and apply these effectively with patients (Barrows & Tamblyn, 1980). These are similar to goals that teacher educators have, albeit for different curriculum content, so we assumed that engagement in PBL should have similar benefits for prospective teachers as for prospective physicians: improved ability to effectively retain, retrieve, and apply knowledge they have acquired through course work and clinical practice. Therefore, it seemed that if PBL showed promise as a pedagogical tool to prepare other professionals, it was worth exploring in the preparation of teachers.

Problem-based learning is also used to educate school administrators (Bridges, 1992), health professionals (Barrows & Tamblyn, 1980), and professionals in such diverse fields as architecture, business, law, engineering, forestry, police science, and social work (Camp, 1996). Although it is not clear if the research on PBL in other professional programs applies to teacher education settings, we felt PBL offered an approach that would allow us to be thoughtful about and sensitive to our prospective general education teachers' developing attitudes as they learned ways to work with students with disabilities. We also hoped that engagement in PBL, as the focus of a semester-long seminar attached to weekly field experiences, would help our prospective regular elementary teachers learn more about inter-professional collaboration and provide multiple opportunities to practice the critical-thinking and problem-solving skills that they would need to be effective teachers for all their students. We also wanted to model the importance of peer collaboration and encourage teachers to learn on their own and from each other. Therefore, we developed a PBL unit to achieve the following objectives with our undergraduate, preservice, general education teachers:

- Learn about and define various exceptionalities that are found in public schools today.

- Know the general education teacher's responsibilities regarding modifications for exceptional children included in your classroom.

- Identify specific strategies for teaching and modifying the curriculum for children with exceptional needs.

- Appreciate the value of collaboration in working with special education teachers and other professionals in inclusion settings.

At the same time, we also wanted to examine our implementation of PBL and study the knowledge, skills, and attitudes our students were gaining as a result of their engagement with PBL. The overarching research question that guided this self-study of our students' learning from engaging in PBL was: How and what can general education preservice teachers learn about teaching students with special needs and teaching in inclusion classrooms from engaging in a PBL experience?

Defining Inclusion of Students with Special Needs
The class of students we focused on in the PBL unit used in this study reflects a very broad definition of exceptional children. The initiating problem is based on the actual experience of a recent graduate of our teacher

education program who teaches an inclusion class in a school in a nearby district that eliminated self-contained classes for students with disabilities. Their version of inclusion meant placing all children with moderate to severe disabilities from each grade level in one classroom so that support services can be concentrated in one room. The class size was kept relatively small and the general education teacher worked daily with the special education teacher, a teacher's assistant, and the personal assistants for particular children. Given this context, part of the PBL experience for our students involved developing an understanding of the debates surrounding the definitions and the very concept of inclusion as it practiced in various schools. The basic definition of inclusion we explored with our students centered on the concept of including all children with disabilities as members of general education classrooms.

Prospective general education teachers in this study also observed how services were provided to students in various inclusion classes in other districts and discovered a wide range of options, including some use of a pull-out model in some of the schools they observed. This variation in service-delivery models led to discussions of how services for students with special needs are provided, whether use of a pull-out model for some services maintained the spirit of inclusion, and linked to our exploration of how other professionals collaborate to work with exceptional children in different schools. Additionally, we explored the issues that arise when a school or family has concerns that a student's needs are not being met in the inclusion setting. These goals are all consistent with competencies identified for general educators to effectively include children with disabilities in general education classrooms (Adams, Quintaro, Killoran, Sebastian, & Frede, 1987).

Research Related to Attitudes about Inclusion

Research about teacher education and inclusion has focused on developing positive attitudes about including students with disabilities in the general education classroom. Knowledge about disabilities and experiences with children with disabilities have also been associated with positive changes in attitudes about including children with disabilities in general education classrooms (Leyser, Johansen, & Abrams, 1984). Support and assistance have been associated with positive changes in attitudes when combined with information and observation (Larrivee, 1981; Dileo & Malloy, 1990). Rademacher, Wilhelm, Hildreth, Bridges, and Cowart (1998) studied groups of general education preservice teachers who received their special education content in different configurations: university-based courses and field-based courses. They found positive attitude changes in students who participated in a two-semester, field-based program in a Professional Development School (PDS) setting. Methods classes were taught on-site at the PDS, students spent time daily in classrooms, and prepared a case study of a student with special needs. The special education content was taught across the two semesters to this group. Students in the university-based course, which included very limited opportunity for classroom-based observation, showed negative changes in their attitudes about including students with disabilities. More recently, Sprague and Pennell (2000) found increased positive beliefs about inclusion and increased feelings of skill in collaborative planning and teaching after a course in which preservice teachers observed in inclusive settings and received instruction about collaboration from a special education-general education teaching pair. In addition to positive changes in attitudes about inclusion, students also indicated increased confidence and ability to engage in co-teaching.

Research Related to Problem-Based Learning

There are very few empirical studies about the effectiveness of PBL as a learning tool in teacher education settings and the research base on PBL in undergraduate education is sparse (Thomas, 2000). The research there does provide evidence that PBL impacts motivation and self-directed learning, which are two characteristics important in teacher education. However, the research evidence with regard to knowledge retention and transfer is mixed. For example, while Shumow (1999) found that teacher education students in her educational psychology classes performed significantly better on objective and essay tests when the PBL unit came during the second half of the semester, Pyke and Porchet (1997) found that students in their educational psychology class enjoyed PBL but did not learn as much about motivational theory as the instructors believe that would in a more traditional class. Shumow (1999) also reported 84% of her students rated the PBL portion of the class as more motivating than the traditional, didactic method of learning. Based on open-ended written responses Shumow's students rated the individualized research they conducted as the most educational aspect of PBL and

indicated that engagement in PBL was valuable for their professional identity development as teachers. Pierce (1999) found that undergraduate educational psychology students who experienced PBL rated their professors as more learner-centered and Sage (1999) reported that engagement in PBL promoted a sense of community in the class and provided a good match for instructors and students who have a constructivist view of learning.

Research in medical schools that use PBL (Norman & Schmidt, 1992) and the findings from two meta-analyses (Albanese & Mitchell, 1993; Vernon & Blake, 1993) indicate that medical students demonstrate positive motivational characteristics including intrinsic motivation, self-regulation, and goal orientation to learning for understanding. In other studies set in medical colleges, PBL students were found to study for deeper understanding (Coles, 1985; Newble & Clark, 1986), retain information longer (Norman & Schmidt, 1992), and were more likely to apply scientific information appropriately (Allen, Duch & Groh, 1996).

In research conducted in secondary school settings, Gallager, Stepien & Rosenthal (1992) found that PBL students spent more time using library sources, applied more problem-definition and problem-identification strategies than students in traditional programs, and outperformed control students on the breadth of their understanding and the depth of warrants made about ethical issues related to the problem. In another study, Stepien, Gallager & Workman (1993) found that secondary students demonstrated equivalent or better content knowledge but did not engage in problem solving.

Methods
Participants
Forty-four preservice teachers from two cohort groups participated in this study during the second of four semesters in an undergraduate elementary education program. All participants were general education students in a Professional Development School (PDS) program at a medium-size state university in the southeastern United States. The majority of participants were white (87%), female (92%) second semester college juniors at the time of the study. PBL activities took place during several two-hour weekly seminar meetings connected to 10-hour per week internships in PDS classrooms in a large, consolidated school district. During this study the seminar time was devoted to learning about ways to include students with special needs in the general education classroom through PBL because none of these preservice teachers would take any special education courses during their teacher education program.

Data Sources
Our three major sources of data were (a) participants' written initial reaction papers, (b) their final decision papers, and (c) pre/ post scores on a modified version of a survey about inclusion beliefs (Bailey & Winton, 1987). Prior to beginning the PBL activities a 28-item survey of beliefs about inclusion was administered to all participants during a seminar session. This survey was based on the Bailey and Winton (1987) survey but we changed the items to focus on school-age children instead of pre-school children. The same survey was also administered during a seminar session at the end of the semester in which the PBL activities occurred. Pajares (1993) defines beliefs as the attitudes and values that preservice teachers bring to their teacher education about teaching (p. 46). We reasoned that if engagement in PBL experiences could engender more positive attitudes about working with students with disabilities, inclusion, and collaboration, then there might be an impact on beliefs. This survey uses a five-point Likert scale with response choices that range from strongly agree to strongly disagree. Scores range from 28 to 140 points with higher scores indicating more positive attitudes about including students with disabilities in the general education classroom. The reliability score for the administration of this instrument during this study was .926 based on using Chronbach's alpha and the factor analysis showed that most of the items loaded on one factor (beliefs about including children with disabilities in regular classroom settings) that accounted for 36% of the variance (Hibbard, 1998).

Implementing ''The Inclusion Classroom" PBL Unit
Initial Reactions
The problem used in this study, which we call *The Inclusion Classroom* (Levin, Hibbard & Rock, 1998), begins with a real-life scenario in which a third-year teacher is asked by her principal to take a newly formed inclusion

classroom for the upcoming year. The problem contains background information about each child and asks the preservice teachers currently in our program to decide whether or not they would accept this position. They are asked to respond to this scenario: "The principal of your school has asked you to consider teaching this inclusion classroom next year. What is your initial response to this scenario? What do you need to know to make an informed decision?" After reading a description of eleven typically developing and seven exceptional students who will be in the second grade inclusion class, participants were asked to (a) write their initial reactions to the principal's job offer, (b) include information about their feelings, concerns, and any other responses to the problem, and (c) identify what they need to know and learn in order to make an informed decision.

PBL Teaching/Learning Opportunities

Following initial discussions about PBL in general and the issues in this particular problem, participants worked on their own, in pairs, and in small groups to find answers to questions they identified in their initial reaction papers and during subsequent class discussions. Participants collaborated in small groups to define and learn more about two or three of the exceptionalities presented in the PBL unit: cerebral palsy, Down's syndrome, specific learning disabilities such as auditory processing problems and dyslexia, mild and moderate mental retardation, hearing impairments, and attention deficit disorder. Some students also elected to research American Sign Language and giftedness as part of the PBL activities. They researched and wrote descriptions and characteristics of the exceptionalities they studied, identified strategies that might be appropriate to use in the classroom, and suggested possible accommodations that teachers might make for students with particular disabilities. These findings were shared with their entire cohort during oral presentations and supplemented with handouts prepared by the preservice teachers.

Other activities participants engaged in during the semester included (a) interviewing and reporting to the class about school-based professionals and paraprofessionals with whom they might work in the inclusion classroom: physical therapists, occupational therapists, guidance counselors, Reading Recovery teachers, special education teachers, special education teaching assistants, and speech/language therapists; (b) either observing inclusion classrooms during their weekly field experiences, interning in an inclusion classroom, and/or visiting the actual classroom that prompted the PBL scenario; (c) visiting a local sheltered employment setting for adults who are visually impaired or blind in order to learn more about job opportunities for people with disabilities and to prompt discussion about the transition from school to work, and (d) engaging in many guided discussions about the various ways students with disabilities are served in the local public schools, implications of the new Individuals with Disabilities (IDEA) legislation, and other topics related to teaching children in general education and pull-out settings. In addition, participants in one cohort group had an opportunity to talk with adults with developmental disabilities about their living arrangements, educational opportunities, social and recreational activities, family involvement, and work.

Final Reaction Paper and Post-PBL Survey

At the end of the semester, participants were asked to revisit the problem and make a final decision about whether or not they would accept the principal's offer of this teaching position. They were again asked to write about their feelings, concerns, and any other responses to the problem. A week later all participants completed the same survey about beliefs about inclusion that they took before starting the PBL activities.

Data Analysis Procedures

Our analyses focused on determining the knowledge, skills, and attitudes our students gained as they moved through the PBL experiences and their perspectives on teaching exceptional students. We were particularly interested in seeing if their attitudes changed because the research literature about inclusion suggested that attitude changes are associated with the acquisition of a knowledge base, understanding of collaboration and support, and firsthand observations. We also wanted to determine what learning experiences during the PBL unit were most beneficial from the perspective of our students.

Based on these goals, the following data analysis procedures were applied to the qualitative data in the writings: First, we tallied participants' initial reactions to the original PBL problem to determine whether they would accept or decline the offer of this teaching position, or whether they were undecided. Second, in order to understand what contributed to their initial decisions, we conducted a content analysis of issues they raised in their initial reaction papers using the method of constant comparative analysis (Strauss & Corbin, 1990). That is, two of the researchers independently recorded all concerns offered by the participants as reasons for their decisions, clustered and labeled these reasons into categories, and resolved any differences in the categories in consultation with the first author and by further examination of specific quotes from these data. Third, we examined their final decisions papers and tallied their decisions using the same procedures. Fourth, we analyzed and categorized all reasons articulated in their final decision papers for accepting or declining the principal's offer of this teaching position. Finally, we analyzed and summarized specific PBL activities and issues that participants indicated in their writing that had influenced their final decisions.

For the quantitative data from the beliefs about inclusion survey we calculated descriptive statistics for each cohort (pretest, posttest, and change score ranges, and standard deviations). T-tests were used to examine changes within groups and differences between groups.

Findings and Discussion
Comparing Initial Reactions and Final Decisions
In their initial reaction papers, preservice teachers were asked to write about their first decision regarding the principal's offer to teach an inclusion class the next year. Nineteen of the 44 preservice teachers in this study stated that they would accept the position, 15 declined, and 10 were undecided. In tallying their final decisions at the end of the PBL unit, 32 preservice teachers said they would accept the offer of this teaching position, 11 would decline, and only one person remained undecided. These responses indicated a net change of +13 preservice teachers who would respond positively to the offer to teach this inclusion class at the end of the PBL unit. However, 11 participants still declined, which yielded a net change of —4 from the original 15 who declined at the start of the PBL unit. Of ten participants who were undecided initially, three stated they would decline the offer in their final decision and six decided they would accept. No one who initially accepted the offer changed their position in their final decision, and only one person was still undecided at the end of the PBL unit. Of those preservice teachers who initially declined the principal's offer, seven said they would accept in their final decision.

Reasons for ''Declining'' Based on Initial Reaction Papers
Participants who initially declined the offer, or were undecided, identified several reasons for their initial negative response to the PBL scenario. Half of these reasons centered on preservice teachers' (a) lack of knowledge, and their (b) lack of teaching experience. Other issues cited by several participants included (c) concerns about their inability to meet students' needs, (d) their own personality mismatch for this kind of job, (e) beliefs and questions about the validity of the practice of inclusion, (f) concerns about having enough professional help, and (g) a lack of contact or familiarity with people with disabilities. An example of the thinking of participants' who declined the offer to take this teaching position can be seen in the initial reaction of this participant:

> There was no way I was going to work in a class with so many problems, so many obstacles, and so many headaches. My main fear is really caused by ignorance. I've not had much exposure to children with disabilities. Sure, I have seen them on TV and occasionally walking down the street, but they were never in my school; at least, not where I could see them (JW, initial reaction paper, 2/2/98).

Reasons for ''Accepting'' Based on Initial Reaction Papers
Participants who were initially favorable toward teaching this inclusion class indicated several reasons for their positive response to the problem including (a) confidence that there would be enough support personnel available and (b) a belief that they could gain the knowledge they needed to work successfully in an inclusion setting. Other issues that influenced them to take a positive stance about this teaching position included (c) de-

siring the challenge of this opportunity and (d) feeling good that the principal had confidence that they could do the job well. Several others also cited (e) their own personal experiences with people with disabilities or in inclusion settings, (f) the importance of gaining experience in teaching students with disabilities, and ironically, (g) their fear of failure. A representative example of the thinking of those who declined in their initial response can be seen in this participant's writing:

> My initial reaction is to take the class. I know it will be challenging, but I believe that I am up for it. I also know that it will be hard, but in the end it will be worth it for the children, as well as myself. (FL, Initial Reaction paper, 1/23/98)

Reasons for Being ''Undecided'' Based on Initial Reaction Papers

In their initial reaction papers, some undecided participants cited reasons for possibly accepting the position including (a) finding the smaller class size to be a benefit, (b) seeing the challenge of the situation as positive, and (c) feeling that the principal's confidence in them was a factor to be considered. Other preservice teachers who were undecided were concerned about their (d) lack of knowledge and ability to meet students' needs, which they saw as potential reasons for declining the offer. An example of the thinking of participants who were originally undecided can be seen in this preservice teacher's initial response to the PBL scenario:

> I have no idea how to organize or manage a classroom with such diversity in order to meet students' needs. I will have to gain a lot of knowledge before I would feel capable of such an endeavor (CM, initial reaction paper, 2/2/98).

Following several activities related to the PBL unit, including research on specific disabilities, observations in inclusion classrooms, group reports, guest speakers, field-trips, and personal time for reflection on the problem scenario, all participants were asked to prepare a final response to the original problem at the end of the semester. Once again, they were asked to write about whether or not they would accept the principal's offer of this teaching position and to give their reasons. In the next section we provide representative examples of reasons participants' gave for accepting or declining the principal's offer as expressed in their final decision papers. This is followed by the results of the beliefs about inclusion survey and discussion of the PBL activities that participants' reported as influencing their decisions, which allowed us to determine which activities participants felt contributed to their learning during the PBL unit.

Reasons for "Declining" Based on Final Decision Papers

At the end of the PBL unit eleven pre-service teachers who declined the principal's offer cited (a) lack of knowledge, experience and/or training as their primary reason for declining the principal's offer to teach the inclusion class. This preservice teacher's final response captured the sentiments of this group:

> I'm sure that in time I will feel more prepared and competent enough to take on a challenge of this nature. This saddens me and makes me feel as if I'm letting down the students and principal to admit my shortcomings in this area. The alternative of accepting the position and being willing, but not ready or able, would be a greater let down to them. (KR, final decision paper, 5/1/98).

Five participants also cited (b) their lack of patience or lack of passion for teaching students with special needs. Four preservice teachers cited (c) personal concerns about inclusion as an effective way to meet the needs of students with disabilities, and (d) their own readiness and inability to meet students' needs. Three participants also expressed concerns about (e) the workload, including the amount of paperwork that an inclusion classroom requires. This kind of thinking from the participants who would decline the offer to teach this class is reflected in this statement:

> I feel that 18 children are too many in an inclusion class of this nature. I feel that an inclusion classroom should be lower than 18 in order for me to fully meet each student's needs (HJ, final decision paper, 5/8/98).

Reasons for ''Accepting'' Based on Final Decision Papers

At the end of the PBL experience, 32 of the original 44 participants said they would accept the principal's offer of a teaching position in an inclusion classroom. Of those, 15 cited (a) the availability of support personnel as an important factor that contributed to their decision. Four additional reasons were each discussed by nine participants including (b) the challenge of this opportunity, (c) their increased knowledge about teaching students with disabilities, (d) personal experiences in inclusion classrooms, and (e) the potential personal rewards of teaching students with disabilities in an inclusion setting. Eight participants talked about (f) being able to recognize strengths of children with disabilities, which made them more willing to accept the offer. They also recognized (g) the contributions each child could make to the classroom community in this way:

> The main reason I would take this classroom is because I know that I will have good helpers all around me—the children. Children have the capability of being compassionate, sensitive, and patient. We should give them more credit. We can all learn and grow together (FL, final decision paper, 5/98).

Seven preservice teachers saw the classroom as (h) an opportunity for more learning and training in this area, and (i) the love of children inspired six participants to accept the position. Finally, the (j) sense of esteem associated with being chosen by the principal contributed to two preservice teachers' decision, while two other participants saw the (k) opportunity as a vehicle for creating positive changes in their school.

TABLE 1. Pre and Posttest Scores on Beliefs about Inclusion Survey

	Cohort #1	Cohort #2
Pretest Scores	M = 100.67	M = 93.41
	SD = 17.83	SD = 13.22
	N = 21	N = 17
Posttest Scores	M = 108.11	M = 108.20
	SD = 14.52	SD = 12.23
	N = 18	N = 15

Reasons for "Undecided" Based on Final Decision Papers

Among all participants only one remained undecided at the end of the PBL unit. Her concerns centered on (a) differences in how inclusion was implemented at various schools, (b) the large number of children with disabilities in this class, and (c) her inability to meet all their needs. She had seen other inclusion models, with fewer children with disabilities in each classroom and felt she could manage that type of inclusion setting, but not the one described in the PBL unit, even though class in the original PBL scenario was based on a real inclusion classroom in a nearby school district.

Survey Results

To examine possible changes in our pre-service teachers' beliefs about including students with disabilities in general education classrooms, we administered a pre- and post-survey about inclusion beliefs based on the work of Bailey and Winton (1987).

The pre-test means for the two cohort groups (93.41 and 100.67) were not statistically different, although both groups had relatively positive beliefs about inclusion at the onset given that the possible range of scores on the survey was 28–140. The posttest means for the two groups were essentially identical (108.20 and 108.11). T-tests to determine changes in mean scores from the pretest to the posttest were significant at the .05 level for both groups, indicating movement toward slightly more positive beliefs about inclusion at the end of the PBL activities for both cohort groups.

PBL Activities Valued by Participants

We were also interested in what aspects of the PBL unit might have influenced participants in their thinking about their final decision. Therefore, we re-analyzed their final decision papers to see what activities were cited as contributing to conclusions they made about the PBL scenario. Based on this analysis two major factors emerged: (a) multiple opportunities to engage in research to learn about various disabilities represented in the PBL unit, and (b) observations that participants made in actual inclusion classrooms. For 29 out of 44

participants, conducting and sharing research about the exceptionalities of the children in the inclusion classroom in the PBL scenario was cited as an important learning activity. In addition, the (c) identification and sharing of strategies, modifications, and instructional adaptations needed to meet the needs of specific exceptionalities, which they learned while researching various disabilities, provided participants with much-needed knowledge and fostered confidence in many participants. The following comment is representative of this sentiment:

> No two children are alike and therefore the same strategy might not work for every child, but the strategies that I learned through my research and from my peers would give me a jumping off point in beginning to work with these children (SF, final decision paper, 5/8/98).

Twenty-four of 44 participants also cited (d) opportunities to observe or complete internships in inclusion classrooms during the semester as an important factor in their decision making process. An additional seven participants stressed that (e) being able to talk with an inclusion teacher made a big impact on their decision beyond just observing. For example, one participant who declined the offer at the beginning of the semester wrote in her final decision:

> All of my thoughts began to change when I had the chance to see this working first hand and from being able to hear the inclusion teacher talk. The research did help because it gave me information that before I did not have, but the true help was the actual experience of seeing the class (KH, final decision paper, 5/8/98).

Six participants also indicated that (f) interviewing other professionals in their PDS sites was helpful in making their decisions. As one participant wrote:

> I have a better understanding now of who the support people are in the school, and of what their role might be in an inclusion setting (SF, final decision paper, 5-8-98).

In fact, many preservice teachers participating in the PBL unit began to perceive the role of an inclusion teacher as a member of a team, rather than as an isolated teacher trying to make the class work on her own, and many participants expressed that cooperation and collaboration is the only way they could see themselves being successful in an inclusion setting. Other activities that our preservice teachers cited as impacting their decision-making process included (g) listening to guest speakers, (h) undertaking their own self-selected extension activities, and (i) reading *The Acorn People* (Jones, 1996), which is a true story about students with multiple disabilities set in a summer camp environment.

Implications of this Study

Although we were gratified that participation in PBL seemed to enhance the knowledge base and attitudes of our preservice teachers about working with students with disabilities in inclusion settings, we realize that other factors may have also contributed to these changes. While we believe that PBL provides a catalyst for motivating and engaging prospective teachers in learning, problem solving, critical thinking, collaboration, and decision-making, we did not directly assess all of these outcomes in this study. We also understand the limitations inherent in any conclusions we may draw from this study. For example, we are concerned about novelty effects because this was the first time we our students had experienced PBL in their teacher preparation curriculum. Although participants were all very positive about the PBL, some of their enthusiasm may have been appreciation for the participant-centered, active learning environment that the PBL provided. However, because we typically teach our methods courses and weekly seminars using other active instructional methods, including case discussions, fieldtrips, student presentations, and class discussions about their field experiences, we don't think PBL was too different from other learning experiences we provide. We also realize that all of our data is based on self-reports from participants who may have been trying to "please" us by indicating what they thought we wanted to hear or what they perceived as politically correct. And, although the survey about inclusion beliefs was anonymous and we did not analyze any of these data until the semester was over, we did ask

for their initials on the first and final papers so that we could tally their decisions and any changes in their thinking from the beginning to the end of the PBL unit. However, because much of the PBL work was not graded, and because our students write reflective papers regularly during the semester, we hope that their writing about the problem scenario was representative of their actual beliefs.

Finally, we were concerned about the influence of two cohort leaders who led the participants in this study. One instructor has a lot of expertise and experience working with student with disabilities in inclusion settings. The other instructor was a general education classroom teacher with much less experience with students with disabilities. Fortunately, the survey data from these same 44 preservice teachers indicated that both cohort groups began this study with similar attitudes about inclusion and both groups displayed positive attitudes and corresponding knowledge at the end of the PBL unit (Hibbard, 1998). Therefore, in this study, instructor effects may not be the problem we anticipated that they might be.

In the future we would like to develop other means of assessing our preservice teachers' knowledge, skills, and attitudes about working with students with special needs in inclusion settings. Although we saw definite changes in our students' knowledge and attitudes and believe that we can identify sources of these changes in the activities engaged in during this PBL experience, we do not know if they are permanent changes or only temporary. Furthermore, we really could not assess our students' skill level in working with students with disabilities, or in inter-professional collaboration, because of their limited opportunities to display their skills. Certainly, longitudinal studies about the impact of this PBL experience would be valuable, including observations and interviews with our students during their remaining semesters in our teacher education program. Trying to determine how accurate pre-service teachers are at self-assessing their ability to teach in inclusion settings would also be interesting to address in a future study because we are not sure whether acceptors or rejecters, in their initial and final responses to the problem, indicates good or poor self-assessment of their ability to work with students with special needs. Following preservice teachers into their teaching careers to track their attitudes and skills with regard to teaching exceptional students would be one way to address this issue.

Summary and Conclusions

Our goal was not to have all preservice teachers decide to accept the position as the inclusion teacher as presented in the PBL scenario, but to have them actively engage in a real-world, problem solving situation, which required them to seek out and gain knowledge about specific disabilities, inclusion settings, collaboration with other professionals, and their responsibilities as general education teachers. In this study we found that engaging preservice teachers in PBL allowed us to accomplish many of our teacher education curriculum objectives in an active, engaging manner. Preservice teachers in this study selected specific disabilities that they wanted to learn more about and were able to define various exceptionalities presented in the PBL scenario. They added to their knowledge base by conducting their own research, and through peer interactions and discussion, rather than through didactic means. They located information and used a number of resources including textbooks, the Internet, and professionals in schools to assist them in learning about various exceptionalities. In addition, this PBL unit required our preservice teachers to identify specific strategies for teaching curriculum content to children with exceptional needs. And, through dialogue with teachers of exceptional children and other professionals they learned the importance of collaboration and teamwork needed when taking on the challenge of becoming an inclusion teacher. Engaging in these PBL-related activities helped to build their knowledge base and influence their attitudes about teaching exceptional children in inclusion settings.

One of the most important outcomes of this PBL activity was that preservice teachers came away with a much better understanding and appreciation for inclusion settings regardless of whether or not they decided to accept or decline the initial offer of this teaching position. In fact, one participant's words capture the concerns and conclusions that many participants in this study also expressed during the semester:

In the beginning of the semester, I questioned whether or not an inclusion classroom is a very good setting. I worried that the "regular" learners might not receive enough special attention because of the "special needs" learners. I thought the "special needs" learners would not receive enough special attention from the teachers. I also felt that the "special needs" learners might hold back the progress of the "regular" learners. I now know that education in an inclusion classroom is very important to the social growth of these children. I witnessed, firsthand, children of all backgrounds getting along and accepting each other. There were no boundaries. The teacher treated all the children as equals. I now realize how important it is to allow these children to be intertwined together. It prepares them for the real world. The "regular" learners will walk away from this experience with a broader knowledge of people. They will be more accepting of others no matter what their background, race, or disability. The "special needs" learners will walk away with the knowledge that they are just as capable as other students. They will confident in the fact they are human just like the rest of us. In an inclusion class, everyone (white, brown, red, disabled, handicapped) is known as simply a child! (SC, final paper, 5/8/98).

In conclusion, our findings indicate that engagement in PBL can help prospective teachers acquire new knowledge and positive attitudes about inclusion and students with disabilities while they gain experience with critical thinking in a problem-solving atmosphere of peer collaboration.

References

Adams, P., Quintaro, M., Killoran, J., Sebastian, S., & Frede, E. (1987). *A review and synthesis of teacher competencies necessary for effective mainstreaming.* Final Report. Washington, DC: U.S. Department of Education.

Albanese, M.A., & Mitchell, S. (1993). Problem-based learning: A review of the literature on its outcomes and implementation issues. *Academic Medicine, 68,*52–81.

Allen, D.E., Duch, B.J., & Groh, S.E. (1996). The power of problem-based learning in teaching introductory science courses. *New Directions for Teaching and Learning, 68,* 43–52.

Bailey, D., & Winton, P. (1987). *Benefits and drawbacks of early childhood inclusion.* Chapel Hill, NC: Frank Porter Graham Child Development Center.

Barrows, H.S. & Tamblyn, R.M. (Eds.). (1980). *Problem-based learning: An approach to medical education.* New York: Springer.

Bransford, J. D., & Vye, N.J. (1989). A perspective on cognitive research and its implications for instruction. In L.B. Resnick and L.E. Klopfer (Eds.). *Toward the thinking curriculum: Current cognitive research.* (pp. 173–205). Reston, VA: Association for Curriculum and Supervision.

Bridges, E.M., with P. Halinger. (1992). *Problem-based learning for administrators.* University of Oregon: ERIC Clearinghouse on Educational Management.

Camp, G. (1996). Problem-based learning: A paradigm shift or a passing fad? *Medical Education Online, 1: 2.* Available: MEO@utmb.edu.

Coles, C.R. (1985). Differences between conventional and problem-based curricula in their students' approaches to studying. *Medical Education, 19,* 308–309.

Dean, C. (1999). *Problem-based learning in teacher education.* Paper presented at the annual meeting of the American Educational Association, Montreal, Canada.

Delisle, R. (1997). *How to use problem-based learning in the classroom.* Alexandria, VA: Association for Supervision and Curriculum Development.

Dileo, J., & Meloy, F. (1990). Project Mainstream: Improving teacher attitudes. *Teaching Exceptional Children, 23,* 56–57.

Gallagher, S., Stepien, W., & Rosenthal, H. (1992). The effects of problem-based learning on problem solving. *Gifted Child Quarterly, 36,* 195–200.

Gerber, M.M., English, J., & Singer, G.S. (1999). Bridging craft and academic knowledge: A computer supported problem-based learning model for professional preparation in special education. *Teacher Education and Special Education, 22,* 100–113.

Hibbard, K.L. (1998). *Preservice teachers' beliefs about including children with special needs in the general education classroom: Can change happen?* Unpublished manuscript. University of North Carolina at Greensboro.

Jacobson, M.J., & Spiro, R.J. (1995). Hypertext learning environments, cognitive flexibility, and the transfer of complex knowledge: An empirical investigation. *Journal of Educational Computing Research, 12,* 301–333.

Jones, R. (1996). *The Acorn People.* New York: Bantum/Doubleday.

Larrivee, B. (1981). Effect of inservice training intensity on teachers' attitudes toward mainstreaming. *Exceptional Children, 48,* 34–39.

Levin, B.B. (2001). Energizing teacher-education and professional development with problem-based learning. Alexandria, VA: ASCD.

Levin, B.B., Hibbard, K.L., & Rock, T.T. (1998). *Exploring problem-based learning with undergraduate preservice teachers: A vehicle for instruction about inclusion.* Paper presented at the annual meeting of the American Association of Teaching and Curriculum, Orlando, FL, October, 1998.

Leyser, Y., Johansen, J.H., & Abrams, P.D. (1984). Training for mainstreaming: An evaluation of attitudinal changes. *Teacher Education Quarterly, 11,* 64–71.

Newble, D.I., & Clark, R.M. (1986). The approaches to learning of students in a traditional and in an innovative problem-based medical school. *Medical Education, 20,* 267–273.

Nooman, Z.M., Schmidt, H.G., & Ezzat, E.S. (Eds.). (1990). *Innovation in medical education: An evaluation of its present status.* New York: Springer.

Norman, G.R., & Schmidt, H.G. (1992). The psychological basis of problem-based learning: A review of the evidence. *Academic Medicine, 67,* 557–65.

Pajares, F. (1993). Preservice teachers' beliefs: A focus for teacher education. *Action in Teacher Education, 15,*45–54.

Pierce, J.W. (1999). *Problem-based learning: A learner-centered tool for higher education.* Paper presented at the annual meeting of the American Educational Association, Montreal, Canada.

Pyke, S., & Pourchet, T. (1997). *Development and assessment of a problem-based learning curriculum for the teaching of educational psychology.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Rademacher, J.A., Wilhelm, R.W., Hildreth, B.L., Bridges, D.L., & Cowart, M.F. (1998). A study of pre-service teachers' attitudes toward inclusion. *The Educational Forum, 62,* 154–163.

Sage, S. (1999). *What does a mobile home park have to do with it anyway? Using problem-based learning to teach problem-based learning in graduate teacher education.* Paper presented at the annual meeting of the American Educational Association, Montreal, Canada.

Shumow, L. 1999). *Problem-based learning in undergraduate Educational Psychology: Contributor to student learning and motivations?* Paper presented at the annual meeting of the American Educational Association, Montreal, Canada.

Spiro, R.J., & Jehng, J. (1990). Cognitive flexibility and hypertext: Theory and technology for the nonlinear and multidimensional transversal of complex subject matter. In D. Nix & R. Spiro (Eds.). *Advances in computer-video technology.* (pp. 163–205). Hillsdale, NJ: Lawrence Erlbaum.

Sprague, M.M. & Pennell, D.P. (2000). The power of partners: Preparing preservice teachers for inclusion. *The Clearing House, 73,* 168–170.

Stepien, W.J., Gallagher, S.A., & Workman, D. (1993). Problem-based learning for traditional interdisciplinary classrooms. *Journal for the Education of the Gifted, 16,* 338–357.

Strauss, A. & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques.* Newbury Park, CA: Sage.

Thomas, J. (2000). *A review of research on project-based learning.* [On-line]. Available at http://www. autodesk.com/foundations. [8/1/00].

Vernon, D.T.A., & Blake, R.L. (1993). Does problem-based learning work? A meta-analysis of evaluative research. *Academic Medicine, 68,* 550–563.