USING PROBLEM-BASED LEARNING IN AN INNOVATIVE TEACHER EDUCATION PROGRAM

by

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B.G.S., SIMON FRASER UNIVERSITY, 1990
M.A., UNIVERSITY OF BRITISH COLUMBIA, 1995

A THESIS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
in
THE FACULTY OF GRADUATE STUDIES
(Department of Educational and Counseling Psychology, and Special Education)

We accept this thesis as conforming to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

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ABSTRACT

The purpose of the present study was to examine the effects of participation in a Problem-based learning (PBL) teacher education program at the University of British Columbia. The PBL teacher education program included changes to the program of studies and changes to the practica experiences.

First, this study examined changes in the PBL teacher education students’ feelings of teacher efficacy, feelings of teacher preparedness, and learning styles and strategies. The PBL students showed significant increases in their feelings of personal teaching efficacy and feelings of teacher preparedness.

In order to better understand the changes over time in the PBL teacher education students the present study also compared the opinions and attitudes towards inclusion of students with special needs, feelings of satisfaction with their programs, feelings of preparedness, and ratings of self-directed learning using both Likert-scale and short answer responses of the same PBL students to 40 non-PBL teacher education students. The results indicated that proportionally more PBL than non-PBL teacher education students had increased concerns about inclusion of children with special needs. As well, proportionally more PBL than non-PBL teacher education students felt the time that they had spent in the classroom had the greatest influence on changes in their opinions. The results revealed that proportionally fewer PBL than non-PBL teacher education students felt well prepared. Participation in a PBL curriculum was not found to have an effect on students' feelings of satisfaction with their program or ratings of self-directed learning.

To further examine the effects of a PBL curriculum in teacher education, the present study also examined the perceptions of university and school-based personnel who were involved with PBL. The results from this investigation revealed that the majority of the groups
involved agreed that a PBL curriculum does have an effect on reasoning, interest, enthusiasm, and satisfaction of faculty and teacher education students. The majority of participant groups also were of the opinion that PBL and non-PBL curriculums provided equal knowledge of basic skills and principles, and professional preparation to the students. Implications of the findings are discussed.
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CHAPTER 1
Introduction

Background to Problem-based Learning

As one watches beginning teachers interact in a classroom or with parents and other professionals, the range of their skills and abilities is remarkable. In the classroom, some beginning teachers create a learning community that fosters a positive learning environment where instruction is designed to meet the needs of all students. These teachers appear to have strong content and pedagogical knowledge. They are able to meet the needs of individual students, establish positive relations with other colleagues and other professionals, and communicate clearly with parents and caregivers (Evans & Tribble, 1986). Other beginning teachers struggle to become effective teachers. How do some beginning teachers attain the skills that allow them to develop into exceptional teachers? This question underlies much of the research in the area of teacher preparation education programs and is the impetus for the present study.

In response to the public concern about the adequacy of public education, the mid-to-late-1980s saw a number of investigations aimed at evaluating teacher preparation education programs (Berliner, 1984; Carnegie Forum on Education, 1986; National Commission on Excellence in Education, 1983). Based on the findings of these investigations, many teacher education programs began to redesign their programs and include innovative alternatives to traditional curricular and instructional practices (Elksnin, 1998; Housego, 1994). The intent of these changes was to provide teacher education students with alternative theories and strategies of teaching to the theories and strategies the teacher education students learned during their "apprenticeship of observation" (Lortie, 1975) as grade school and university students.
Calderhead and Robson (1991) reported that teacher education programs do not have a significant impact on changing the attitudes and opinions of students from those they held when they began their programs. Bird, Anderson, Sullivan, and Swidler (1993) reported similar findings. A number of hypotheses have been posited to explain this lack of change. First, Joram and Gabriele (1998) and Richardson (1996) argued that teacher education students are unable to apply the theory to practice because traditional teacher education courses do not provide a bridge between two powerful forces, the prior personal experiences of students and their practica experiences. Second, Kagan (1992) has suggested that traditional teacher education programs are not able to create a bridge between previously held beliefs and pedagogy for two reasons: a) traditional methods of course delivery (i.e., lectures) do not result in changes in teacher education students' beliefs, and b) teacher education students do not find their course work relevant. Although many teacher education programs employ student-centered approaches (e.g., collaborative learning activities) they do not primarily rely on an integrated contextualized curriculum through which knowledge is created and made meaningful by the context and activities through which it is acquired. Therefore, students are unable to build the bridge between personal experiences and the pedagogy taught at university. For example, while many courses in teacher education programs include student-centered activities (e.g., cooperative learning activities, group projects), teacher education courses are often offered as isolated blocks of information that are not integrated across courses or into the students' practicum experiences in the schools. As Richardson (1996) explained, "Preservice courses tend to focus on formal knowledge where it is classroom experience that allows teachers to develop practical knowledge." (p. IX). Dixon (1999) suggested that this type of fragmented curriculum is analogous to the 1960s assembly line method of producing cars where each person was responsible for an individual component of the car being produced but no one took responsibility for
the whole car. The courses offered may be practical and well structured; however they remain fragmented into subject areas and often do not represent the complexity of issues regularly faced by teachers in a classroom.

One alternative approach for teaching education students is Problem-based Learning (PBL). PBL is an innovative educational strategy that weaves problem solving and critical thinking into content knowledge through the use of real life-like problems and situations. Thus, the role of educators is to facilitate the process of learning by assisting students in constructing meaning by providing authentic experiences that allow them to actively confirm or disconfirm their previous knowledge. The process of learning is seen as each individual student's discovery of new relationships, concepts, and understandings and these cannot be measured using traditional assessment tools. Although PBL may represent a shift in paradigm, it has conceptual roots going back to the late 1800s. For example, turn of the century educator John Dewey (1897) suggested that learning in school should be a response to real life events when he stated:

I believe that school must represent present life - life as real and vital to the child as that which he carries on in the home, in the neighbourhood, or in the playground.... I believe that it should exhibit these activities to the child, and reproduce them in such ways that the child will gradually learn the meaning of them, and be capable of playing his own part in relation to them. (p. 78)

In 1968, McMaster University instituted a program of medical education that incorporated a curriculum that used complex, interdisciplinary, integrated real life-like problems. The foundation of PBL is the tutorial group, where small groups of students meet on a regular basis to discuss and analyze a problem.

All of this is an introduction to the argument that PBL theory represents a description of the way in which education students can be taught pedagogical concepts.
It is argued here that PBL can assist student teachers in: a) modifying their existing beliefs and cognitions about learning and teaching, and b) incorporating the theory learned in university to the practice of teaching. The intent of this study is to determine if a PBL program in teacher education has the potential to assist students in developing these skills.

In order to provide a basic theoretical background on the constructivist perspective of PBL, this chapter will begin with a presentation of the learning theories of four influential researchers, Dewey, Piaget, Vygotsky, and Bruner. This will be followed by a discussion of the etiology of Problem-based Learning. Also included is a description of the Problem-based Learning program that was created in the teacher education program at the University of British Columbia.

**Theoretical Framework**

Schmidt (1993) maintained there is an essential distinction within the philosophical approaches to learning instruction. One approach describes learning as a constructive process. The basic assumption is that a learner actively constructs and transforms his or her own world. External forces (i.e., life experiences) influence learning, but the meaning of these experiences is determined by the learner. Maimonides (n.d./1902), a late 18th century Spanish-Jewish philosopher, was a proponent of this point of view. In his view, the true perfection of human beings was intellectual knowledge acquired through self-directed inquiry and research. In more recent times, the roots of modern cognitive educational psychology can be traced to Dewey (1910).

**Dewey's Theory**

Dewey (1897) published "Pedagogical Creed" wherein he argued that educators need to appreciate that the active precedes the passive side of a child's nature, and that
educators must provide both direct experience and social activities for children. Dewey (1910) expanded the concept of the importance of social activities when he stressed that learning must be in response to, and in interaction with, real-life events. Dewey (1910) echoed Maimonides (n.d./1902) when he suggested that learners must actively engage in knowledge acquisition. Bruner (1968) suggested that Dewey's philosophy of education reflected important changes in the conceptions of children but has "no experimental support" (p. 115). In the 1930s, Piaget and Vygotsky began to provide some support for the hypothesis that children learn by active engagement with their environment.

Piaget's Theory

Central to Piaget's theory of cognition is the active role of the individual in constructing his or her own cognitive world. That is, an individual's understanding of his or her world is dependent on his or her interaction with that world and is not entirely dependent on reinforcement or socialization. Moreover, according to Piaget, cognitive growth is based on adaptation. Specifically, adaptation is composed of two processes: a) assimilation, and b) accommodation. Assimilation takes place when an individual relates and modifies new experiences into his or her existing cognitive structures. However, when new experiences cannot be modified to fit into existing structures, the individual is forced into a state of disequilibrium where change or reorganization is facilitated. The innate need for equilibrium compels the individual to modify or reorganize his or her cognitive structures to accommodate new information. The resolution of the conflict, opposition, or contradiction (Piaget, 1974/1980b) between the individual and the environment results in the process of accommodation and a higher level of equilibrium. Cognitive conflict is therefore considered to have central role in cognitive development (Chapman & McBride, 1992). This conflict can occur through interaction (e.g., being confronted by a contradiction between the beliefs of one's family
and the beliefs of one's friends) or through structured activities (e.g., peer discussion in school) and is a response to the disequilibrium felt by individuals when they cannot accommodate new information into their existing cognitive structures. Piaget's theory suggests how an individual actively makes meaning from the environment and experience.

**Vygotsky's Theory**

Vygotsky (1934) broadened the work of Piaget through his examination of factors of cognitive development overlooked by Piaget such as the relation of learning to social interaction (Lacasa, 1990; Woolfolk, 1998). For Vygotsky, cognitive development is mediated by the tools of a culture and by social interaction. The tools of culture include both real tools (e.g., pencils, printing presses, computers) and symbolic tools (symbols, codes, and signs). In their writings, Piaget (1926) and Vygotsky (1987) both proposed that language is important to the internalization of a mental operation. For Piaget (1926), internalization of a mental operation for a person involves individually reconstructing an activity by moving from action to language. "For to become conscious of an operation is to make it pass over from the plane of action to that of language; it is therefore to reinvent it in imagination in order to express it in words." (p. 27).

Vygotsky believed that throughout the developmental process, internalization is linked to the social world. According to Lacasa (1990), Vygotsky believed that every function in a child's development occurred twice, first on a social level and later on an individual level. That is, internalization occurs as a sequence of transformations through which an external interpersonal event is transformed into an internal intrapersonal event. For Vygotsky, the emphasis was on "...the relationship between the internalization process and the cultural and historical forms of activity. From this point of view, the child internalizes external and interpersonal process using cultural tools, especially speech (Lacasa, 1990, p. 13).
Vygotsky was interested in how one of the institutions of a culture – school – influenced cognitive development and specifically how a teacher can determine where instruction can succeed. Vygotsky (1987) argued that there are two developmental levels, an actual developmental level that can be measured and that describes the level of development the child has achieved, and a second developmental level termed the zone of proximal development. This second developmental level extends beyond the actual developmental level (Vygotsky, 1978). "The zone of proximal development is the distance between actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers." (p. 78). The zone of proximal development is where a learner cannot independently solve a problem but can successfully problem solve and learn new concepts with the assistance of carefully structured learning activities, modeling, teacher guidance or through collaboration with more experienced peers.

One of the lasting contributions of Vygotsky is the creation of an empirical model, the double-stimulation method, that tested his assumptions (i.e., action generates thought and development results from social interaction). Much of the earlier cognitive research was limited by the problem of empirically demonstrating how children actually construct answers (Thomas, 1992) or that people actually experience cognitive conflict (Taylor, 1995). The work of Vygotsky and Piaget formed the foundation of work of Bruner.
Bruner's Theory

Bruner (1966) believed that "while we know a certain amount about learning and thinking, we know precious little about teaching and its functions" (p. 337). The intent of his research was to use the cognitive developmental theories proposed by Piaget, Vygotsky, and others to examine how teachers and teaching can effectively communicate knowledge and facilitate learning.

Bruner (1968) proposed that there are two types of teaching, "one that takes place in the expository mode and one that takes place in the hypothetical mode" (p. 83). Teaching in the expository mode places the student in the role of listener. The teacher is the principle decision maker. "He has a wide choice of alternatives; he is anticipating paragraph content while the listener is intent on the words; he is manipulating the content of the material by various transformations while the listener is quite unaware of these internal options" (Bruner, 1968, p. 83). Bruner (1968) argued that the danger with this type of learning is that the learner "does not make the leap between learning and thinking" (p. 342). Thinking is described "as the operation of utilizing information to go beyond that which has been given to that which is more likely" (p. 342). Moreover, Bruner (1968) contended that the hypothetical mode of teaching occurs when "the student is not a bench-bound listener, but is taking a part in the formulation and at times may play the principle role in it" (p. 83). This mode of teaching encourages students to reassemble and transform information in order to gain new insights. Bruner (1968) termed the hypothetical mode of teaching "learning through discovery". The role of the teacher is crucial to learning through discovery.

Bruner (1966) proposed that teachers and teaching have two main functions. Firstly, the role of the teacher is to allow for the presence of error without irreversible harm and to allow error to be instructive. Teachers should encourage students to understand the instructiveness of error. That is, the teacher should make the error
acceptable, understandable and assist the student in analyzing the error. The following example illustrates Bruner's point: A student is walking in the woods and is food gathering. The student sees an object that could be an edible or poisonous mushroom. The potential for irreversible harm is high. The role of the teacher is to assist the student in recognizing the error. In addition, the role of the teacher includes calling attention to the contrast between edible or poisonous mushrooms, and to help the student in analyzing the differences between the two fungi.

Secondly, the role of the teacher is to recognize that learning in school often removes learning from a real life context. Bruner (1966) hypothesized that this offers the potential for "learning to be separated from doing" (p. 342) and consequently, students may not be aware of the manner in which they can take the information they have learned in class and apply it to novel situations. The role of the teacher therefore is to assure that "operations are performed on what has been learned - that thinking occurs-----to make the learner do something with what they have learned" (Bruner, 1966, p. 343). Bruner (1966) suggested that teachers can do this by ensuring that reversibility has occurred by having students make predictions and inferences based on the new information.

Bruner (1968) proposed that teachers who expose students to learning through discovery create four benefits for students. First, students may experience an increase in intellectual potency. Intellectual potency is the ability of a person to develop a variety of a) problem solving skills, b) organizational strategies, and c) methods for transforming knowledge. Second, students may shift from extrinsic to intrinsic motivation. Bruner (1968) suggested that if students approach learning as a discovery task, a sense of learning, competency, or a desire to understand their environment will motivate them. This, in turn, will advance them from a self-focused and externally directed person, in whom reinforcement is crucial, to a self-directed and responsible person, in whom
growth and mastery are crucial. Third, learning by discovery will assist students in the learning of the heuristics of discovering. The more students have practice with problem solving and discovering on their own, the more likely they are to develop a variety of processes for problem solving that they will generalize to other tasks. Finally, Bruner (1968) hypothesized that learning to discover may be an aid to conserving memory. The key to memory is not "storage but retrieval" (p. 94) and the "key to retrieval is organization" (p. 95). He further claimed that learning by discovery assists the learner in imbedding new material "into a cognitive process a person has constructed for himself that will make that material more accessible for retrieval" (p. 95). In this way, new material is organized into systems that are based on the person's own interests, cognitions and prior knowledge. The education theory proposed by Bruner (1966/68) provided the foundation for a set of cognitive principles outlined by Schmidt (1993).

Schmidt's Principles of Learning

Schmidt condensed and refined the cognitive learning philosophy and research of the 1960s and 70s to a set of six principles. These principles and the research that support them are outlined in Table 1. As outlined in the table, the correlation between learning and prior knowledge has been consistently demonstrated in a number of studies. Nevertheless, the relationship between prior knowledge and beliefs and how student teachers learn pedagogical routines is not clear. Prior knowledge and beliefs as correlates of student teacher pedagogical development will be more completely explored in the review of the literature section that immediately follows this chapter.
Table 1.

Principles of Cognitive Learning

<table>
<thead>
<tr>
<th>Principle</th>
<th>Researcher</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) The prior knowledge people have regarding a subject is the most important determinant of the nature of the new information that can be processed</td>
<td>Haugeland (1985)</td>
<td>1) Better students, those who have sufficient prior knowledge learned more than those who did not. 2) Difficulty level of books and materials is a function of the way the material is presented and the knowledge level of the learner.</td>
</tr>
<tr>
<td>2) The availability of relevant prior knowledge is a necessary but not sufficient condition for understanding and remembering new information Prior knowledge also needs to be activated by cues in context from which the information is being activated.</td>
<td>Ausubel (1968)</td>
<td>1) Students are learned and retained material when it was readily anchored to prior concepts than when it was not anchored.</td>
</tr>
<tr>
<td>3) Knowledge is structured. The way in which it is structured in memory makes it more or less accessible for use</td>
<td>Bransford and Johnson (1972)</td>
<td>1) Students remembered almost twice as much information when text was accompanied by a context, then when information was not accompanied by a context.</td>
</tr>
<tr>
<td>4) Storing information into memory and retrieving it can be greatly improved when, during learning elaboration of the material takes place</td>
<td>Schmidt and Boshhuizen (1993)</td>
<td>1) Displaying and learning material using a semantic enhanced organization and retrieval.</td>
</tr>
<tr>
<td>5) The ability to activate knowledge in the long term memory and to make it available for use depends on contextual cues.</td>
<td>Anderson and Reder (1979)</td>
<td>1) Students remembered more pairs of words when they were established a relationship between the two words than students did not learn in this manner.</td>
</tr>
<tr>
<td></td>
<td>Godden and Baddeley (1975)</td>
<td>1) Divers who learned lists of words and recalled them in the same environment performed better than those divers who retrieved information in an environment different from the one they learned in.</td>
</tr>
</tbody>
</table>

Adapted from Schmidt, 1993
Problem-based Learning

Problem-based learning (PBL) is an educational method that grew out of a response to the need to develop the problem-solving and self-directed learning skills of medical students. PBL was pioneered in the mid-1960s at the McMaster University Medical School. The intent was to create a curriculum that would ensure students: a) acquired a rich body of integrated knowledge structured so as to facilitate problem solving and generalization skills, b) developed self-directed learning, team and interpersonal skills, and c) developed a desire to continue learning (Barrows, 1998). Maudsley (1999, p. 179) summarized the essential characteristics of a problem-based learning curriculum:

First, knowledge is acquired in an active, iterative, and self-directed way, predominately working on a progressive framework of problems unconstrained by subject divisions. Second, acquiring new knowledge is not the starting point for learning. Third, process details may vary but only within this philosophy, which is not determined by other curricular elements.

PBL, as envisioned by Barrows, is rooted in cognitive and constructivist theory and research and, as discussed earlier, represents a shift in education. The problems associated with a shift or curriculum reform (e.g., discomfort with change, conflict with existing beliefs) have resulted in the term PBL being used to describe a wide variety of educational activities and curriculum (Barrows, 1986; Barrows, 1998; Maudsley, 1999). This problem is compounded by a lack of agreement of what PBL is. Vernon and Blake (1993, p. 560) state that PBL:

Is better described as a complex mixture of general teaching philosophy, learning objectives and goals, and faculty attitudes and values, all of which are difficult to regulate and are often not very well defined in research reports.
Barrows (1998) acknowledged that the "term PBL is so non-specific that it may be hard to conceptualize what it could be in its fullest" (p. 630). Barrows (1986) published a taxonomy of various teaching methods referred to as PBL:

1) Lecture-based cases: Cases are used to demonstrate the relevance of information provided by the lecture.

2) Case-based lectures: Cases are used to highlight material to be covered in the subsequent lecture.

3) Case method: Cases are studied in preparation for class discussions, as in traditional law and business education.

4) Modified case-based method: Cases provide opportunities for deciding between a limited number of opinions for action.

5) Problem-based learning: Cases are used in a problem-simulating format encouraging free enquiry.

6) Closed-loop, or reiterative problem-based learning: A reflective phase that follows the completion of the case and enhances the synthesis of information (e.g., what was learned, how does it relate to other problems).

In response to the questions arising about how to define or characterize "authentic PBL," Barrows (1998) asserted that his "taxonomy is now inadequate" (p. 630) and outlined the following eight essential characteristics that should be included in an authentic PBL program:

1) PBL must be student centered. Students assume responsibility for their own learning and faculty are there as facilitators and guides. Based on the cases, students set their own learning objectives, direct their own learning and find their own resources. Barrows (1998) noted that student centered learning can be "easily weakened if PBL is episodic or a recurring event in an otherwise traditional curriculum or is an add-on" (p. 630).
2) The cases in PBL must represent real life problems and the problems need to be presented to the student as they are to a practitioner, with only a minimal amount of information. Students then have to generate hypotheses and problem-solve as they would in practice. In addition the learning activities mirror those students would experience in practice.

3) The tutor needs to facilitate and develop the problem-solving skills that will be required in actual practice. This is essential because "problem-solving is an essential career skill and should be developed under faculty guidance and not spontaneously under the pressures of the real world" (Barrow, 1998, p. 631). It is essential that the tutor facilitates and guides learning and not tell the student they are right or wrong.

4) Self-directed learning is an essential component of PBL. The students are responsible for learning to find and evaluate information relevant to the problems from a variety of sources. Barrows (1998) considered this an essential skill because 50% of information learned in medical school will be outdated and wrong when needed in actual practice.

5) Collaboration is an important skill that must be included in PBL curriculum.

6) A PBL curriculum needs to be integrated so as to remove the artificial separations of disciplines or courses. This is done in order for students to be able to understand problems at a deeper level. They should be able to be presented with problems that reflect the complexity of practice.

7) PBL curricula should allow for the reiteration of problems in order to promote a deeper understanding and to ensure that students will recall and apply the information. As well, PBL curricula should provide students with opportunities for reflection. This will allow the information to be applied back to the problem.
8) Assessment in PBL should be student centered and should reflect both the philosophy and objectives of PBL. Opportunities for peer and self-assessment need to be provided.

Schmidt (1983) operationalized the process of PBL into a series of seven systematic steps that outline the process that the small groups of students need to participate in after they have been presented with a case. These steps are presented in Table 2.

Schmidt (1983) contended that when PBL is presented using these seven steps, the three educational objectives envisioned by Barrows (1980) can be met because PBL links three cognitive principles: activation of prior knowledge, encoding of knowledge in a specific content, and the opportunity to elaborate on information.

PBL students are expected to apply prior knowledge and experience, in steps one and two, in order to understand the problems. PBL facilitates the encoding of specific knowledge through the use of real life-like problems that closely resemble the problems that students will have to face. Learning knowledge using this type of context assists students in creating a scaffold for storing knowledge that will assist them in the retrieval of relevant knowledge when needed for similar problems (Norman, 1988).

PBL provides the opportunity for students to elaborate on their prior knowledge and their new knowledge through small group discussion that promotes the sharing and reviewing of ideas and information in a collegial environment.
Table 2.
Steps Involved in Problem-based Learning

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Clarify and agree on the meaning the terms and concepts not readily comprehensible.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Produce and reach agreement on the exact definition of the problem.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Peruse the text and analyze the problem, drawing on prior knowledge, prediction and inference to develop a working hypothesis/es.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Develop a systematic inventory to act as a summary of the working hypothesis/es and develop study priorities.</td>
</tr>
<tr>
<td>Step 5</td>
<td>Formulate learning objectives based on the inventory and select which objectives to focus on and agree on a distribution of tasks.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Individual research on objectives.</td>
</tr>
<tr>
<td>Step 7</td>
<td>Come back to group, and synthesize, supplement, and reapply the new information.</td>
</tr>
</tbody>
</table>

Adapted from Schmidt (1983)

PBL in Teacher Education at the University of British Columbia.

The Teacher Education Faculty at the University of British Columbia (UBC) offered a new option for a cohort of elementary teacher education students in September of 1998. The principles that guided the development of this new option were those described by Barrows (1986) and implemented by McMaster University Medical School. Although a number of health science faculties have switched to a PBL curriculum, a PBL curriculum created as an alternative program of professional study for education students was unique.
Teacher education programs traditionally consist of a program of studies and practica experiences. The PBL teacher education program included not only changes to the program of studies but changes to the practica. In the traditional teacher education program at UBC, students "develop a foundation of knowledge, apply that knowledge as student teachers and then return to campus to build upon and augment their teaching experiences" (University of British Columbia Teacher Education Handbook, 1989-99, p.2). The aim of PBL in teacher education is to provide a closer connection between the study of teaching and the practice of teaching. One of the key aspects of PBL in teacher education at UBC is a cohesive and integrated program that includes weekly practica experiences beginning in September and continuing throughout the entire year, in addition to the traditional short and long practica experiences. The traditional practicum includes: a) a half-day per week in elementary school settings beginning in September and continuing until November, b) a two-week practicum in January, and c) a 13-week practicum beginning in March. The two-week and 13-week practicum may or may not be in the same school. The PBL option practicum differs in that it includes: a) a three-day school visit in September, b) weekly visits to the same school one day a week for the entire year, c) a two-week practicum in the same school beginning in January, e) planning, teaching and evaluating lessons on their weekly visits between the short and long practica, and d) a 15-week practicum in the same school beginning in March. This was done in order to provide the students with ongoing opportunities to apply theory to practice over the entire year.

Cases and Assessment

The UBC Teacher Education Program Handbook (1998-99) stated that students in the traditional 12-month elementary program were required to enroll in 16 individual courses that were designed to provide students with a balance of generalized and specialized knowledge about curriculum and instruction. The courses were offered over
three terms (i.e., Sept-Dec, Jan-March, and July-Aug.) The classes typically contained
30 to 40 students and were taught by instructors with expertise in individual areas. The
teacher education program also offered a number of cohort programs that allow 36
students to take their required classes together with an instructional team.

The PBL curriculum included written cases that were designed to include the key
concepts for each of these courses presented to the students in an integrated format.
All of the cases contained learning issues from three perspectives: curricular,
professional, or developmental. The incidents in the cases were based on real life
events in schools.

In PBL, students are organized into small groups of six to eleven students. Each
group works with a tutor, who is an experienced classroom teacher and who holds, or is
in the process of acquiring, a minimum of a Master's degree in education. The groups
meet regularly with five resource faculty who are specialists in subject areas. Two times
a week each tutorial group meets with their tutor to discuss the case and share
information gathered in self-directed and group research (for a total of 10 hours over 2
weeks). The role of the tutor is to facilitate the student-led discussions.

The following is an example of a PBL case as submitted to students in the
teacher education program at UBC:

You are a Grade One teacher and have returned from your winter break.
While you have been on vacation, you have been thinking about many of the 26
members of your class. The class is composed of 14 boys and 12 girls. Twelve
of the children in your class are ESL.

You are concerned about a student named Jeffrey. He lives at home with
his mother, stepfather, and two younger sisters. His mother's divorce occurred
when Jeffrey was two years old and his mother remarried two years ago. Jeffrey
attended both preschool and kindergarten before entering first grade. In
preschool and kindergarten, it was noted that Jeffrey was very active and liked to participate in many activities during the day. You have observed that Jeffery seems to be out of his seat a lot, requires more supervision that other students do, and always seems to be in trouble. Your classroom is structured, but you allow students to choose many of their own activities. You use a behaviour program that consists of acquiring rewards for positive behaviour and removal of rewards for negative behaviour.

You are exploring the development of a balanced literacy program and need to begin to research how you can implement this type of program. You have concerns because some parents are demanding more structured teaching and "back to the basics."

Your theme this month is Dinosaurs. You have been assigned a student teacher and he has requested a copy of your math overview in order to better understand how you have seamlessly integrated math into the theme.

The format for the each two week case rotation has been adapted from Schmidt (1983) and is as follows:

<table>
<thead>
<tr>
<th>Week</th>
<th>Part</th>
<th>Tutorial number</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Read the first part of the case together. Identify issues. Individual research with each member becoming familiar with every issue.</td>
</tr>
</tbody>
</table>

Table 3.

Case Rotation
Come back to group, synthesize, supplement, and reapply the information. Agree on the distribution of topics. Individual research with each member becoming a mini expert on a topic. Prepare questions for other members of the group that are based on their mini-expert research (e.g., Member A is researching development and asks Member B who is researching Bullying, "How development has an impact on bullying.").

Discuss the issues and answer questions of other members. Read the second part of the case. Identify and discuss the expanded issues. Individual research.

Presentation. Written synthesis of material.

Schmidt (1983)

The tutorial format used in PBL in teacher education at UBC is based on the PBL curriculum characteristics outlined by Barrows (1998). Specifically, the students are responsible for setting their own learning objectives, directing their own learning, and finding and evaluating their own resources. Opportunity for the reiteration of the issues is provided in tutorials two and three. The tutorial four presentations provide the opportunity for students to demonstrate their ability to apply the information they have learned back to the problem. At the end of tutorial four the PBL teacher education students are responsible for synthesizing all of the information that has been presented in a two-page document. The faculty are responsible for facilitating and guiding the learning using open-ended questions.

Assessment for most of the traditional courses often includes participation, written and oral in-class examinations and a final exam. The assessment for the PBL students includes peer and self-assessment, tutorial participation, a portfolio
assessment, two integrated oral examinations based on original cases created by the faculty for the examinations, and a final assignment which requires each student to individually develop an original case and present the questions and solutions in a written format.

**Practica and Practica Assessment**

In addition to course content changes, the PBL teacher education program included changes to the practicum experience. In the traditional elementary education program, students have three practica. The first begins in late September and students spend one-half day per week in a school setting. The second begins in January and the students spend two weeks in a school setting. In the second practicum students in a traditional program begin to develop a working relationship with their school advisor and by the end of the second week teach a series of lessons. The third practicum begins in March. During the third practicum, students in the traditional teacher program are responsible for planning, implementing and evaluating instruction over a 13-week period. They then return to university to complete their course work.

The practicum for PBL student teachers begins with a three-day school experience in September. The students visit this same school one day a week for the entire school year. That is, the students visit one day a week until they begin their short (two-week) practicum in January, then return to the same class one day a week until they begin their extended practicum in March, and again one day a week after they finish their extended practicum. This creates the possibility for teacher education students to continue to develop relationships with the students in their class, the sponsor teachers (i.e., the classroom teachers who act as the mentors, models, and supervisors for the student teachers), and other members of the staff. In addition, PBL students continue to plan, implement, and evaluate lessons between their short and extended practica. Of note is that the students are not initially assigned to a teacher but to a school and they
rotate through a number of classrooms until they are assigned a sponsor teacher in early November.

In the traditional teacher education program, the faculty associate is the liaison between the university and the school when the student teachers are involved in the practica. They have the responsibility of communicating the expectations and evaluation procedures to the student and the school advisor, supporting the school advisor and student teacher and supervising and evaluating the student. The faculty associate is responsible for the final evaluation of the student's practicum. In PBL, the role of the faculty associate is altered. The faculty associate and the school advisor work in a collaborative manner with the school advisor taking on the primary responsibility for the supervision and evaluation of the student.

Statement of the Problem

Research findings generally support the idea that participation in PBL programs leads to improvements in intrinsic interest in subject matter, self-directed learning, transfer, integration of basic concepts into problems, retention of knowledge, and clinical performance evaluations (Antepohl & Herzig, 1999; Iputo, 1999; Kaufman & Mann, 1996; McGrew, Skipper, Palley, & Kaufman, 1999; Norman & Schmidt, 1992). However, it is yet unknown if participation in a PBL teacher education program will result in the same improvements. The purpose of the present investigation is to examine the effects of a PBL teacher education program on students': a) beliefs and attitudes about teaching and learning, b) feelings of teacher efficacy, c) attitudes towards inclusion, d) feelings of preparedness to teach, and e) perceptions and attitudes of the university and school-based personnel with respect to PBL relative to their attitudes towards a traditional teacher education.
CHAPTER 2

Review of the Relevant Literature

This review of the literature is divided into two sections. The first section is a review of the relationship of a PBL curriculum to student attitudes and outcomes (i.e., positive student attitudes, acquisition of knowledge, learning styles and strategies, and intrinsic interest). The second section of the review investigates the influence of teacher education programs on students' prior beliefs. Teacher education programs continue to search for curriculum changes that will refine and extend their programs in order to have a strong influence on their students. The intent of this second section is to review the research findings that examine this objective and suggest support for incorporating PBL into teacher education programs. This chapter concludes with a delineation of the hypotheses addressed in the present study.

Attitudes and Outcomes

Studies on the relationship of student attitudes and outcomes to a PBL curriculum provide an intuitive place to begin to compare PBL programs to traditional programs because students who are challenged and feel successful or motivated will go beyond simply studying for the examination (Bruner, 1966; De Volder, Schmidt, Moust, & DeGrave, 1986; Dolmans & Schmidt, 2000). Studies that have examined the attitudes of students enrolled in PBL center around two foci: a) faculty perceptions of PBL students, and b) student perceptions of PBL. Two additional indicators of the success of a program are the perceptions of the graduates of the program and the perceptions of graduate performance. Both of these indicators have been examined in studies that have compared PBL to traditional medical school curricula.
Faculty Opinions

Some of the issues regarding faculty opinions towards PBL were addressed in a review written by Norman and Schmidt (1992). Norman and Schmidt's intent was to examine PBL using six constructs: a) acquisition of problem-solving skills, b) acquisition of factual knowledge, c) transfer of concepts and principles, d) pattern recognition, e) intrinsic interest, and f) self-directed and lifelong learning. They reviewed the experimental evidence from 14 studies that examined differences between a PBL and a traditional school curriculum that could be attributed to PBL. Norman and Schmidt concluded from these studies that a PBL curriculum could be associated with several positive learning outcomes. PBL may enhance students' intrinsic interest in subject matter and retention of information, transfer of concepts, and self-directed learning when compared to traditional medical programs. However, they were unable to find evidence that PBL curricula resulted in improvement in problem-solving skills.

Additional evidence for the relation of PBL to positive student attitudes was found in a study conducted by Vernon (1995). Vernon investigated the attitudes and opinions of PBL tutors to the merits of a PBL medical education program compared to a traditional medical program. It should be noted that the author indicated that there were no criteria used to differentiate the type of PBL program that was being implemented at each medical school. Questionnaires were sent to 1,287 faculty members who served as PBL tutors in Canadian or US medical schools during 1992-93. The overall response rate was 69%. The findings of this study revealed that faculty reported that students who participated in a PBL medical curriculum displayed a higher level of: a) student interest, b) general principles, c) reasoning, and d) clinical preparation when compared to students from a traditional medical school. The PBL students, in the opinion of the tutors, displayed a lower level of factual knowledge in basic science than traditional medical students did. The faculty tutors felt there was no significant difference between
groups on the measure of learning efficiency. As noted by the author, there were a number of problems in this study. First, there is no way to determine if the large number of faculty (31%) who did not return the questionnaires may have been more or less positive than the respondents. Secondly, the variation in definitions of PBL or traditional medical curriculum created "ambiguity" (Vernon, 1995, p. 222).

Kaufman and Holmes (1996) addressed the issues stated above in a later study that confirmed the results reported by Vernon (1995). Kaufman and Holmes surveyed PBL faculty tutors' opinions about the relative benefits of PBL. They surveyed 88 tutors from the Dalhousie University Faculty of Medicine. The response rate was 93%. The tutors were asked to rate 39 items that asked opinions about PBL and medical education. The survey items included questions about the relative benefits of PBL, the tutors' level of satisfaction, the difficulties the tutors encountered, and the workload. The results of Kaufman and Holmes' study echoed those of Vernon with faculty tutors rating PBL students higher than traditional students on: a) interest and enthusiasm, b) reasoning ability, c) overall value to student, d) understanding general principles, and e) preparation for clinical rotations. However, the faculty tutors rated traditional students higher on factual knowledge of science than PBL students.

Both Vernon (1995) and Kaufman and Holmes (1996) agreed that, in the opinion of the tutors, the PBL students had acquired less factual knowledge of science than the traditional medical students. However, the data on the acquisition of knowledge and PBL programs has been contradictory. For example Patel, Groen and Norman (1991) compared the reasoning and knowledge of beginning, middle and senior medical students from two medical schools with different medical education programs, the PBL at McMaster University Medical School and the traditional program at McGill University Medical School. Patel et al. included a measure of reasoning processes (i.e., breaking down verbal responses of the students into propositions and examining the relations
between the propositions) in order to examine the differences between the reasoning of
a novice group of medical students, an intermediate group of medical students, and an
expert group of medical students. Patel et al. supported the hypothesis that experts use
forward reasoning. They characterized forward reasoning as "making inferences
forward from the data towards hypotheses to the diagnostic solution" (1991, p.381). This
is contrasted with backward reasoning used by novices which is characterized as
"deducing from a hypothesized solution of observed data, an example of which is
hypothetical-deductive reasoning" (Patel et al., p. 381), using hypothesis to guide
problem solving. Specifically, Patel et al. examined the reasoning processes in a
sample of 108 students, 36 from each university. The students from each university,
represented three levels of medical training, beginners (n = 12), students who were
within six months of entering medical school, intermediates (n = 12), students who were
in their second year of medical school, and seniors (n = 12), students who were a few
months away from graduation. The students were asked to solve a clinical problem and
to integrate three passages of scientific material into their answer. The students'
responses were analyzed with respect to the structure of the explanation, the
directionality of the reasoning (i.e., backward reasoning or forward reasoning) and
accuracy and errors. The results revealed that intermediate students from both schools
gave more accurate diagnoses than beginners. The non-PBL intermediate students
made fewer clinical errors, used text information more directly and made fewer
inferences than the PBL students. The diagnoses all of the non-PBL seniors made were
completely or partially correct, and they usually gave a single major diagnosis and did
not include a list of differential diagnoses. The PBL seniors each gave a list of four or
five diagnoses that contained the accurate or partially correct diagnoses. The PBL
seniors gave longer explanations with less use of relevant cues from the text. The
authors noted that there was significantly more backward reasoning used by the PBL
students compared to the non-PBL students and more forward reasoning used by the non-PBL students compared to the PBL students. The authors suggested that the reason the PBL students at all levels made more errors in their explanations may be related to the different modes of reasoning that are predominantly used in the groups. They posited that the PBL students were explicitly taught to use hypothetical-deductive reasoning and that this dependence on backward reasoning interfered with "the formation of the sophisticated knowledge structures associated with expert performance on which forward reasoning depends" (Sweller, Mawer, & Ward, cited in Patel, Groen, & Norman, 1991, p. 385).

The expert-novice model of problem solving is not universally supported. For example, Hmelo and Lin (2000) suggested that the ability to formulate differential diagnoses, that are hypothesis and not data driven, help practitioners deal with each problem competently. Because medicine is a continually advancing and changing field, a skilled practitioner needs to know "how to formulate questions to seek the specific information needs and how the knowledge can be applied to practice" (Hmelo & Lin, 2000, in Evenson & Hmelo, 2000, p.227). Patel, Goren, and Norman (1991) concluded that all students could benefit from "learning a systematic method of clinical reasoning such as the hypothetical-deductive method" (p. 388), but believe that it necessary to find methods to link reasoning to accurate science.

In addition to interpretation problems created by theoretical differences in cognitive processing between expert and novice thinkers, there are other obstacles to inter-university comparisons that can decrease the generalizability of results. These problems can include equality of programs, difficulties in random assignment of professional groups, the diversity of outcome measures, the positive or negative attitudes associated with a new program, and the length of time a program has been in place. Additionally, different universities have different criteria for entry that are unique
to their educational philosophy or have a different emphasis in program objectives and
goals and this may have a confounding effect on the results (Antepol & Herzig, 1999,
Vernon & Blake, 1993). Wolfe (1993) suggested that meta-analysis can "generate more
generalizable results...because the combined evidence speaks more powerfully than the
individual parts" (p. 542). Three independent comprehensive meta-analyses of PBL
include Albanese and Mitchell (1993), Berkson (1993), and Vernon and Blake (1993).

Albanese and Mitchell (1993) examined 11 variables in their meta-analysis of
PBL: a) basic science as measured by the National Board of Medical Examiners Part 1-
examination, b) clinical performance, c) thought processes, d) study behaviours, e)
learning environment, f) students' satisfaction, g) graduates' perceptions of their
preparation, h) clinical ratings, i) specialty choices, j) faculty perceptions, and k)
academic achievement. The three areas that will be discussed at this time will be the
National Board of Medical Examiners Part 1 examination, clinical knowledge, and
academic achievement. The remaining variables will be addressed in a subsequent
section. The authors reported that in ten studies that specifically reported basic science
examination performance as measured by the National Board of Medical Examiners
examination Part 1, PBL students scored significantly lower than traditional students in
three of the 10 studies reviewed. However, Albanese and Mitchell reported a trend in
favor of PBL students, in the seven studies that included reports of clinical science
examination results. That is, PBL students scored higher than traditional students did in
five of seven studies, but the results were significantly different on only one of the five.
Specifically, PBL medical students scored higher than traditional medical students on an
ethics problem task and traditional students significantly higher than PBL medical
students on multiple choice test items that assessed internal medicine. Clinical
supervisors' ratings of PBL students were either more positive for PBL students or
nonsignificantly different from the ratings of the conventional group.
Vernon and Blake (1993) conducted a meta-analysis of 35 studies that represented 19 institutions. The authors used three variables to compare PBL and non-PBL students: a) ratings and tests on clinical performance, b) tests of clinical knowledge, and c) measures of humanistic knowledge. PBL students scored significantly higher on measures of attitudes and opinions about their programs and on measures of clinical performance. Vernon and Blake found no significant difference between groups on tests of factual knowledge and clinical knowledge. Of note, Vernon and Blake, similar to Albanese and Mitchell (1993), also reported a slight but nonsignificant trend in favor of the PBL students with respect to clinical performance. The authors found that non-PBL students scored significantly higher than the PBL students on the National Board of Examiners Part 1 examination. Vernon and Blake cautioned that the National Board of Examiners examination displayed significant heterogeneity and therefore the generalizability of these scores may be doubtful. The high clinical ratings of the PBL students and the low scores on standardized measures of basic science are difficult to understand because students with significant deficits in their knowledge should not be expected to have high clinical ratings. Researchers have suggested that one of the problems could be the type of assessment measure that are being used. Norman and Schmidt (1992) maintained that conventional testing measures are useful tools to assess conventional teaching methods and enable the teacher to determine what concepts were taught in the course but do not allow for the flexibility or variability of a PBL curriculum. Eck and Mathews (2000) and Norman and Schmidt (1992) suggested that measures that allow PBL students to demonstrate the depth of their concept knowledge and account for differences in the learning process are more appropriate measures. Berkson (1993) reviewed literature that examined problem solving, academic achievement, approaches to studying, motivation, self-directed learning and faculty and student satisfaction. She concluded that there were no
significant differences between groups on problem solving, approaches to studying, academic achievement, motivation, and self-directed learning. She suggested that while the literature indicates that PBL students enjoy PBL, the studies reviewed are flawed (e.g., a high non-response rate and potential bias not explored by the researchers). Berkson stated that there are a number of variables that may have interfered with the inquiry into the effects of PBL. These variables included insensitive and inappropriate measurement tools, variations in the implementation of PBL, and cross-contamination of groups. Nevertheless, she posited that the graduate of a PBL program is not significantly different from a the graduate from a non-PBL program and it is the similarities between the programs that need to be examined more closely in order to determine the best educational program for students.

Additional support for the hypothesis that PBL develops conceptual and factual knowledge and that this knowledge is best assessed using non-standardized assessment measures can be found in the research of Antepohl and Herzig (1999). The intent of Antepohl and Herzig was to design a controlled and randomized study that addressed some of the limitations in the previous research. Antepohl and Herzig investigated the link between PBL and factual knowledge acquisition in a sample of 123 medical students randomly assigned to either PBL (n = 63) or traditional lecture format (n = 60) in the same medical school. The students attending the lectures were divided into three groups of 20 each. The PBL students were divided into groups containing six to nine participants. Both groups of students were given a written examination of basic pharmacology at the end of the semester. The examination consisted of 20 multiple-choice questions and 10 short answer questions. The authors reported that there were no significant differences between the groups on the multiple-choice questions. The PBL students' scores were similar across the two formats, multiple choice (11.6) and short-essay (11.2) while the students in the lecture based course scored significantly
lower ($p < .01$) on the short-essay questions when compared to the multiple choice questions. The authors reported higher scores in the PBL group on the short answer questions; however the differences between the scores did not reach conventional levels of statistical significance ($p = .07$). The authors acknowledged that this difference between groups could be a result of factors other than group membership (e.g., size of group). They further suggested that questions that are designed to measure comprehension and analysis of knowledge are more appropriate for testing the outcomes of PBL. The results from this study suggest that a PBL curriculum is equivalent to a traditional curriculum in providing students with conceptual and factual medical knowledge. The authors note that the results of this study were used to justify a complete replacement of traditional lecture courses in pharmacology with PBL courses.

Banta, Black, and Kline (2000) examined the recent literature on evaluation in PBL and found that a range of assessment tools are currently being employed to assess outcomes; these include knowledge and process-oriented instruments. They conclude that while more formative evaluation is occurring, it is not being implemented in a systematic manner using assessment tools that match specific learning outcomes. They suggested that the recommendations outlined by Nendaz and Tekian (as cited in Banta et. al., 2000) would provide a framework from which to begin to systematically assess PBL outcomes. These recommendations include: a) carefully constructed multiple-choice questions and extended matching items that assess higher order intellectual skills, b) short answer essay exams that reflect problem solving skills and synthesis of knowledge, c) oral exams using hypothetical cases for which questions and scoring criteria have been prepared in advance, and d) written problem-analysis questions that require students to analyze information, generate hypotheses, and propose explanations.
Student Opinions and Perceptions of PBL

Although, the faculty evaluations are important external indicators of student attitudes toward learning, the opinions of students themselves are paramount as attitudes and opinions have a strong influence on learning (Renzaglia, Hutchins & Lee, 1997).

The correlation between PBL and positive student attitudes has been consistently demonstrated in a number of studies. For example, using a 3-point Likert scale, O'Hanlon, Winefield, Hejka, and Char-Hansen (1995) included measures that asked 119 PBL medical undergraduate students to rate their opinions about PBL compared to the traditional approach. The authors reported that while the majority of PBL students (53%) reported that they found the PBL module interesting, a large percent (44%) felt that they would have benefited more if the module had been purely lecture based. This difference is explained by the authors as possibly being a result of the demographics of the group, the mean age of the students' (18) and 40% of the students having a first language other than English. The difference could also be explained as possibly being a result of the learning activities of the students. This PBL program was designed to include supplementary tutorials that were not compulsory. The authors did not indicate if the students who preferred PBL were the ones who attended all the sessions, or alternatively if the students who felt they would have benefited from a more traditional lecture approach were those who did not attend the tutorial sessions.

Kaufman and Mann (1996) continued to investigate and compare student attitudes in a sample of students attending PBL courses (n = 84) and students attending traditional courses (n = 84) at Dalhousie Medical School. Kaufman and Mann used two survey instruments along with items from other questionnaires to create a 65-item Likert scale questionnaire. The instrument included subscales intended to measure
evaluation, academic enthusiasm, goal direction, authoritarianism, breadth of interest, student interaction, enjoyment and satisfaction with curriculum, social factors, and intellectual maturity. The findings from this study indicated that PBL students reported significantly more positive attitudes than traditional students did on the scales of academic enthusiasm, authoritarianism (i.e., PBL was more democratic) and more positive attitudes towards curriculum. The authors noted that on the remainder of the subscales there were no significant differences between groups. Kaufman and Mann acknowledged that the generalizability of these findings is limited because the students were unable to choose their curricula and were not randomly assigned to groups.

Bhattacharya (1998) also reported a link between PBL and positive attitudes towards learning. For this study, Bhattacharya created an eight-item questionnaire that used a three-point Likert scale. The questionnaire was administered to 213 first and second year medical students after they had completed eight PBL cases. Their program of studies included both PBL blocks and lecture blocks. The author reported on only three of the eight items measured: a) relevance, b) tutor guidance, and c) learning from fellow students. Bhattacharya reported that 60% of the PBL students thought the cases were relevant, 60% of the students rated the tutor guidance as good and 44% indicated a high level of learning from fellow students. The author anecdotally reports that the students desired more PBL sessions.

Antepohl and Herzig (1999) investigated the link between PBL and learning behaviour and learning style in a subset of the sample of 123 students mentioned previously. Of the 123 students who were originally included in the study, 112 wrote the final exam in pharmacology. From this group 51 lecture-based students and 52 PBL students completed questionnaires on curriculum preference. Additionally the PBL students completed a questionnaire that assessed their satisfaction. The authors included two different questions to assess students' curriculum preference: a) "If you
had had the possibility to choose before the course would you have opted for PBL-course or the lecture-based course?" (p.109), and b) "After the experience from the course, would you now opt for the PBL-course or the lecture-based course if you had to choose again?" (p.109). Antepohl and Herzig's research findings indicated that the majority of students in both groups would have chosen a PBL course before the course began. As well, after the course was completed, relatively more students changed their mind preferring a PBL to a traditional course rather than vice versa. The second measure, given only to the PBL students, asked them to rate level of satisfaction with PBL. This questionnaire consisted of 25 items and used a five-point Likert scale. The students in the PBL course expressed a high overall level of satisfaction with the course, indicated that they felt PBL to be an effective learning strategy, stated they would recommend PBL to other students, believed PBL stimulated them to seek out other learning resources, and considered PBL to have increased their interest in pharmacology. Of note is that the PBL students did not feel that the tutorial process improved their communication skills. Unfortunately, the authors did not administer the same questionnaire to the traditional students and, as a result, there is no comparison group for the measure of satisfaction. Nevertheless, the results from this study suggest a link between student satisfaction with the curriculum and PBL.

Among the goals of PBL is the development of students who are lifelong learners and who are self-directed. Several research projects have found significant differences in the development of self-directed learning between PBL and non-PBL students. For example, Blumberg and Michael (1992) investigated the link between PBL and self-directed learning in a sample of 112 traditional medical students (56% of the total enrollment) and 31 PBL students (86% of the PBL students). The measures used to assess self-directed learning were: a) a questionnaire about learner resource use, b) library circulation data, and c) student and faculty questionnaires that assessed
perceptions of self-directed learning. The results of this study indicated no group
differences on the average amount of time spent studying but indicated the groups used
different resources. PBL students used more self-directed resources (e.g., journals and
other books, informal discussions) and fewer teacher-directed resources (e.g., course
syllabi and lecture notes). The circulation data from the library confirmed that PBL
students borrowed more library material. Finally, when compared to traditional students,
PBL students reported an increased ability to assess their learning needs, to find
relevant material, and assess their knowledge. Thus, according to Blumberg and
Michael, these findings support previous research (see Albanese & Mitchell, 1993 for a
review) that asserts that participation in a PBL program promotes self-directed learning.

Hmelo and Lin (2000) provided additional support for the hypothesis that
participation in a PBL program promotes self-directed learning in their comparison of
PBL students to non-PBL students from two different universities. Hmelo and Lin
included four self-directed strategies in their comparison: a) the type of learning issue
generated (hypothesis or data-driven), b) the learning plan (i.e., the number and type of
learning resources used), c) students perceptions of success, and d) information
integration. Hmelo and Lin reported group differences on all four comparisons. The
PBL students used more hypothesis-driven learning strategies than the non-PBL
students did. The authors hypothesized that this type of learning strategy is important
when the learning goal is, as it is in PBL, conceptual understanding and flexible use of
knowledge. The PBL students used a wider range of resources and more resources
than did non-PBL students. Both PBL students and non-PBL students grew in their
perceptions of their science knowledge but only the PBL students grew significantly in
their perceptions of their clinical knowledge, and the PBL students integrated more
information into their explanations than non-PBL students.
The results from Hmelo and Lin (2000) confirm an earlier investigation conducted by Ryan (1993). Thirty-five first-year PBL nursing students were asked to complete questionnaires that assessed perceptions of their abilities as self-directed learners improving over time and the importance they placed on self-directed learning. The students were asked to rate the importance of and their abilities to: a) identify specific learning needs, b) identify and locate a range of relevant resources, c) critically evaluate the scope and accuracy of the information, and d) evaluate the effectiveness of the application of this knowledge. The results indicated an increased rating of importance (p < .01) and an increase in perceived ability (p < .001).

Self-directed learning is one component of learning style. The investigation of the learning style of students and their approaches to learning is valuable because it is hypothesized that self-directed learning has a significant influence on the academic success of students (Leiden, Crosby & Follmer, 1990; Newble & Gordon, 1985). A number of inventories have been used to assess the learning style of PBL students, including Kolb's Learning Style Inventory (LSI; Kolb, 1985), the Manual of Learning Styles (Honey & Mumford, 1986) and versions of the Lancaster Approaches to Studying Inventory (LI; Entwistle, 1981). Learning style inventories are "differentiated by the extent to which they reflect personality characteristics, information-processing characteristics or preferences for different types of instruction" (Leiden et al., 1990, p.395). An example of a learning style inventory that measures cognitive-personality characteristics is the Myers-Briggs Type Indicator (Myers, 1962). The Inventory of Learning Preference Inventory (Rezler & Rezmovic, 1981) represents an example of an instructional preference learning style inventory.

The LI (Entwistle, 1981) is a 64-item measure that assesses information processing. The items of the questionnaire are summed according to nine broad scales:
1) Achieving. This scale is scored out of 24 and contains items relating to study methods, competitiveness, and hope for success.

2) Reproducing. This scale is scored out of 24 and measures items relating to syllabus boundness, attempts to memorize, and anxiety and fear of failure.

3) Comprehension. This scale is scored out of 24 and measures items related to the student's ability to relate ideas to real life and to map out subject areas.

4) Meaning. This scale is scored out of 24 and measures deep approaches to learning and intrinsic and academic motivation.

5) Operation. This scale is scored out of 12 and measures students' reliance on a logical approach to learning and emphasis on factual detail.

6) Improvidence. This scale is scored out of 12 and measures the student's failure to see the interrelation of topics and how topics fit into general subject areas.

7) Globetrotting. This scale is scored out of 12 and measures the student's ability to make premature judgments and seek generalizations without sufficient evidence.

8) Versatile. This scale is scored out of 48 and measures both comprehension, learning strategies, intrinsic motivation and meaning orientation.

9) Pathological. This scale is scored out of 48 and combines reproducing, improvidence and globetrotting learning styles.

The reliability and the validity of the LI have been established in previous research by Leiden et al. (1990). Alpha coefficients ranging from .74 to .76 were reported on three of the major factors (i.e., Non-Academic Orientation, Reproducing Orientation, and Meaning). However, a coefficient of .37 was reported for Strategic Orientation and a coefficient of .26 was reported on the one of the subscales (i.e. fear of failure) included in the Reproducing Orientation. These results are similar to an earlier study conducted by Ramsden (1983).
In one of the first empirical studies to examine learning approaches and PBL students, Coles (1985) compared PBL medical students to traditional medical students on their learning styles and strategies. Learning styles were assessed using the Approaches to Studying Inventory (APSI; Entwistle, 1981). The APSI consists of 29 measures, each scored using a four-point Likert scale. Students were initially approached in their first year. Coles' research findings revealed that PBL medical students were more likely to use versatile and meaning approaches. The results were confirmed in a subsequent study done by Newble and Clark (1986). The results from these studies indicate that PBL students are approaching learning in a manner that enhances deeper understanding. The aim of students who approach learning in order to deepen their understanding "with the intention of actively seeking out the author's meaning" (Newble & Entwistle, 1986, p.164). Students whose "intention is to identify and then memorize what they see to be the important fact and ideas...remember the facts they think might be required to produce at the end of the text" (Newble & Entwistle, 1986, p.164) are described as using a surface approach. Students who use a deeper approach to learning are reported to: a) be more successful in passing examinations, b) have a more complete understanding and be able to remember more facts, and c) spend more time in independent study (see Newble & Entwistle, 1986, for a review).

Added support for the positive relationship between a deeper approach to learning and PBL was revealed in a longitudinal study examining learning styles and strategies of PBL students at the University of Transkei (Iputo, 1999). Iputo compared the learning styles of 106 students over the four years that they attended the medical school. The author reports a reduction in the scores for individual achievement, fear of examination, globetrotting, and an increase in the scores for operation learning and versatile learning. The author concludes that it appears that participation in a PBL curriculum assists medical students in becoming more versatile learners leaning towards
a logical learning style, and encourages less competitiveness, globetrotting, and improvidence.

In the present investigation, students' learning styles will be assessed using the 29-item version of the LI. Although sparse, the research demonstrates a relationship between a PBL curriculum and self-directed learning, intrinsic motivation, academic enthusiasm and enjoyment and satisfaction with the curriculum among PBL students. The following section will explore the relationship between PBL and problem solving.

**PBL and Problem-Solving**

One of the initial premises of PBL was that it would improve problem-solving skills (Barrows, 1984); however the results of several research projects and reviews are conflicting. For example, Berkson (1993), Elstein, Shulman and Sprafka (1978), as well as Norman and Schmidt (1992) have not reported significant differences between the acquisition of problem-solving skills in PBL students and other students. However, in their review of the literature, Albanese and Mitchell (1993) concluded that PLB students have deficits in problem solving (i.e., forward reasoning) when compared to their conventionally trained peers. Maudsley (1999) suggested that these differences may be a result of a lack of clear definition of problem solving. For example, Barrows and Feltovich (1987) conceptualized problem solving as a hypothetical-deductive model of clinical reasoning defined as the serial questioning-justification-interpretation. Barrows and Feltovich argued that the problem-solving process used by expert medical practitioners is "characterized by the generation of multiple hypotheses followed by a problem-oriented inquiry" (p. 88), referred to as backward reasoning. Conversely, Gilhooly (1990) characterized backward reasoning as a process that is typically used by novices and forward reasoning as a process typically used by experts. An alternative view was stated by Norman, Trott, Brooks, and Smith (1994) who observed both forward
and backward reasoning in the problem solving of experts. An example of backward reasoning is offered by Albanese and Mitchell (1993), "a student comparing a patient's presenting signs and symptoms with those that occur for a relatively undifferentiated list of illness, cataloguing those that match and gradually narrowing the choices to the disease with the highest match rate" (p. 60). The authors cited the following example of forward reasoning, "Forward reasoning would seem to be consistent with the pattern recognition or illness-script conceptualization of the expert problem-solving process." (p. 60).

Others (i.e., Norman, 1988; Norman and Schmidt, 1992) linked problem solving to knowledge and the ability to easily access that knowledge. This results in the ability of experts to generate a greater number of informed hypotheses. An additional component is the use of inquiry skills that are conceptualized as "the general skills that can be applied to gather, interpret, and integrate data from a clinical problem" (Norman & Schmidt, 1992; p.588). Norman and Schmidt suggested that the reasoning process used by experts is pattern recognition. They posited that pattern recognition is a result of the complex cognitive processes that expert medical practitioners have proceduralized. Specifically, an expert diagnostican, when presented with a new case, is able to efficiently and correctly identify a pattern of symptoms and match them to previous case experience.

Claessen and Boshuizen (1985) operationalized problem solving as recall ability and reasoning process. To examine this issue, Claessen and Boshuizen presented 21 PBL medical students from the University of Limburg at Maastricht and 26 conventional medical students from the University of Limburg at Utrecht with two written patient cases. One case was classic in character and one was atypical. The students were assessed on their ability to recall information, identify important information, and create an accurate diagnosis. The students were also assessed on the amount of time taken
and the relevance of their statements. There were no differences reported between the groups on error rates; however the PBL students were more likely to include material that did not appear to be relevant to the case in their statements.

Patel, Groen, and Norman (1991) further explored the relationship between PBL and problem solving by investigating the forward or backward reasoning skills of students. Forward and backward reasoning skills are associated with expert-novice differences (Gilhooly, 1990). In this study Patel et al. (1991) presented a written clinical case to 54 PBL medical students attending McMaster and 54 conventional medical students attending McGill. Overall Patel et al. found that the senior PBL students, when compared to senior traditional students, employed backward reasoning and the generation of multiple hypotheses followed by inquiry, more often and made more erroneous statements.

Lemieux and Bordage (1992) propose that:

An accurate diagnosis is not explained in terms of forward reasoning through networks of casual rules, by means of networks of semantic qualities abstracted from the symptoms and signs...successful diagnosticians are those who use the most diversified and pertinent set of semantic axes and, therefore have a deeper representation of the problem. (p. 185)

Using this heuristic, Lemieux and Bordage reexamined Patel et al's (1991) study using a structural semantic approach as opposed to the propositional accuracy measured by Patel et al. Specifically, Patel et al. numbered each propositional segment of each sentence used by the participants in their explanations and then coded each segment according to grammatical function, recall-inference, linear order and frame notation reference. The frame notation reference assesses the directionality of reasoning; that is, text based knowledge followed by diagnosis indicates forward
reasoning and a general hypothesis followed by text based knowledge indicates backward reasoning.

Lemieux and Bordage (1992) propose that while propositions in language can be coded and measured this does not measure meaning or the pathways that are used to create meaning. They suggested that the differences between correct and incorrect diagnosis are a result of the greater amount of meaningful semantic inferences through the use of a sophisticated vocabulary composed by semantic axes (e.g., acute-chronic; low-medium-high). This allows the better problem solver to effectively and efficiently organize the information in order to recognize and define the symptoms and effects of disease. Lemieux and Bordage asserted that the conclusion that correct diagnosis is related to directionality of reasoning is a result of the methodology used by Patel et al. (1991) which minimizes the importance of the underlying structures that determine competence.

One solution to the problem of the operationalization of problem solving can be found in the writings of Dewey (1910). Dewey proposed that the inquiry begin by determining the nature of a problem before proceeding to attempt to solve it. The supposition that the initial recognition of a problem is tantamount to problem solving is widely supported (Cópland, 1999; Thomas, 1997). Mandin, Jones, Wolschuk, and Harasym (1997) suggested that while there is no generic problem-solving process, there exists a problem solving strategy that is applicable to problems of a similar type and this strategy follows a sequential series of steps beginning with an individual's perception and definition of a problem. Cuban (1990) referred to this process as the framing of a problem, "Framing a problem, then, is a subjective process. It depends upon one or two facts that show a discrepancy between what is and what ought to be. It depends on the perceptions of the person or group who interpret the data and do the defining" (p. 2).
Leithwood and Stager (1989) investigated problem-solving and public school personnel in a sample of school principals. Based on this research, Leithwood and Stager proposed a model of six components that were used to differentiate expert and novice school principals' problem solving. For example, when compared to novice principals, expert principals: a) develop a clear interpretation of a problem, b) are able to clearly articulate this problem to others, c) actively seek out others' interpretations to the problem, d) check their assumptions with others, e) do not become personally invested in the solution, f) anticipate problems, and g) plan in advance how to solve any anticipated problems.

Copland (1999) has produced the only research linking problem-framing ability and PBL. In general, Copland believes that problem-framing ability is linked to PBL in three ways: a) prior knowledge has to be activated in order for the problem solvers to understand the problem situation, b) the problems in the cases provide a context that will facilitate the encoding of the new knowledge in a manner that will allow the learner to remember it, and c) the skills of problem-framing are enhanced through group discussion, peer review and personal reflection.

Copland (1999) created a rubric of the three skills (i.e., definition of the stated problem, reflection of the stated problem, reframing the problem) and 10 sub-skills that define problem-framing ability and used this rubric to examine problem framing in 18 students attending Stanford University Prospective Principals Program. He reported a positive association between PBL exposure and problem-framing ability. However, Copland identified three limitations: a) the small number of subjects in each group, b) the lack of a control group, and c) the lack of random assignment to each group.

Maudsley (1999) suggested that not only are there conceptual differences between current definitions of problem solving but the tools for measuring problem
solving are poorly developed as it is difficult to discern the use or lack of use of problem-solving strategies.

The next section will explore the relationship between the perceptions of their training and preparation between graduates of PBL or traditional curricula.

Graduates Perceptions of their Training and Preparation

Comparisons of the feelings towards their training and preparation of PBL and traditional students have relied on questionnaires and the results indicate that graduates from PBL programs view themselves overall to be equal to or better prepared than graduates from traditional programs (Albanese & Mitchell, 1993; Antepohl & Herzig, 1999; and Vernon & Blake, 1993; Wolfe, 1993). A study conducted by McGrew, Skipper, Palley, and Kaufman (1999) illustrates this type of investigation. The participants in this study included 119 of 165 (72%) of medical students attending the University of New Mexico School of Medicine (UNM). The program at UNM is composed of three phases over four years. Students attend PBL tutorials and lectures in phases one and two. They begin clinical activity in phase one and clerkships in phase two. Phase three consists of subinternships, electives and a rural experience. McGrew et al. (1999) reported that the PBL students felt that the PBL component (i.e., PBL tutorials using real cases) and independent study prepared them more effectively than the didactic lectures for the final practical phase of their program.

A recent study conducted by the author (1999) found no significant differences on feelings of preparation to teach between PBL and traditional teacher education students enrolled in the teacher education program at the University of British Columbia. The participants in this study included thirty-one student teachers drawn from two populations: students who were enrolled in the traditional teaching education program elementary school focus (n = 12) and students who were enrolled in the PBL teacher education program (n = 19). This study included 24 females and seven males ranging in
age from 24 to 40 years. Their teaching assignments spanned the elementary grades, kindergarten to grade seven. The PBL group was composed of 15 females and four males. The traditional education student group was composed of nine females and three males. In this study, the author administered the Student Teachers' Feelings of Preparedness to Teach Scale (PREP; Housego, 1990b) and the Gibson Teacher Efficacy Scale (Dembo & Gibson, 1984). The PREP (Housego, 1990b) is a 50 item measure that is designed to assess the degree to which student teachers feel prepared to perform a set of tasks central to teaching. The PREP asks questions such as "How prepared do you feel at this point in time to give clear explanations to students?" or "How prepared do you feel at this time to summarize a lesson?" The student teacher is asked to rate the questions using a five-point, Likert-type scale with 1 "very poorly" and 5 "very well" as anchors. Repeated administrations reported reliabilities (measured by Hoyt's coefficient) ranging from .95 to .97. Cronbach's alpha in the present study was .87.

The Gibson Teacher Efficacy Scale (Gibson & Dembo, 1984) is a 16-item measure designed to measure teachers' feelings of efficacy. Nine items measure personal teaching efficacy, a teacher's belief that he or she has the skills and abilities to effect student learning (e.g., "When I really try, I can get through to most difficult students."). Seven items measure teaching efficacy, a teacher's belief that teaching itself can overcome the effects of negative home and family background influences (e.g., "The amount that a student can learn is primarily related to family background."). Each item uses a five-point, Likert-type scale with 1 "strongly disagree" and 5 "strongly agree" as anchors. The original measure uses a six-point Likert-type scale. The current study included only one "neutral choice." Previous research (Woolfolk & Hoy, 1990) reported satisfactory reliability of the Gibson Teacher Efficacy Scale (.74 for teaching efficacy and .82 for the personal efficacy scale). Cronbach's alpha in the present study was .89.

Overall, the author found the ANOVA yielded no significant group effect for feelings of
teacher preparedness. Both groups of student teachers' feelings of preparedness to teach scores increased from pretest to post test. These results support previous research (Housego, 1990) that found participants significantly (p < .01) increased in their feelings of preparedness to teach. With regard to personal teaching efficacy the ANOVA revealed no significant differences between groups. A significant group effect emerged for teaching efficacy F (2, 28) = 6.74, p<.05, indicating that PBL students believe that teaching itself can overcome the effects of negative home and family background. These findings provide evidence that students who participate in a PBL program feel that they are equally prepared to teach as students who participate in a traditional program.

**Performance Assessment of Graduates**

Few studies have investigated the performance of PBL medical school graduates. This problem is compounded by difficulties in interpreting the results and a lack of clear criteria for measuring success. Is success measured by cost-effectiveness, time spent with a patient, the number of new patients or the number of referrals to other specialists? An example of these difficulties can be found in two studies conducted at McMaster University by Woodward, Ferrier, Goldsmith and Cohen (cited in Albanese & Mitchell, 1993). The authors of these two studies compared the patient care profiles of graduates from a PBL medical school (i.e., McMaster) and traditional medical schools by examining the reimbursement to each physician. Woodward et al. (cited in Albanese & Mitchell, 1993) included 261 PBL graduates and 1,741 traditional graduates and examined time in direct patient care. The 1990 study included 322 PBL graduates and 322 traditional graduates and examined the number of services per month, earnings per month, patients per month, cost per service, cost per patient, services per patient and psychotherapy services. The authors reported that PBL graduates earned less per month and had a higher cost per patient. That is, they spent more time with each patient, saw fewer patients, and made more psychotherapy services per month. At first
glance, these results seem to favor PBL. But as Albanese and Mitchell (1993) explain, the interpretation of these data is challenging as "the results suggest that PBL graduates are more likely to spend more time with patients...on the other hand, a similar practice profile would result if PBL graduates had more difficulty arriving at a definite diagnosis and had to resort to psychotherapy for treatment" (p. 67). Exploring the relationship between a specific educational program and the performance of its graduates is undoubtedly an important responsibility of educators and it is this relationship that continues to need to be explored. An additional valuable research focus in teacher education is the exploration of the relationship between students' prior beliefs and specific teacher education programs. This relationship will be examined in the following section.

Teacher Education

Teacher Education Students' Prior Beliefs

According to Constructivist theory (Bruner, 1966, Piaget, 1974/1980b) learners come to a learning situation with a set of previously constructed ideas and beliefs based on personal experience and cultural influences and these ideas and beliefs may be strongly established. These ideas and beliefs are referred to as folk pedagogues (Bruner, 1966), personal history-based lay theories (Holt-Reynolds, 1992), and images (Calderhead & Robson, 1991). Bird, Anderson, Sullivan, and Swidler (1993) stated that these beliefs may include conceptual categories, empirical claims, prescriptive guidelines, and educational values. Research (Lonka et al., 1996; Joram & Gabriele, 1998; Weinstein, 1989) has indicated that these ideas and beliefs are robust and difficult to change.

Teachers' belief is generally defined as "teachers' implicit assumptions about students, learning, classrooms and subject matter to be taught" (Kagan, 1992, p.66).
These prior beliefs serve as frameworks and filters through which students interpret and translate information from their university courses and observations (Joram & Gabriele, 1998; Kagan, 1992; Lonka, Joram, & Bryson, 1996) and "may not be well adapted to teaching" (Calderhead, 1991, p.532). However, they might have a profound impact on the practice of teaching. In a review of the research addressing teacher beliefs, Kagan believes that the research evidence consistently demonstrates the prior knowledge that teacher education students bring to teacher education tends to be stable and resistant to change. Indeed, not only do teacher education students leave the program with the same beliefs they began the program with, students become more comfortable with their initial beliefs. It is not surprising that the search for instructional techniques that are directed to influencing students' prior beliefs continues to be a topic of interest in teacher education research.

This section briefly summarizes several alternative explanations regarding the minimal effect of teacher education programs on changing student teachers' beliefs: a) strong pre-training influences, and b) the relation of pedagogy to field experience.

The first of these positions, entitled the "apprenticeship of observation" (Lortie, 1985), suggests that the thousands of hours of exposure to teaching models have resulted in the development of an established set of beliefs that "washes out" (Ziechnner & Tabachnick, 1981) any university pedagogical training. For example, Calderhead and Robson (1991) found teacher education students held beliefs of teaching that were derived mostly from their own school experiences and these beliefs influenced their interpretation of their courses and classroom experiences. Calderhead and Robson interviewed seven primary teacher education students on four occasions over the course of a year. The aim of the interviews was to examine the knowledge the students possessed about classroom practice. In addition to the four interviews, participants were shown two videos of contrasting teaching styles and asked to comment on the aspects
of the teaching styles they liked or disliked and describe how they would have reacted to
the situation. Finally, the participants were asked to describe a creative writing lesson,
then shown a video of a creative writing lesson, and asked to comment on the video.

Calderhead and Robson stated that the beliefs education students have about teaching
and classroom process can be conceptualized as images. The researchers reported
that the images that teacher education students possessed before they began the
program strongly influenced what the participants found relevant in the course.

Calderhead and Robson replicated previous research (Hollingsworth, 1988; Nespor,
1985) both in their results and their conclusions. That is, teacher education programs
need to assist teacher education students in becoming more reflective and conscious of
their beliefs and to create conflict between the beliefs held by the students and the new
beliefs being taught.

Teacher education students enter the program believing that teaching
experience, not course work, is what they need to master teaching (Joram & Gabrielle,
education programs reinforces that belief by not actively bridging the gap between
theory and practice. He argued that teacher education programs assume that students
will link theory to practice by not directly promoting a model for teacher education that
systematically promotes an analytic response to teaching.

There is evidence to support the thesis that portfolios can be used in teacher
education to promote an analytic response to teaching though reflective thinking.

Reflective thinking in teacher education has been defined as: deliberation of pedagogy,
questioning institutional criteria and goals, and reflecting and analyzing personal
teaching practice and experience (Wade & Yarbrough, 1996). Wade and Yarbrough
investigated the relationship between portfolios and self-reflection in a sample of 151
undergraduate elementary teacher education students. The portfolios included both five
required assignments (i.e., reflection on the students' experiences, a research paper, an integrated lesson plan, and two letters to the instructor) and items chosen by the students. These items typically included a journal, resources and handouts. Wade and Yarbrough reported that 93 of the 151 participants in their study indicated that portfolios helped with their reflection with respect to representing learning and their ability to reflect on the specific course, and 61% (92 of 151) would use the portfolios for personal purposes. That is, students would use the portfolios in their future classroom teaching and found portfolios a valid tool.

Wade and Yarbrough (1996) confirmed the results of previous research (Barton & Collins, 1993) that has found a link between the use of portfolios in teacher education and self-reflection. From this research, one could argue that programs that develop self-reflection have the potential to improve the ability of students to link academic experience to their practical experience.

It is hypothesized in this study that the structure of the PBL program (e.g., year-long cohorts, year-long classroom experiences, real life-like cases, school based assessment, and the use of portfolios) at UBC would assist students in modifying their pre-existing beliefs and linking theory to practice. It was expected that those students who participated in the PBL teacher education curriculum would demonstrate a significant change in their beliefs when compared to students participating in a traditional teacher education curriculum.

**Practicing Teachers' Perceptions of Inclusion**

For over two decades, there has been a concerted attempt by those involved in establishing the procedures and guidelines for education to support the concept of equitable access to education for all students. In 1982, the Ministry of Education in the province of British Columbia published the first of many documents that support equitable access to education for all students. Although this first document
reflected only guidelines, the rights of all students in British Columbia to be included are now guaranteed by law (i.e., Ministerial Order 150/89). The intent of these laws and policies is to promote the development of an inclusive society through a unitary system of education. Beginning with "mainstreaming" in the 1970s, a number of terms and practices have been used to describe an integrated educational setting. For the purposes of this discussion, the definitions used by the Ministry of Education (1995) in the province of B.C. will be used. Inclusion refers to a value system "which holds that all students are entitled to equal access to learning and achievement" (p. 7).

There is a substantial nonempirical literature base (Houck & Rogers, 1994) composed of position papers as well as conceptual and opinion articles that debate the merits of inclusive education. However, there is a paucity of empirical evidence to support the efficacy of inclusive educational program outcomes (Lindsey, Ghose & Ramsasamy, 1996; Roach, 1995; Scruggs & Mastopieri, 1996). One exception is the examination of the variables promoting greater support for inclusive education. These variables include administrative district support, administrative support, monetary support, resource support, and teacher attitude (e.g., Blenk & Fine, 1995; Larrivee & Cook, 1979; Scruggs & Mastopeiri, 1994). Of these variables, Bender, Vail and Scott (1995) suggested that the most important variable is teacher attitude.

A number of previous studies have examined teachers' perceptions of inclusion of students with special needs (Houck & Roger, 1994; Larrivee & Cook, 1979; Scruggs & Mastopeiri, 1996) and identified variables related to teacher support of inclusive education. These variables include:

1. Personal agreement with the stated goals of inclusive education.

2. Teacher efficacy. Teacher efficacy is composed of two components, a sense of personal competency (i.e., teachers' beliefs in their own ability to bring about change
in their students) and the efficacy of teaching (what learning gains can be made through teaching).

3. Effective use of strategies

4. Training

5. Time

Bender and Ukeje (1989) have suggested that while it is possible to examine these variables independently, they are correlated (e.g., teacher attitude and effective use of strategies and teacher support of inclusive education). As Bender and Ukeje noted, "It does very little good to teach mainstream teachers how to use effective strategies, if the attitudes of those teachers effectively prevent the use of strategies" (p. 28). Additional evidence for the relation between teaching efficacy and inclusion is found in two recent studies - Scruggs and Mastropieri (1996) and Podell and Soodack (1993). Scruggs and Mastropieri examined teachers' perceptions of mainstreaming. Their conclusions are based on nine surveys and represent the opinions of 2,193 respondents from both Canada and the United States. Scruggs and Mastropieri reported that while 65% of the teachers surveyed indicated support for mainstreaming, only 53.4% were willing to teach students with disabilities. Scruggs and Mastropieri hypothesized that teachers' willingness to accept a student covaries with the severity of the disability and the teachers' perception of their ability to handle the student. These findings are consistent with those found in an earlier study conducted by Podell and Soodak (1993). Podell and Soodak investigated the influence of teaching efficacy and the type of problem experienced by the student on special education referrals. Specifically, Podell and Soodak examined whether teachers' sense on personal efficacy and teaching efficacy had a significant bearing of their judgments towards the appropriateness of educational placement for those students with learning and behavioral problems. The participants in this study included 192 teachers (96 regular
educators and 96 special educators) who had been teaching for one year. Podell and Soodak found that teachers' willingness to work with more difficult students is a result of their sense of their ability as a teacher, their sense of the efficacy of teaching, as well as the type of problem experienced by the student.

These studies demonstrate that while the majority of practicing teachers support inclusion, only half are willing to have students with disabilities in their classes and many experienced teachers do not feel that they possess the necessary skills for inclusion (Podell & Soodak, 1995; Scrugg & Mastropieri, 1996). The present study will include measures of student teachers' attitudes towards students with special needs in order to investigate this important issue.

These studies provide important information regarding the importance of practicing teachers' perceptions of teaching efficacy and personal efficacy and inclusion. However, little research exists that has examined student teachers' feelings of preparedness to teach, personal teaching efficacy, and teaching efficacy and inclusion. The few extant published studies in this area will be reviewed.

**Student Teachers' Practicum Experiences and Attitudes Regarding Inclusion**

Warger and Tripe (1982) examined student teachers' attitudes toward mainstreamed students with emotional impairments. They studied the attitudes of 213 undergraduate students (54 male, 159 female) after they had completed two months of student teaching in either elementary or secondary classrooms. Their findings revealed that while student teachers found the behaviours of students with emotional impairments troubling, they were strongly in favor of the concept of mainstreaming and felt that they possessed the necessary skills for mainstreaming. Warger and Tripe reported that this finding is surprising, as experienced teachers do not find themselves possessing the necessary skills for mainstreaming. They hypothesized that the student teachers' limited experience might account for these differences.
Hoover and Cessna (1984) offered further support towards a positive attitude to inclusion by student teachers. They compared the attitudes of two groups of student teachers \( n = 58 \). Group 1 \( n = 38 \) consisted of students who had just completed a mainstreaming course and did not have extensive fieldwork experience. Group 2 \( n = 27 \) consisted of students who had completed a mainstreaming course the previous year and approximately 180 hours of fieldwork. The authors found that student teachers from both groups reported a positive attitude towards mainstreaming and had confidence in their ability to teach in an inclusionary setting. However, those students who had recently completed the mainstreaming course demonstrated higher positive attitudes towards mainstreaming. The Group 2 students were assessed again after a lapse of a minimum of five months. The authors reported that after a time lapse of five months the highly positive attitudes were not as apparent. The authors suggested that "as prospective teachers become older and/or gain more experience with the challenges of classrooms and teaching they may become more conservative or realistic" (p. 51).

These findings support previous research (e.g., Alper & Retish, 1972) that found that the attitudes of student teachers towards inclusion became less positive after their practica.

Although meager, the preceding studies demonstrate a relationship between practicum experience and attitudes regarding inclusion among student teachers. The present study will add to the body of literature by further examining this relationship.

**Student Teachers' Coursework and Attitudes Regarding Inclusion**

Researchers (see Renzaglia, Hutchins, & Lee, 1997 for a review) have suggested that course content and organization, course delivery, course assessment, interactions with faculty, student teaching and school experiences, a congruent theoretical and conceptual teacher education framework, university supervision, and supervision models also have an impact on student teachers' beliefs and attitudes towards inclusion of students with special needs. Renzaglia, Hutchins, and Lee (1997)
reported that there is little empirical data indicating the effect of different components of teacher education on the beliefs, attitudes and dispositions of preservice teachers towards students with disabilities. However, the authors were able to identify common themes: the promotion of reflective teaching framework using small group discussions that examine problems using case studies and action research; and a cohesive integrated set of experiences. PBL differs from a traditional education program on these variables. In summary, there is strong evidence that teacher education students' beliefs are strongly entrenched. It is the responsibly of teacher education programs to design programs that are facilitative of positive attitudes towards students with special needs and to be cognizant of the impact of their teacher education programs on teacher education students' beliefs. The present study will add to the body of literature by further investigating differences between teacher education students completing a PBL or traditional teacher education program in order to determine if the structure of PBL will have a significant impact on modifying the students' preexisting beliefs and attitudes towards inclusion.

**Hypotheses**

In order to determine the effects of participation in a PBL teacher education program the present study examined changes in attitudes and opinions of a group of PBL teacher education students from the beginning of their teacher education to the end of their teacher education. This was accomplished in two ways by: a) examining the changes in attitudes and opinions among the PBL students, and b) comparing the attitudes and opinions between the same group of PBL students and a group of non-PBL students. Additionally, the present study examined the attitudes and opinions of university and school personnel who were involved with PBL. It was hypothesized that at the completion of their teacher education programs:
1. Participants in a PBL teacher education program would show increases in their scores on the Gibson Teacher Efficacy Scale (Gibson & Dembo, 1984) when compared to their scores at the beginning of the program.

2. Participants in a PBL teacher education program would show increases in their scores on the Student Teachers' Feelings of Preparedness to Teach Scale (Housego, 199b) when compared to their scores at the beginning of the program.

3. Participants in a PBL teacher education program would show changes in learning style scores when compared to their scores at the beginning of the program.

4. Participants in a PBL teacher education program would show differences in their opinions of their teacher preparation when compared to participants in a traditional teacher education program.

5. Participants in a PBL teacher education program would show differences in their opinions about the effect of their program on their attitudes towards inclusion of students with special needs when compared to participants in a traditional teacher education program.

6. Participants in a PBL teacher education program would show greater changes in scores in their perceptions of their improvement in self-directed learning and their feelings about the importance of self-directed learning when compared to traditional teacher education students.

7. Participants in a PBL teacher education program would show differences in their perceptions of the impact their teacher education year had on their beliefs about teaching and learning when compared to the students in the traditional teacher education program.

8. There would be differences in the performance assessments of PBL teacher education participants and traditional teacher education participants.
9. There would be higher levels of satisfaction for the university and school-based personnel.
CHAPTER 3
Methodology

Description of the Sample

The participants in this study were 66 student teachers drawn from two populations: students who are enrolled in the traditional teacher education program elementary focus (n = 40) and students who were enrolled in the PBL teacher education program (n = 26). The background information of the teacher education students can be found in Table 4. The 26 PBL students represented 58 percent of the 45 PBL students who had successfully completed their final practicum.

The present study also included 12 PBL instructors (seven PBL tutors, five method specialists). The background information of the instructors can be found in Tables 5 and 6. The return rate for the tutors was 100% (n = 7) and 71% (n = 5) for the methods specialists.

The background information on the school-based personnel is listed in Tables 7 and 8. The school-based personnel consisted of 38 school associates, the teachers who directly supervised the students in their practica, and 10 school administrators who had PBL practicum students in their schools and/or had been involved with the job placement interviews of PBL graduates. The return rate for the administrators was 100%. The ten administrators had come into contact with over 100 PBL students across the three years of the program. The return rate for the school associates was 84% (n = 38).
Table 4
Background information on Teacher Education Students

<table>
<thead>
<tr>
<th>Variables</th>
<th>PBL Students</th>
<th>Non-PBL Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Males</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>21 - 45 yrs.</td>
<td>23 - 49 yrs.</td>
</tr>
<tr>
<td>Mean</td>
<td>28 yrs.</td>
<td>28 yrs.</td>
</tr>
<tr>
<td>SD</td>
<td>6 yrs</td>
<td>6 yrs.</td>
</tr>
<tr>
<td>Children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>24</td>
<td>36</td>
</tr>
<tr>
<td>Undergraduate Degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Humanities or Arts</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>Social Science</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Fine Arts</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Human Kinetics</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Theology</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Years of experience with children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>2 - 21 yrs.a</td>
<td>1 - 21 yrs.b</td>
</tr>
<tr>
<td>Mean</td>
<td>9 yrs.</td>
<td>6 yrs.</td>
</tr>
<tr>
<td>SD</td>
<td>6 yrs.</td>
<td>3 yrs.</td>
</tr>
</tbody>
</table>

Note. Means not sharing a common subscript significantly differ at p < .05.
### Table 5

**Background Information on PBL Tutors**

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PBL supervising experience</strong></td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>1</td>
</tr>
<tr>
<td>3 years</td>
<td>6</td>
</tr>
<tr>
<td><strong>PBL tutoring experience</strong></td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>4</td>
</tr>
<tr>
<td>3 years</td>
<td>3</td>
</tr>
<tr>
<td><strong>Non-PBL teacher education experience</strong></td>
<td></td>
</tr>
<tr>
<td>0 – 5 years</td>
<td>1</td>
</tr>
<tr>
<td>6 – 10 years</td>
<td>2</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>4</td>
</tr>
<tr>
<td><strong>Degree</strong></td>
<td></td>
</tr>
<tr>
<td>B.A.</td>
<td>1</td>
</tr>
<tr>
<td>B. Ed.</td>
<td>2</td>
</tr>
<tr>
<td>M. Ed.</td>
<td>2</td>
</tr>
<tr>
<td>Ph. D.</td>
<td>2</td>
</tr>
<tr>
<td><strong>Involved in writing cases</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7</td>
</tr>
<tr>
<td><strong>Involved in examinations</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7</td>
</tr>
<tr>
<td><strong>Would tutor again</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
</tbody>
</table>
### Table 6

**Background Information on Method Specialists**

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PBL experience</strong></td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>3</td>
</tr>
<tr>
<td>3 years</td>
<td>2</td>
</tr>
<tr>
<td><strong>Non-PBL teacher education experience</strong></td>
<td></td>
</tr>
<tr>
<td>0 – 5 years</td>
<td>3</td>
</tr>
<tr>
<td>6 – 10 years</td>
<td>1</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>1</td>
</tr>
<tr>
<td><strong>Degree</strong></td>
<td></td>
</tr>
<tr>
<td>M. Ed.</td>
<td>2</td>
</tr>
<tr>
<td>Ph. D.</td>
<td>3</td>
</tr>
<tr>
<td><strong>Involved in writing cases</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td><strong>Involved in examinations</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td><strong>Would be a method specialist again</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
</tr>
<tr>
<td>Variable</td>
<td>n</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Teaching experience</td>
<td></td>
</tr>
<tr>
<td>0 – 5 years</td>
<td>2</td>
</tr>
<tr>
<td>5 – 10 years</td>
<td>13</td>
</tr>
<tr>
<td>More than 10</td>
<td>23</td>
</tr>
<tr>
<td>School associate experience</td>
<td></td>
</tr>
<tr>
<td>0 – 5 years</td>
<td>23</td>
</tr>
<tr>
<td>6 – 10 years</td>
<td>11</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>4</td>
</tr>
<tr>
<td>Previous PBL experience</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>34</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>26</td>
</tr>
<tr>
<td>M.A. in progress</td>
<td>2</td>
</tr>
<tr>
<td>M.A.</td>
<td>6</td>
</tr>
<tr>
<td>M.Ed.</td>
<td>2</td>
</tr>
<tr>
<td>M.Sci.</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 8  
**Background Information on School Administrators**

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teaching experience</strong></td>
<td></td>
</tr>
<tr>
<td>0 -25 years</td>
<td>4</td>
</tr>
<tr>
<td>26-30 years</td>
<td>2</td>
</tr>
<tr>
<td>More than 30</td>
<td>3</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td><strong>Administrator experience</strong></td>
<td></td>
</tr>
<tr>
<td>0 – 5 years</td>
<td>4</td>
</tr>
<tr>
<td>6 –10 years</td>
<td>2</td>
</tr>
<tr>
<td>More than 10</td>
<td>3</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td><strong>Previous PBL experience</strong></td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>1</td>
</tr>
<tr>
<td>2 years</td>
<td>3</td>
</tr>
<tr>
<td>3 years</td>
<td>6</td>
</tr>
<tr>
<td><strong>Number of PBL students in your school this year</strong></td>
<td></td>
</tr>
<tr>
<td>Less than 3</td>
<td>3</td>
</tr>
<tr>
<td>Between 4 - 10</td>
<td>7</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>M.A.</td>
<td>4</td>
</tr>
<tr>
<td>M.Ed.</td>
<td>4</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>1</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
</tr>
</tbody>
</table>
Measures

Demographic Information (Appendix A)

A questionnaire was used to gather information about each student's gender, age, educational training/degrees, and experiences working with children.

Student Teachers' Feelings of Preparedness to Teach Scale (PREP; Housego, 1990b, Appendix B)

This is a 50-item measure that is designed to assess the degree to which student teachers feel prepared to perform a set of tasks central to teaching. The PREP asks questions such as "How prepared do you feel at this point in time to give clear explanations to students?" or "How prepared do you feel at this time to feel to summarize a lesson?" The student teacher is asked to rate the questions using a five-point, Likert-type scale with 1 "very poorly" and 5 "very well" as anchors. Housego (1990b) reported reliabilities (measured by Hoyt's coefficient) ranging from .95 to .97. A previous investigation (Krivel-Zacks, 1999) reported the Cronbach's alpha as .87. Cronbach's alpha in the present investigation was .98.

Gibson Teacher Efficacy Scale (Gibson & Dembo, 1984, Appendix C)

This scale is a 16-item measure designed to measure teachers' feeling of efficacy. Nine items measure personal teaching efficacy, a teacher's belief that he or she has the skills and abilities to effect student learning (e.g., "When I really try, I can get through to most difficult students."). Seven items measure teaching efficacy, a teacher's belief that teaching itself can overcome the effects of negative home and family background influences (e.g., "The amount that a student can learn is primarily related to family background."). Each item uses a five-point, Likert-type scale with 1 "strongly disagree" and 5 "strongly agree" as anchors. The original measure used a six-point Likert-type scale. The current study included only one "neutral choice." Previous research (Woolfolk & Hoy, 1990) reported satisfactory internal consistency reliabilities for
the Gibson Teacher Efficacy Scale, .74 for teaching efficacy and .82 for the personal efficacy scale. A previous study (Krivel-Zacks, 1999) reported the Cronbach's alpha as .89. In the present study the subscales were found to be internally consistent, as evidenced by Cronbach's alphas ranging from .70 for teaching efficacy and .83 for personal teaching efficacy.

**Lancaster Approaches to Studying Inventory (LI; Entwistle, 1981, Appendix D)**

The LI is a 29-item measure that assesses information processing. The present study used the 29 items listed in Entwistle (1981), these items were grouped into seven subscales that were combined into four broad scales: reproducing orientation, meaning orientation, strategic orientation and styles and pathologies. The subscales and their meanings are outlined in Table 9.
Table 9.

Meaning of Subscales in Lancaster Approaches to Studying Inventory

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meaning orientation</strong></td>
<td></td>
</tr>
<tr>
<td>Deep approach</td>
<td>Active questioning in learning</td>
</tr>
<tr>
<td>Interrelating ideas</td>
<td>Relating to other parts of the course</td>
</tr>
<tr>
<td>Use of evidence</td>
<td>Relating evidence to conclusions</td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>Interest in learning for learning’s sake</td>
</tr>
<tr>
<td><strong>Reproducing orientation</strong></td>
<td></td>
</tr>
<tr>
<td>Surface approach</td>
<td>Preoccupation with memorization</td>
</tr>
<tr>
<td>Syllabus boundness</td>
<td>Relying on staff to define learning tasks</td>
</tr>
<tr>
<td>Fear of failure</td>
<td>Pessimism and anxiety about academic outcomes</td>
</tr>
<tr>
<td>Extrinsic motivation</td>
<td>Interest in courses for the qualifications they offer</td>
</tr>
<tr>
<td><strong>Achieving orientation</strong></td>
<td></td>
</tr>
<tr>
<td>Strategic approach</td>
<td>Awareness of implications of academic demands</td>
</tr>
<tr>
<td>Disorganized study</td>
<td>Unable to work regularly and effectively</td>
</tr>
<tr>
<td>methods</td>
<td></td>
</tr>
<tr>
<td>Negative attitudes to</td>
<td>Lack of interest and application</td>
</tr>
<tr>
<td>studying</td>
<td></td>
</tr>
<tr>
<td>Achievement</td>
<td></td>
</tr>
<tr>
<td>motivation</td>
<td></td>
</tr>
<tr>
<td><strong>Styles and Pathologies</strong></td>
<td></td>
</tr>
<tr>
<td>Comprehension learning</td>
<td>Readiness to map out subject areas and think divergently</td>
</tr>
<tr>
<td>Globetrotting</td>
<td>Over-ready to jump to conclusions</td>
</tr>
<tr>
<td>Operation learning</td>
<td>Emphasis on facts and logical analysis</td>
</tr>
<tr>
<td>Improvidence</td>
<td>Over-cautious reliance on details</td>
</tr>
</tbody>
</table>

From Ramsden and Entwistle, 1981

Satisfactory reliability and the validity of the LI have been reported (Leiden et al., 1990). Alpha coefficients ranging from .74 to .76 were reported on three of the major factors (i.e., non-academic orientation, reproducing orientation, and meaning). However, a coefficient of .37 was reported for the subscale of strategic approach included in the achieving orientation and a coefficient of .26 was reported on the subscale of fear of
failure included in the reproducing orientation. In the present study, the internal subscales of the LI, as evidenced by Cronbach's alpha, ranged from .51 to .76 (.61, achieving; .51 comprehension; .76 meaning; .60 reproducing).

Questionnaire on Student Satisfaction (Antepohl & Herzig, 1999, Appendix E)

This questionnaire is a 25-item scale designed to assess students' satisfaction with a PBL course. The measure asks students to rate the content, framework, and subjective components of PBL (e.g., "The group climate facilitated the learning process."
"I will recommend PBL to other students."). For each item, respondents are asked to rate their overall satisfaction with aspects of PBL using a five-point scale with 1 "definitely disagree and 5 "definitely agree" as anchors. The present measure used only 15 items that were linked to the format of PBL as used in the present study. For example questions that addressed individual subjects (e.g., "I consider this subject to be important within my frame of studies.") and questions that addressed medical education (e.g., "The case illustrated medical concepts.") were not included. Cronbach's alpha for the present study was .60.

Self-rating Instrument for Competencies of Self-Directed Learning (Appendix F)

Students' rating of their self-directed knowledge was accomplished following the procedure outlined by Ryan (1993) using the four-item "Self-rating Instrument for Competencies of Self-Directed Learning" (Knowles, 1975), which relate to students perceptions of their abilities as self-directed learners. Questions one through four asked students to rate how they perceived their teacher education program to have had developed their abilities to identify their current learning needs, identify and locate a range of materials, critically evaluate the scope and accuracy of the information, and evaluate the application of this knowledge. Questions five through eight asked students to rate how important/relevant to their learning they perceived each item on a six-point Likert-type scale with 0 "absent" and 6 "high" as anchors. The current study includes
only one neutral choice. In order to determine if there were any differences between groups at the end of their teacher education year the current study used, "My teacher education program has developed my ability to:" as a stem. Previous research (Ryan, 1993) established alpha coefficients for items one through four as .58, .72, .63 and .81 respectively. In the present study the subscales were found to be internally consistent, as measured by Cronbach's alpha ranging from .86 for items one through four and .87 for items five through eight.

Student Teachers' Feelings about the Teacher Education Program (Appendix G)

In order to compare the attitudes and feelings of students to their teacher education programs, traditional and PBL teacher education students were asked to respond to seven open-ended questions. The students were presented the questions after they have finished their extended practica in June. The research questions were based on Renzagliz, Hutchins, and Lee (1997), Hmelo and Lin (2000) and Housego (1990) and ask teacher education students "How have your attitudes towards inclusion of students with special needs changed from September?", "What aspects of your teacher education year influenced your attitudes towards inclusion of students with special needs?", "Have you found the teacher education program relevant to the practice of teaching?", "How prepared did you feel to teach in your practicum?", "How did your teacher education year assist you in dealing with problems and issues that you faced during your teacher education year?", "Describe how your teacher education program had an impact on your attitude towards your own learning", and "Describe how your teacher education program has had an impact on your beliefs about teaching."

Attitudes and Opinions of Teaching Staff and Faculty Tutors (Kaufman & Holmes, 1996; Vernon, 1995, Appendix H)

This is a 25-item scale designed to assess the attitudes and opinions of PBL faculty concerning the merits of PBL curriculum compared to a traditional educational
The first section contains seven questions that ask for background information about the respondents (e.g., years of teaching at university, years of teaching PBL, degree). The second section includes eighteen items. Nine items ask about different aspects of PBL, six items ask about staff satisfaction with the PBL experience and three questions that ask faculty to comment on what they like, dislike and would change about PBL. For each item in the staff satisfaction scale, respondents are asked to rate their overall satisfaction with aspects of PBL using a five-point scale with 1 = very dissatisfied, 2 = dissatisfied, 3 = neutral, 4 = satisfied, and 5 = very satisfied. For each item in the different aspects of PBL scales, respondents are asked to compare PBL to a traditional teacher education program using a five-point scale with 1 = traditional significantly better, 2 = traditional generally better, 3 = both the same, 4 = PBL generally better, and 5 = PBL significantly better. A previous investigation (Vernon, 1995) reported the Cronbach's alpha as .87. Cronbach's alpha for the present investigation was .87.

**School Principals Assessment of PBL Students (Appendix I)**

This measure is a 10-item questionnaire that was adapted from Attitudes and Opinions of Teaching Staff (Vernon, 1995). The purpose of this questionnaire was to measure the attitudes and opinions of school principals with regard to the preparation and attitudes of PBL students. The first four questions asked for background information about the respondents; the next four questions asked respondents to compare PBL teacher education students to traditional teacher education students using a five-point Likert scale. Cronbach's alpha for the present investigation was .91. The final section of the questionnaire asked respondents to comment on differences between PBL teacher education students and to explain why they would or would hire a graduate from a PBL teacher education program.
School Associates' Assessment of PBL Students (Appendix J)

This measure is a 10-item questionnaire that was adapted from Attitudes and Opinions of Teaching Staff (Vernon, 1995). The purpose of this questionnaire was to measure the attitudes and opinions of school principals with regard to the preparation and attitudes of PBL students. The first four questions asked for background information about the respondents; the next four questions asked respondents to compare PBL teacher education students to traditional teacher education students using a five-point Likert scale. Cronbach's alpha for the present investigation was .84. The final section of the questionnaire asked respondents to comment on differences between PBL teacher education students and to explain why they would or would not hire a graduate from a PBL teacher education program.

Procedure

PBL Teacher Education Students

The Faculty of Education at UBC offers a number of program options. Each option is open to any student who has a four-year Bachelor's degree, which includes some pre-admission studies, and students are free to choose the program option that they would like to enroll in. The PBL students were recruited from a cohort of students who were enrolled in the PBL program. To ensure confidentiality and lack of coercion for the participants, the author (a PBL instructor) and a research assistant gave a 15-minute presentation of the study to all the PBL students in an auditorium at the university. It was emphasized to the students that their participation was voluntary and their choice would not affect their class marks. The author then left the room and participants who had expressed interest were given an informed consent form and asked to complete the questionnaire packet. The pre-test questionnaire packet included the demographic questionnaire, the "Student Teachers' Feelings about the Teacher Education Program", the "Questionnaire on Student Satisfaction" (Antepol & Herzig, 1999), and the "Self-
Rating Instrument for Competencies of Self-Directed Learning" (Knowles, 1975). The pretests were administered to this group during September. The post-tests were administered in a group setting at the end of the 13-week practicum when the PBL students met for a workshop.

Non-PBL Teacher Education Students.

The non-PBL education students were recruited from the teacher education students who had chosen the elementary teacher education program. Information letters, informed consent forms and questionnaires were sent to all non-PBL elementary teacher education students the second week of September. There was less than a 6% return rate by the middle of October. The teacher education students had now been attending school for four weeks and any pre-test information that would have been collected after that date would not have reflected their attitudes at the beginning of the program. Therefore, in July of the following year, the author gave a brief presentation of the study to all university instructors who were teaching a compulsory educational psychology and special education course. The author or a research assistant then went to the classes and during a regular weekly meeting, gave the same brief presentation of the study and collected the data. The measures for the non-PBL elementary teacher education students did not include the "Student Teachers' Feelings of Preparedness to Teach Scale" (Housego, 1990b), the "Gibson Teacher Efficacy Scale" (Gibson & Dembo, 1984), or the "Lancaster Approaches to Studying Inventory" (Entwistle, 1981).

Faculty

A brief presentation of the study was given and the questionnaires distributed to all faculty, tutors and methods specialists (i.e., the resource faculty who are specialists in subject areas) who were working with the PBL students during a monthly PBL staff meeting in May 2001. Faculty were asked to respond to the questionnaire within two
weeks. Faculty were assured of confidentiality and that their responses would be anonymous. The responses were sent through campus mail.

**School Administrators**

The school administrators were recruited from the one suburb of a large Western Canadian city. All of the school administrators have PBL practicum students in their schools. A PBL coordinator gave a brief presentation of the study to all of the school administrators at their monthly meeting. The school administrators were ensured of confidentiality. The questionnaires were distributed and the respondents were asked to return them by district mail in two weeks.

**School Associates**

School associates were the individual teachers who supervised the teacher education students in their practica. During a meeting in June, a brief presentation of the study was given to the school associates, from the same large suburb of a Western Canadian city, who had PBL students who had successfully completed their final practicum. School associates were asked to respond to the questionnaire by the end of the school year. School associates were assured of confidentiality and mailed their responses through campus or school district mail.
CHAPTER 4

Results

The description of the results of this study is divided into three sections. The first section presents the analyses of the changes in attitudes and opinions of PBL teacher education students from the beginning of their program until completion of their extended practicum. This section begins with a presentation of the results of the changes of the PBL students from pretest to posttest on the measures of feelings of teacher preparedness, feelings of teaching efficacy and learning styles and strategies. This is followed by a comparison of the PBL students to the non-PBL students on their opinions about their programs and their ratings of self-directed learning. The section ends with the results of six-open ended questions that compared the opinions and attitudes of the PBL and non-PBL students at the end of their practica.

The second section presents the analyses of the attitudes and opinions of university faculty on the effects of participating in a PBL curriculum. The final section presents the analyses of the attitudes and opinions of the school-based staff on the effects of participating in a PBL curriculum.

There are two sets of data used in the analyses presented. One set includes quantitative data (e.g., Likert-type scales). Various statistical methods were used in the analysis of these data; Cronbach's alpha to describe homogeneity and t-tests to explore differences between the opinions of the participants with respect to the PBL teacher education program and the traditional teacher education program. In order to determine the relationship between the background information of the participants and their attitudes and opinions, this study compared the attitude scores to the background information of each participant group (i.e., school administrators, faculty, and students).
The second data set included open-ended questions that were used to explore the opinions of the tutors, method specialists, school associates and school administrators in more depth. Following the procedure described by Vernon (1995), the first response to each question was classified by the author into one of several response types. To determine inter-rater reliability, a second rater independently scored a random selection of 50% of the questionnaires. The final level of inter-rater agreement was 100%.

The students' responses, which were more complex and lengthy, were analyzed using the sequential data analysis outlined by Huberman and Miles (1994). Specifically, working with a research assistant, the primary researcher underlined the key ideas in the responses to question one, "How have your attitudes towards children with special needs changed from September." The key ideas were then restated as key phrases. The key phrases were written on file cards. The key phrases were examined, grouped into categories, and then grouped under headings that reflected those categories. Finally, the key phrases under each category were sorted into themes. Two key headings emerged from question one, "change" and "no change". For example, the categories under the heading of change were "positive" and "negative". The themes under the categories of favorable were "more confident" and "more aware". The category under the heading of less favorable was "more difficult". The same procedure was followed for each of the remaining five questions.

Attitudes and Opinions of the Teacher Education Students

PBL Teacher Education Students

Feelings of teacher preparedness. A significant difference emerged between the pretest and posttest scores of the PBL teacher education students, \( t_{(25)} = 9.93, p < .01 \). The means and standard deviations are listed in Table 10. These scores are
consistent with the findings of previous research (Housego, 1990, 1992; Krivel-Zacks, 1999) which indicated that teacher education students enrolled in teacher education at the University of British Columbia, irrespective of the program, increase in their feelings of teacher preparedness over the course of their program.

**Teacher efficacy.** In the present investigation, student teachers' feelings of efficacy were measured using the Gibson Teacher Efficacy Scale (Gibson & Dembo, 1984). This measure contains two subscales, teaching efficacy (i.e., a belief that teaching itself can overcome negative influences) and personal teaching efficacy (i.e., a belief that a teacher has the skills and abilities to affect students' learning). The means and standard deviations are listed in Table 10.

With regard to teaching efficacy, the difference between the pretest and posttest scores did not reach conventional levels of statistical significance.

With regard to personal teaching efficacy, a significant difference emerged between the pretest and posttest scores that measured feelings of personal teaching efficacy, $t(24) = 6.15, p < .001$, indicating that PBL education students' belief in their abilities to effect students' learning has increased from pretest to posttest. The decrease in scores indicates agreement with statements that a teacher has the skills and abilities to effect students' learning. These scores are consistent with the findings of previous research (Housego, 1992) which indicated that teacher education students enrolled in teacher education program at University of British Columbia, irrespective of their program, experience significantly increased feelings of personal teaching efficacy over the course of their program.

**Approaches to Studying.** In the present investigation, PBL students' information processes were assessed using the 29-item Lancaster Approaches to Studying Inventory (Entwistle, 1981). The items in the inventory were grouped into four broad scales, meaning, reproducing, achieving, and styles and pathologies. Paired sample $t$-
tests revealed that the posttest scores were significantly higher than the pretest scores, \( t(21) = 2.07, p < .05 \) on the achieving subscale. This subscale is indicative of students' awareness of academic demands, their ability to work regularly and effectively, their interest and application, and their confidence. A closer examination of the statements in this subscale indicated that the greatest difference between the scores was on the questions that measured students' effective use of study time and organizing their studying conditions.

Table 10

Means and Standard Deviations of Differences Between Pretest and Posttest Scores for PBL Teacher Education Students on Measures of Feelings of Teacher Preparedness, Teacher Efficacy and Approaches to Studying.

<table>
<thead>
<tr>
<th>Measures</th>
<th>n</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Feelings of Teacher Preparedness*</td>
<td>24</td>
<td>143.20</td>
<td>24.63</td>
</tr>
<tr>
<td>Teacher Efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching Efficacy</td>
<td>22</td>
<td>22.68</td>
<td>3.18</td>
</tr>
<tr>
<td>Personal Teaching Efficacy*</td>
<td>24</td>
<td>25.30</td>
<td>4.11</td>
</tr>
<tr>
<td>Approaches to Studying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achieving Subtest*</td>
<td>22</td>
<td>21.63</td>
<td>3.93</td>
</tr>
<tr>
<td>Question 1</td>
<td>22</td>
<td>3.52</td>
<td>1.32</td>
</tr>
<tr>
<td>Question 13</td>
<td>22</td>
<td>3.60</td>
<td>1.22</td>
</tr>
</tbody>
</table>

Note. * Means significantly differ at \( p < .05 \).
Comparisons between PBL and Non-PBL Students

Student satisfaction.

In the present study, student teacher's satisfaction with their program was measured using the Questionnaire on Student Satisfaction (Antepohl & Herzig, 1999). This measure asks students to rate the content, framework and subjective components of PBL (e.g., "The content of the tutorial fitted with my level of knowledge."); The tutor steered the group strongly."); The learning outcome of the tutorial was large."). In order to allow for comparison of groups in the present study the questions were adapted so that they could be used for both PBL and non-PBL teacher education students (e.g., "I will recommend PBL to other students"); "I will recommend this program to other students"). Significant differences emerged between groups on one statement. Non-PBL students rated their program higher on the improvement of communication skills, than did non-PBL students \( t_{(64)} = 3.32, p < .001 \). These results do not support the hypothesis that PBL students would perceive their communication skills as improving as a result of participation in a PBL curriculum. One possible explanation for this is that the characteristics of the tutorial group may have challenged PBL teacher education students' feelings of confidence in their oral communication skills.
Table 11
Means and Standard Deviations for Differences Between PBL Students and non-PBL Students on Ratings of Student Teacher Satisfaction.

<table>
<thead>
<tr>
<th>Question</th>
<th>PBL Students</th>
<th>Non-PBL Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M  SD</td>
<td>M  SD</td>
</tr>
<tr>
<td>(N = 26)</td>
<td>(N = 40)</td>
<td></td>
</tr>
<tr>
<td>&quot;In teacher education, I could improve my communication skills.&quot;*</td>
<td>3.76 1.06</td>
<td>4.50 .70</td>
</tr>
<tr>
<td>Note. * Means significantly differ at p &lt; .05.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Self-directed learning. Self-directed learning was divided into students' perceptions of increases in their abilities as a self-directed learner (i.e., identify learning needs, locating materials, critically evaluating the information and evaluating the application of the information) and students' ratings of the importance of each item to their own learning. There were no significant differences between the groups. These findings do not support the hypothesis that PBL students' perceptions of their self-directed learning abilities or the importance that they place on these skills will increase as a result of participation in a PBL curriculum. One possible explanation for the lack of difference between groups may be that while the PBL program in teacher education at UBC does place considerable, overt, and systematic emphasis on self-directed learning, components of self-directed learning are also emphasized in the non-PBL teacher education programs. The present study did not investigate the types of experiences with self-directed learning that the non-PBL students had.

Comparisons of education students' responses. PBL and non-PBL students were asked to respond to six open-ended questions. Tables 12 through 17 show the
frequency distribution, the headings (i.e., sub-groupings of key phrases), the categories
(i.e., sub-groupings of headings), and themes (i.e., sub-groupings of categories) for each
individual question.

Table 12

Frequency Distributions, Headings, Categories and Themes to "How Have Your
Attitudes Towards Students with Special Needs Changed from September?"

<table>
<thead>
<tr>
<th>Heading</th>
<th>Categories</th>
<th>Themes</th>
<th>PBL Students (N = 26)</th>
<th>Non-PBL Students (N = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
<td>Positive</td>
<td>More confident</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More aware</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>Difficult for the teacher</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Needs of students not being</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>met</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Change</td>
<td></td>
<td></td>
<td>7</td>
<td>18</td>
</tr>
</tbody>
</table>

As shown in Table 12, education students' responses were divided into two
headings, change and no change. Nineteen (73%) of the PBL students and 22 (55%) of
the non-PBL students indicated their attitudes had changed. Seven (27%) of the PBL
students and 18 of the non-PBL students (45%) indicated that their attitudes had not
changed. Chi square tests were conducted so as to examine the association between
changes in attitude and group membership. There was no significant relationship found
between overall changes in attitude and group membership. With respect to the category
of positive changes in attitude towards the inclusion of students with special needs
approximately the same proportion of PBL (38%) and non-PBL teacher (35%) education
students reported positive attitude changes. The largest differences can be seen in the category of negative changes in attitude where 35% of PBL students reported negative changes in attitude compared to 18% of non-PBL students. Of note, is that equal numbers of respondents said the reason behind their changed opinion was "difficulty for the teacher" (e.g., not enough support, too many demands for one person to handle). The major difference between the groups was reflected in the theme of "meeting the needs of the individual students". Specifically, six (23%) of the PBL teacher education students and two (5%) of the non-PBL students responded that the principal reason that their opinions about inclusion had changed was that they felt the individual needs of the students were not being met. Chi square tests were conducted so as to examine the relationship between teacher education students' principal reason for attitude change and group membership. A significant relationship \( \chi^2 (1, N = 66) = 4.13, p < .05 \) between group membership and students' responses emerged with proportionally more PBL students than non-PBL students expressing increased concerns about the inclusion of students with special needs. These results support the hypothesis that participation in a PBL curriculum would result in differences between the attitudes of PBL and non-PBL students. However, the changes were not in the direction anticipated. It may be that the extended time in classrooms, building relationships with the teachers and the students may result in a "confrontation with reality and a subsequent reduction in idealism" (Housego, 1992, p. 61). This hypothesis is supported by the results, shown in Table 13, of the analysis of the question "What aspects of your teacher education year influenced your attitudes towards inclusion of students with special needs?".

Education students' responses to the question that asked them to comment on what aspects of their teacher education year influenced their attitudes towards inclusion of students with special needs were divided into two categories, change and no change. As shown in Table 13, the students' responses indicated that seven (27%) of the PBL
students and 20 (50%) of the non-PBL student indicated no change in attitude while 19 (73%) of the PBL students and 20 (50%) of the non-PBL students indicated a change in attitude. Chi square tests were conducted so as to examine the relationship between changes in attitude towards students with special needs and group membership and a significant relationship ($\chi^2 (1, N = 66) = 3.91, p < .05$) was revealed between group membership and student responses with proportionally more PBL students indicating a change in attitude. The headings were divided into three categories, changes that were influenced by the practicum experience and a combination of course work and classroom experience influenced changes. The two groups were approximately equal in their opinions of the importance of the combined influence of course work and practicum experiences (PBL group = 19%; non-PBL group = 23%). The largest differences were in student teachers' perceptions of the influence of the practicum; 50% of the PBL students felt the classroom experience and meeting students with special needs had the largest influence on their attitudes towards students with special needs. A smaller proportion of non-PBL students (28%) felt that their practicum experiences had an influence on attitudes towards the inclusion of students with special needs. The blending of these results with the results from the examination of changes in student teachers' attitudes towards inclusion suggest that participation in a PBL program (i.e., extended time in the classroom) may result in differences between PBL and non-PBL teacher education students in their attitudes towards inclusion.
Table 13

Frequency Distributions, Headings, Categories and Themes Responses to "What Aspects of Your Teacher Education Year Influenced Your Attitudes towards Inclusion of Students with Special Needs?"

<table>
<thead>
<tr>
<th>Heading</th>
<th>Categories</th>
<th>Themes</th>
<th>PBL Students</th>
<th>Non-PBL Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Change</td>
<td>Practicum</td>
<td>Philosophy matched experience</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Change Practicum</td>
<td>Classroom experience</td>
<td>9</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meeting students with special needs</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course work and practicum</td>
<td>5</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

Table 14

Frequency Distributions, Headings, Categories and Themes Responses to "Please Describe How You Have Found the Teacher Education Program Relevant to the Practice of Teaching?"

<table>
<thead>
<tr>
<th>Heading</th>
<th>Categories</th>
<th>Themes</th>
<th>PBL Students</th>
<th>Non-PBL Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant</td>
<td>Practicum</td>
<td>Hands-on</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Practicum</td>
<td>Apply theory to practice</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Courses</td>
<td>Practical courses</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>Not relevant</td>
<td></td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>No response</td>
<td></td>
<td></td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
The responses to the question that asked students to describe how their program was relevant were classified into two types, relevant and not relevant. As shown in Table 14, 24 of the PBL students and 37 of the non-PBL students indicated that they found their teacher education program relevant and none of the PBL students and 3 of the non-PBL students found their program not to be relevant. Of note is that, of the 24 PBL teacher education students who responded to this question, 100% found their program relevant. This can be compared to 97% of the 40 non-PBL students who responded to this question. Chi square tests were conducted so as to examine the relationship between perceptions of program relevance and group membership. There was no significant relationship found between relevancy and group membership. These results suggest that teacher education programs at the University of British Columbia are considered to be relevant for the majority of the students who finish their programs.

Further analysis of this question indicated three themes under the heading of program relevance. Chi square tests were conducted as to examine the relationship between students' perceptions of how they found their teacher education program relevant to the practice of teaching and group membership. Eighteen (69%) of the PBL students reported that the opportunity to blend theory and practice was the main factor that made their program relevant. This can be compared to 16 (40%) of the non-PBL students. Chi square analysis revealed a significant relationship ($\chi^2 (1, N = 66) = 4.92, p < .03$) between teacher education students' perceptions of being able to apply theory to practice and group membership. That is, proportionally more PBL than non-PBL teacher education students indicated that the opportunity to apply theory to practice was the most relevant component of their teacher education year. Two (8%) of the PBL students reported that the practical courses they took were the most relevant to the practice of teaching. This can be compared to 18 (45%) of the non-PBL students. Chi square analysis revealed a significant relationship ($\chi^2 (1, N = 66) = 9.77, p < .01$) between
perceptions of the relevance of course work and group membership. Specifically, proportionally more non-PBL students reported that they found the practical courses to be the most relevant component of their teacher education program. These findings provide some support for the hypothesis that participation in a PBL program may provide increased opportunity for teacher education students to apply theory to practice in a manner that they find relevant.

Table 15

Frequency Distributions, Headings, Categories and Themes Responses to "How Prepared Did You Feel to Teach Your Practicum? Please Briefly Describe How Your Teacher Education Program had an Impact on Your Feelings of Preparedness to Teach in Your Practicum".

<table>
<thead>
<tr>
<th>Heading</th>
<th>Categories</th>
<th>Themes</th>
<th>PBL Students (N = 26)</th>
<th>Non-PBL Students (N = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Prepared</td>
<td>Needed more methods courses</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Prepared</td>
<td>Would have liked more methods courses</td>
<td>14</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Except for special needs students</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Had foundation skills and able to plan</td>
<td>5</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Well prepared</td>
<td>Previous experience</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course work</td>
<td>0</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course work and time in classroom</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
The responses to this question were classified into three types of headings, not prepared, prepared and well prepared. As shown in Table 15, the responses indicated that 22 (86%) of the PBL teacher education students and 37 (92%) of the non-PBL teacher education students felt prepared to teach in their practicum while four (16%) of the PBL teacher education students and three (8%) of the non-PBL students did not feel prepared to teach in their practicum. Chi square tests were conducted so as to examine the association between group membership and feelings of being prepared. There was no significant relationship found between group membership and feeling prepared to teach during the final practica. The results from the present investigation indicate that although approximately equal number of PBL and non-PBL students felt prepared to teach their practica, a larger proportion of PBL students indicated that they would have liked to have more methodology courses. That is, 18 (54%) of the PBL teacher education students mentioned the desire to have more methods courses while only five (13%) of the non-PBL students mentioned this. Chi square tests were conducted to examine the association between desiring more methods courses and group membership. The results indicated a significant association ($\chi^2 (1, N = 66) = 15.83, p < .001$) between wanting more methods courses and group membership with proportionally more PBL students indicating a desire for more courses. Additionally, these data reveal that three (12%) of the PBL teacher education students felt that they were well prepared while 17 (43%) of the non-PBL students felt that they were well prepared. Chi square tests were conducted so as to examine the association between feeling well prepared and group membership. The results revealed there is a significant relationship ($\chi^2 (1, N = 66) = 7.58, p < .01$) between group membership and feelings of being well prepared. Of note, proportionally more non-PBL students felt that they were well
prepared because of their course work. These findings suggest that while the majority of PBL students feel prepared to teach in their practica, they would like more course work and this may be influencing their feelings of being well prepared to teach in their practica.

As shown in Table 16, the responses to the questions that asked teacher education students to describe how their teacher education program had an impact on their learning indicated that for 20 (77%) of PBL and 37 (75%) non-PBL teacher education students the largest impact on their attitudes towards their own learning were changes to their learning styles. Chi square tests were conducted to examine the relationship between heading type and group membership on the question that asked teacher education student to describe how their teacher education program had an impact on their learning, no significant relationship emerged. Of note is that one of the non-PBL students indicated that the teacher education program had a negative impact on their attitudes towards their own learning. There were no similar responses from the PBL students. The response from the student was "I became much lazier in my assignments in most classes because people who were obviously not cut out to be teachers were still passing." The responses from each group suggest that there are no differences between the groups and do not provide support for the hypothesis that participation in a PBL curriculum would result in differences between PBL and non-PBL teacher education students in changes in their attitudes towards their own learning.

The responses to the statement, "Describe how your teacher education program has had an impact on your beliefs about teaching." were classified into two types, students who felt that the teacher education program had an impact on their beliefs and those that felt their program had not had impact on their beliefs. As shown in Table 17, twenty-two (85%) of the PBL students and 28 (70%) of the non-PBL students indicated that their teacher education program had an impact on their beliefs about teaching.
square revealed no significant relationships between feelings of impact and group membership. Four categories emerged from the headings: a) concept of teaching, b) concept of teacher, c) concept of students, and d) strengthened beliefs. The responses indicated that 85% of the PBL teacher education students felt that their program had an impact on their beliefs about teaching and 65% of the non-PBL teacher education students felt that their teacher education program had an impact on their beliefs about teaching. The differences between the groups can be seen in the area of concept of teaching in which 31% of the PBL students compared to 15% of non-PBL students reported that this area had an impact on their beliefs about teaching. Another difference can be seen in the area of concept of teacher in which 19% of PBL teacher education students compared to 5% of non-PBL teacher education students reported as having an impact on their beliefs about teaching. The groups were relatively equal in their responses listed under the heading of concept of students (PBL group = 12%; non-PBL group = 13%). There are differences in their responses are found under the theme of strengthened of beliefs (PBL group = 27%; non-PBL group = 38%). These findings provide some support for the hypothesis that participants in a PBL teacher education program would demonstrate differences in their perceptions of how their teacher education program influenced their beliefs about teaching after they had completed their teacher education program compared to students from a non-PBL teacher education program. The results from the investigation of the attitudes and opinions of the university faculty will be discussed in the next section.
Table 16

Frequency Distributions, Headings, Categories and Themes Responses to "Describe How Your Teacher Education Program Had an Impact on Your Attitude towards Your Own Learning."

<table>
<thead>
<tr>
<th>Heading</th>
<th>Categories</th>
<th>Themes</th>
<th>PBL Students (N = 26)</th>
<th>Non-PBL Students (N = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
<td>Learning style</td>
<td>Life-long learner</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased self-reflection</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Awareness of own learning style</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-directed learning</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collaboration</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Need to be more organized</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased self-confidence</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative attitude towards learning</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No impact</td>
<td></td>
<td></td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Heading</td>
<td>Categories</td>
<td>Themes</td>
<td>PBL Students</td>
<td>Non-PBL Students</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------</td>
<td>-------------------------------------</td>
<td>--------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Impact</td>
<td>Concept of teaching</td>
<td>Teaching is complicated</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teaching is easy</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>System is more important than the student</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teaching is not just academics</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Awareness of different approaches to teaching</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Concept of teacher</td>
<td>Teachers have a lot of influence</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teachers need support</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teachers are accountable</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Concept of student</td>
<td>Unique learning styles and needs</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Beliefs</td>
<td>Strengthened beliefs</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>No impact</td>
<td></td>
<td></td>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>
Attitudes and Opinions of University Faculty

Tutors

Tutors' ratings of their overall satisfaction. Table 18 shows the frequency distribution of the responses and means on the outcome variables of tutor's satisfaction. On all of the items the mean ratings were over 3. There were no significant relationships between any of the background variables and the levels of tutor satisfaction.

The responses from the tutors indicated that in 100% of the cases they were satisfied with: a) the students' learning in their groups, b) the group dynamics, c) the role they played in the group, d) the interest of the students, and e) their overall performance. On the outcome variable of grading 86% of the respondents indicated that they were satisfied with the pass/fail grading system.

The responses from the tutors indicated that 86% of the tutors would like to tutor again. The one respondent who did not want to tutor again due to time commitments and his/her other commitments is remaining in the program as a method specialist. All of the tutors were involved with PBL case writing and PBL students' examinations. These findings replicate previous research findings that indicate the PBL tutors are satisfied with PBL.
Table 18

Distribution of Responses and Means on Outcome Variables for Tutor's Overall Satisfaction (N = 7)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dissatisfied</th>
<th>Neutral</th>
<th>Satisfied</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Learning</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>4.71</td>
</tr>
<tr>
<td>Group Dynamics</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>4.57</td>
</tr>
<tr>
<td>Tutor's Role</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>4.57</td>
</tr>
<tr>
<td>Interest</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>4.57</td>
</tr>
<tr>
<td>Grading</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>4.57</td>
</tr>
<tr>
<td>Overall Performance</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>4.57</td>
</tr>
<tr>
<td>Overall Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.57</td>
</tr>
</tbody>
</table>

Tutors' comparisons of PBL to traditional teaching methods. Table 19 shows the frequency distribution of the responses and the means on the outcome variables for tutor's comparisons of PBL teaching methods to traditional teaching methods. One participant did not respond to this section of the questionnaire. On all of the items the mean ratings were over 3.

The responses to comparisons of PBL teaching methods to traditional teaching methods on the variables of: a) students' interest and enthusiasm, b) efficiency of learning, and c) personal satisfaction were favorable to PBL teaching methods in 100% of the cases. The responses to comparisons of PBL teaching methods to traditional teaching methods on the variable of students' knowledge of basic teaching strategies were favorable to PBL in 67% of the cases and equivalent in 33% of the cases. The
responses to comparisons of the two teaching methods of the variables of understanding
the basic principles of teaching were favorable to PBL in 67% of the cases, and
equivalent in 17% of the cases and favorable to traditional teaching methods in 17% of
the cases. The responses to comparisons on the variable of faculty interest were
favorable to PBL in 67% of the cases, and equivalent in 33 % of the cases. The
responses to comparisons on the variable of students' reasoning ability were favorable
to PBL in 83% of the cases and equivalent in 16% of the cases. The responses to group
comparisons of students' preparation for their final practicum were favorable to PBL in
50% of the cases and equivalent in 50% of the cases. The responses to comparisons
between the groups on the variable of the overall value to students were favorable to
PBL in 83% of the cases and equivalent in 17% of the cases.

These results support previous research that has revealed that, in the opinions of
the PBL tutors, PBL teaching methods are better than traditional teaching methods in
several areas.
### Table 19

**Distribution of Responses and Means on Outcome Variables for Tutor's Comparisons of PBL Teaching Methods to Traditional Teaching Methods (N = 7)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Traditional Better</th>
<th>Neutral</th>
<th>PBL Better</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Interest</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>4.50</td>
</tr>
<tr>
<td>Basic Strategies</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>4.00</td>
</tr>
<tr>
<td>Principles of Teaching</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>3.50</td>
</tr>
<tr>
<td>Faculty Interest</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>3.83</td>
</tr>
<tr>
<td>Efficiency of Learning</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4.33</td>
</tr>
<tr>
<td>Reasoning</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4.16</td>
</tr>
<tr>
<td>Preparation</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>3.83</td>
</tr>
<tr>
<td>Overall Value</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4.33</td>
</tr>
<tr>
<td>Personal Satisfaction</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4.33</td>
</tr>
<tr>
<td>No Response</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.00</td>
</tr>
<tr>
<td>Overall Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.05</td>
</tr>
</tbody>
</table>

**Tutor's responses.** Tutors were asked to respond to three opened-ended questions, what they "liked most", "disliked most" and would "change" about PBL. The first answer in each question was classified into response type. The tutor-student relationship (43%) and student-directed learning (29%) were the most-liked aspects of PBL. Students' reasoning (14%) and problem solving (14%) in PBL were the other aspects of PBL liked by the tutors.
The most disliked aspect of PBL was the time requirements (43%). Of note is that one respondent felt there was not enough meeting time, while two of the respondents felt that PBL meetings required too much of their time. The PBL tutors also disliked start-up problems associated with a new program (29%) and the structure of the methods classes (29%).

The responses from the respondents suggested change: a) to student evaluation (42.8%), b) to the instruction of basic teaching strategies (27%), and c) to encouraging participation in discussions for quieter students (14%). One respondent suggested making no changes to the program (14%).

These results support the hypothesis that PBL tutors in teacher education would have similar opinions and attitudes about PBL to PBL tutors from other university faculties (Vernon, 1995).

Methods Specialists

Method specialists' ratings of their overall satisfaction. Table 20 shows the frequency distribution of the responses and the means on the outcome variable of method specialist satisfaction. On all of the items the mean ratings were over 3.

Significant positive relationships emerged between the number of years the methods specialists had been teaching in teacher education with non-PBL students and the dynamics of the group ($r = .88$, $p = .05$) and student interest ($r = .92$, $p = .03$). These findings suggest that the more experienced methods specialists feel that PBL teaching methods have a favorable effect on group dynamics and student interest compared to non-PBL teaching methods.

The responses from the method specialists indicated that in 100% of the cases they were satisfied with their performance as a method specialist and the grading system. Eighty percent of them were satisfied with a) students' interest and enthusiasm,
b) the group dynamics, c) the role they played in their group, and c) their overall performance, and d) the students' learning.

The responses from the method specialists indicated that 100% of them would like to remain. These findings replicate previous research findings that indicate the faculty who are associated with PBL are satisfied with PBL.

Table 20

Distribution of Responses and Means on Outcome Variables for Method Specialists' Overall Satisfaction (N = 5)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dissatisfied</th>
<th>Neutral</th>
<th>Satisfied</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Learning</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Group Dynamics</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Methods Specialist's Role</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Interest</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Grading</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Overall Performance</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Overall Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Methods specialists' comparisons of PBL to traditional teaching methods. Table 21 shows the frequency distribution of the responses and the means on the outcome variables for method specialists' comparisons of PBL teaching methods to traditional teaching methods. The mean ratings were over 3 on the variables of: a) faculty interest, b) efficiency of learning, c) students' reasoning, d) the overall value to the students, and e) personal satisfaction. Three participants did not respond to the comparisons of PBL
and non-PBL teaching methods with respect to the teaching of basic strategies, principles of teaching and preparation for the long practicum. The respondents felt that they could not answer these questions because they focused on one area of the curriculum and had not seen the students in their practica. On the remaining items the mean ratings were over 3.

The responses to comparisons of PBL teaching methods to traditional teaching methods on the variables of student and faculty interest were favorable to PBL teaching methods in 80% of the cases and equivalent in 20% of the cases. The responses to comparisons of PBL teaching methods to traditional teaching methods on the variable of students' knowledge of efficiency of learning were favorable to PBL in 40% of the cases and equivalent in 60% of the cases. The responses to comparisons of the two teaching methods on the variable of students' reasoning were favorable to PBL in 40% of the cases, and equivalent in 60% of the cases. The responses to comparisons on the variable of overall value to the student were favorable to PBL in 60% of the cases, equivalent in 40% of the cases. The responses to comparisons on the variable of personal satisfaction were favorable to PBL in 80% of the cases, equivalent in 20% of the cases.

These results are consistent with previous research that has revealed that, in the opinions of faculty, PBL teaching methods are better than non-PBL methods with the exception of the teaching of basic skills (Kaufman & Holmes, 1996).
Table 21

Distribution of Responses and Means on Outcome Variables for Method Specialists' Comparisons of PBL Teaching Methods to Traditional Teaching Methods (N = 5)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Traditional Better</th>
<th>Neutral</th>
<th>PBL Better</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Interest</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Faculty Interest</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Efficiency of Learning</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Reasoning</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Overall value</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Personal Satisfaction</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Overall Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Method specialists responses. Method specialists were asked to respond to three opened-ended questions, what they "liked most", "disliked most" and would "change" about PBL. The first answer in each question was classified into response type. The active participation of the students (60%) was the most-liked aspect of PBL. Self-directed learning (20%) and the philosophy of PBL (20%) in PBL were the other liked aspects of PBL referred to by the method specialists.

The most disliked aspect of PBL was the content of the cases (40%). For example, "Social issues were in the forefront and content specific areas were in the background." and "The students could not see how the cases connected to each other." Problems with group dynamics (20%) and the schedule (i.e., once every two weeks) of
the methods classes (20%) were the other disliked aspects of PBL referred to by the method specialists. One respondent did not reply to this question.

Forty percent of the respondents suggested changes to the cases that would ensure that all of the specialty areas were reflected in an equivalent manner. More time with the method specialists (20%), increasing the communication among method specialists (20%), and allowing the students to have a more interactive role in the creation of the cases (20%) were the other areas suggested for change.

The current findings are largely consistent with previous opinion research that has indicated the likes and dislikes of faculty involved with PBL (Vernon, 1995), confirming the hypotheses that this PBL faculty would have similar opinions and attitudes to other PBL faculties.

**Attitudes and Opinions of School-based Staff**

**School Administrators**

School administrators' comparisons of PBL to traditional students. Table 22 shows the frequency distribution of the responses and the means on school administrators' comparisons of PBL to traditional teacher education students. On all of the items the mean ratings were over 3. Significant positive relationships emerged between the amount of years being a principal and comparisons of PBL and traditional education students: 1) interest and enthusiasm ($r = .71, p = .03$), 2) reasoning ($r = .75, p = .03$) and, 3) total mean ($r = .74, p = .03$). These findings suggest that more experienced principals will be more favorably disposed to PBL.

The responses to comparisons of students' interest and enthusiasm were favorable to PBL students in 50% of the cases, and equivalent in 50% of the cases. The responses to comparisons of students' knowledge of basic teaching strategies were favorable to PBL students in 60% of the cases, favorable to traditional students in 20%
of the cases, and equivalent in 20% of the cases. The responses to comparisons of students' understanding of principles of teaching were favorable to PBL students in 60% of the cases, favorable to traditional students in 10% of the cases and equal in 30% of the cases. The responses to comparisons of students' reasoning ability of students were favorable to PBL in 80% of the cases, favorable to traditional students in 10% of the cases and equivalent in 10% of the cases.

These findings support previous research findings that have found that, in the opinion of expert evaluators, PBL students and traditional students are equivalent in their acquisition of basic teaching strategies and principles of teaching and PBL students may have more developed reasoning and higher levels of interest and enthusiasm.

Table 22
Distribution and Means on Outcome Variables for Administrators' Comparisons of PBL Students to Traditional Students (N = 10)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Traditional Better</th>
<th>Neutral</th>
<th>PBL Better</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest and Enthusiasm</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Basic Teaching Strategies</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Principles of Teaching</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Reasoning</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Overall Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

School administrators' responses. Administrators were asked, "How do you perceive PBL graduates to be alike or different from graduates from a traditional teacher education program?" The first answer given by the respondent was classified into three major response types, professional preparation, self-directed learning, and motivation.
With respect to professional preparation 50% believed that the PBL students were more professionally prepared (i.e., ready for a career in education, aware of all aspects of the school, understanding of teaching, self-confident) than traditional students, while 20% of the administrators felt that PBL students were not as professionally prepared (i.e., class management, methodology) as traditional students. Ten percent of the respondents felt that PBL students were more motivated than traditional students were and 20% felt PBL students were more self-reflective than traditional students.

These results provide support for the hypothesis that, in the judgement of school administrators, participation in a PBL teacher education program enhances the development of reasoning ability and interest and enthusiasm in teacher education students compared to traditional teacher education students. Additionally, these results suggest that PBL students and traditional students develop equivalently in the areas of knowledge of basic teaching strategies and principles of teaching. Finally, these results suggest that, in the judgement of school administrators, PBL students have higher levels of motivation and self-reflection when compared to traditional education students.

**School associates’ comparisons of PBL to traditional students.** Table 23 shows the frequency distribution of the responses and the means on school associates’ comparisons of PBL to traditional teacher education students. On two of the items (i.e., interest, reasoning) the mean ratings were over 3. A significant relationship between school associates’ perceptions of PBL students being different from traditional teacher education students and their willingness to take a PBL student again ($r = .80, p = .01$) was revealed. These findings suggest that school associates who were positive about PBL were more willing to have a student again and rated them more highly. No other significant relationships were found.

On the variable of principles of teaching the mean rating was equivalent and on the variable of knowledge of basic teaching strategies the mean rating was below 3.
One case (3%) is missing from the analysis. The responses to comparisons of students' interest and enthusiasm were favorable to PBL students in 16% of the cases, favorable to traditional students in 8% of the cases and equivalent in 76% of the cases reported. The responses to comparisons of students' knowledge of basic teaching strategies were favorable to PBL students in 16% of the cases, favorable to traditional students in 38% of the cases and equivalent in 46% of the cases reported. The responses to comparisons of students' understanding of principles of teaching were favorable to PBL in 32% of the cases, favorable to traditional students in 30% of the cases, and equivalent in 38% of the cases reported. The responses to comparisons of students' reasoning ability were favorable to PBL in 38% of the cases, favorable to traditional students in 5% of the cases and equivalent in 57% of the cases.

Table 23

**Distribution and Means on Outcome Variables for School Associates’ Comparisons of PBL Students to Traditional Students (N = 37)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Traditional Better</th>
<th>Neutral</th>
<th>PBL Better</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Interest and Enthusiasm</td>
<td>1  2</td>
<td>28  3</td>
<td>3  3</td>
</tr>
<tr>
<td>Basic Teaching Strategies</td>
<td>5   9</td>
<td>17  7</td>
<td>5   5</td>
</tr>
<tr>
<td>Principles of Teaching</td>
<td>3   8</td>
<td>14  7</td>
<td>5   5</td>
</tr>
<tr>
<td>Reasoning</td>
<td>0   2</td>
<td>21  7</td>
<td>7   7</td>
</tr>
<tr>
<td>Overall Mean</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These findings support previous research that has found that, in the opinion of their practicum supervisors (i.e., school associates), PBL students have acquired equivalent skills to traditional students on the variables of knowledge of basic teaching.
strategies, and principles of teaching and are equally as interested and enthusiastic. The results also support the hypothesis that PBL students have more developed reasoning than traditional students do, in the opinion of their direct practicum supervisors.

School associates' responses. School associates were asked to respond to two-opened questions, "How do you perceive PBL student teachers to be alike or different from student teachers from a traditional teacher education program?" and "Would you be a school associate for PBL again? Please explain your answer." The first response to each question was classified into response type.

The responses to the first question, "How do you perceive PBL student teachers to be alike or different from student teachers from a traditional program?" were classified into three response types, professional preparation, self-directed learning, and support. Seven participants did not answer this question or their answers were unusable because they did not respond to the question asked. With respect to professional preparation, 52% of the respondents felt that PBL students were better prepared (e.g., knowledge base, more well rounded, aware of all aspects of the school) than traditional students. Seventeen point two percent of the respondents felt that PBL students were not as professionally prepared as traditional students. Of note is that, within this group, there was 100% agreement that the PBL students did not have the same basic skills and strategies as the traditional students have.

Twenty-one point seven percent of the respondents felt that PBL students were more self-directed (e.g., self-motivated, independent) than traditional students. Ten percent of the respondents felt that PBL students had better support systems (e.g., well supported in the learning community, better networks) than traditional students.

The responses to the second question "Would you be a school associate again?" were classified into two response types, positive and negative. Six of the participants did
not answer this question. The majority of the remaining respondents (80%) would take a 
PBL student again. There were explanations included a variety of reasons that reflected 
two major themes: 1) the PBL program (e.g., the year-long practicum, program 
emphasis on problem solving and reasoning) and 2) the enjoyment and stimulation of 
working with a student teacher. A minority (16%) of the respondents would not have a 
PBL student again. One respondent would not have any student teachers again, 
regardless of the program, because of the time that the school associates were not with 
their students. The remaining four school associates (11%) would not have a PBL 
student again because they felt that PBL students did not have enough knowledge of 
teaching methods.

This research provided support for the hypothesis that, in the opinions of their 
school associates, PBL students are equally or better professionally prepared. It also is 
consistent with previous research that has demonstrated that, in the opinion of some 
direct supervisors, PBL students may have acquired less basic knowledge than 
traditional students may have. Finally, these research findings suggest that the majority 
of faculty working with PBL students find the work satisfying.
CHAPTER 5
Discussion

This chapter will begin with a discussion of the results of the present study. First, the results regarding the examination of the changes in the group of PBL students will be discussed in order to illustrate the effects of participation in the PBL teacher education program of studies and practicum. Second, the results of the investigation of the attitudes and opinions of the university instructors and the school-based staff who were involved with PBL at UBC will be discussed. Next, the strengths and limitations of the study will be considered. Finally, this chapter will conclude with a discussion of some educational implications.

Opinions and Attitudes of the Teacher Education Students

The findings from the present investigation provide evidence that participation in the PBL teacher education program at UBC has a significant effect on feelings of personal teaching efficacy and feelings of preparedness to teach. Specifically, student teachers who were enrolled in the PBL program scored significantly higher on measures of feelings of personal teaching efficacy, and feelings of preparedness to teach at the end of their program than they had at the beginning of their program. The higher feelings of personal teaching efficacy and feelings of preparedness to teach are consistent with previous research conducted at the University of British Columbia (Housego, 1990, 1992). However, one caveat is noted. These findings only compared the pretest and posttest scores of the PBL group, there are no comparison scores for the non-PBL group.

The results from the present study indicate that that there were no differences between groups in their perceptions of feeling prepared to teach in their practicum. However, there were differences between groups of feeling well prepared. Specifically,
more PBL students compared to non-PBL students did not feel that they were well
prepared to teach their final practicum, and more PBL students would have liked to have
additional methodology courses. There are two possible interpretations of this finding.
First, as has been indicated by previous research, PBL students may have less basic
skill knowledge than their non-PBL peers (Vernon, 1995). This hypothesis is supported
by the results of the present study that indicate that, in the opinions of the method
specialists, school advisors also felt that PBL teacher education students had less basic
knowledge skill than non-PBL teacher education students. It would appear that that the
relationship between methodology courses and student teachers’ feelings of
preparedness continues to need to be investigated. Second, it may be that, while PBL
students would like to have more opportunity to learn additional skills and strategies
through increased method courses this does not necessarily indicate a lack of
preparedness but may represent some other variable. For example, the findings from
this study indicate that more PBL students than non-PBL students reported that they had
changed their beliefs about the concept of teaching and the concept of teacher.
Perhaps, participation in a PBL program challenges teacher education students’ existing
conceptions and beliefs about teaching as was indicated in the some of the themes in
the open ended questions (e.g., teaching is difficult, different approaches to teaching)
and this resulted in an awareness of the importance of continued professional
development, their feelings of not being well-prepared, and wanting more methods
courses. The relationship between teacher education students’ beliefs about their
professional preparedness and participation in a PBL curriculum needs to be
investigated further.

The current finding that scores of the measure of feelings of teaching efficacy
increased is in concert with previous research that has compared PBL students to non-
PBL students (Krivel-Zacks, 1999). It would appear that some components of the PBL
program result in increases in student teachers' feelings of teaching efficacy (i.e., teaching itself can overcome negative influences of a student's home environment). Although further research is needed in order to determine the relationship between PBL and feelings of teaching efficacy, the evidence presented does provide some support for the hypothesis that the year-long practicum and the opportunity of the PBL students to blend theory and experience may have an influence on feelings of teaching efficacy. For example, more PBL students felt the greatest influence on their attitude about teaching was an increased awareness of how complicated teaching is and the multi-faceted role of teachers in the school.

The increased awareness of how complicated teaching is and the role of teachers in the school did not have the expected effect on PBL students' attitudes towards inclusion of students with special needs. The results of the present investigation indicate that more PBL than non-PBL teacher education students became increasingly concerned about inclusion of students with special needs. One possibility for this result can be found in the responses from the students. Specifically, more PBL students felt that the time they spent in the classroom and the time they spent with individual students had the greatest influence on their attitudes towards students with special needs. Additional time in the classroom is a result of the year-long practicum offered in PBL and represents a clear difference between PBL and non-PBL programs as they currently exist as the University of British Columbia. However, in subsequent years the non-PBL teacher education program at the University of British Columbia will include a year-long practicum. It would be useful to use this opportunity to examine the relationship between the amount of time student teachers spend in a classroom to changes in their attitudes towards inclusion of students with special needs.

In the present study participation in a PBL program did not result in significant differences in ratings of student satisfaction with the exception of significant increases in
the non-PBL students' ratings of communication skills compared to their PBL peers. This finding is consistent with previous research (Antepol & Herzig, 1999) but was surprising. It may be that characteristics of the tutorial process (e.g., active questioning, having to develop plainly stated hypotheses that clearly explicate reasoning) may have challenged students' feelings of confidence in their oral communication skills.

The current finding that there were no differences between the groups in their self-directed learning was unanticipated. Self-directed learning was operationalized, in this study, as a student's ability to: a) identify specific learning needs, b) select appropriate learning resources, c) critically evaluate the information, and d) evaluate their learning. There are two possible explanations for this finding. One explanation may be that all of the students in teacher education at UBC have, at a minimum, a Bachelor's degree and these self-directed learning skills are already well developed. A second explanation may be that while the PBL program in teacher education at UBC does place considerable, overt, and systematic emphasis on self-directed learning, components of self-directed learning are also emphasized in the non-PBL teacher education programs. The present study did not investigate the types of experiences with self-directed learning that the non-PBL students had in teacher education or their previous beliefs about self-directed learning and this may account for the lack of differences between groups.

Hoover and Cessna (1984), and Renzaglia, Hutchins, and Lee (1997) suggested that course content and organization, course delivery, course assessment, interactions with faculty, student teaching and school experiences, a congruent theoretical and conceptual teacher education framework, university supervision, and supervision models have an impact on student teachers' beliefs. Although, it is difficult to attribute separate effects for each individual variable (Friedman, de Bliek, Greer, Mennin, Norman, Sheps, Swanson, & Woodward, 1990), future investigators should be sure to examine the
relationships between these individual components as it is unclear from the present investigation how these individual variables (e.g., the year-long practicum, the smaller tutorial group, information delivery), may have influenced students' opinions and how they differ from those in medicine. A discussion of the opinions and attitudes of the university and school-based personnel follows.

Opinions and Attitudes of University Instructors and School-Based Staff

The results of the present study suggest that, in the opinion of the tutors, school associates and school administrators participation in a PBL teacher education program does have an impact on reasoning when compared to a non-PBL program. In the opinion of 40% of the methods specialists, there was a difference between PBL teaching methods and non-PBL teaching methods with respect to reasoning. The present study examined perceptions of reasoning from two perspectives. One perspective included the perceptions of the university faculty (i.e., tutors and methods specialists) who compared the two teaching methods using a Likert-scale questionnaire. The second perspective was that of the school-based staff who responded to Likert-scale and short answer questions that asked the school-based staff to compare the two groups of students. One hypothesis for the high reasoning ratings of the PBL students could be the systematic teaching of problem solving. This could be considered if reasoning is defined as being able to formulate questions, seek information and apply the information to practice (Hmelo & Lin, in Evenson & Hmelo, 2000). Some support for this hypothesis can be found in the responses to short-answer questions from the school-based staff. For example, "PBL students are better able to express themselves", and "PBL students are more thoughtful in their approach and want more dialogue", "are able to articulate strategies for dealing with a wide variety of important and key educational issues" and "know how to research a question." The construct of "reasoning" is complex and the
present study has not clearly defined the construct. Therefore, it is possible each individual participant could have conceptualized reasoning in a unique manner. This may account for why 60% of the method specialists rated the development of reasoning as the same across teaching methods. For example, it is possible that the method specialists may have defined reasoning not as a problem solving strategy but as "the ability of students to recall information and identify important information" specific to their content area (Albanese & Mitchelle, 1993, p. 60). Some support for this hypothesis can be found in their responses to the short answer questions that suggest that the method specialists feel that there was not enough emphasis on individual specialty areas. Implicit in this suggestion is that students are not getting enough specific content information. It would appear that the construct of "reasoning" needs to be more clearly defined in order to elucidate the relationship between "reasoning" and PBL.

With the exception of the tutors, the same evaluators did not report differences between groups in their acquisition of basic teaching strategies and principles of teaching. The equivalent scores between groups on the variable of basic knowledge are consistent with previous research (Albanese & Mitchell, 1993; Berkson, 1993). The question arises as to why the tutors gave higher ratings to PBL teaching methods on the variables of acquisition of basic knowledge and principles of teaching? An issue, which may have emerged with the tutors, was the effect of the tutors being involved in all aspects of the PBL program as tutors and faculty associates. As a result they may have wanted to present the program in a positive way and the demand characteristics of the questionnaire may have influenced their responses. Further, examination of the data revealed that the majority of tutors felt PBL teaching methods were superior to traditional teaching methods. However, those tutors who did not agree were experienced university instructors with doctoral degrees. Thus, it is possible that the differences in the tutors' opinions of PBL teaching methods and traditional teaching methods on the
variables of knowledge of basic teaching strategies and the principles of teaching could be a result of inexperience or unconscious bias towards the program. The short answer questions, across participant groups, in the present study confirm perceptions of problems in the teaching of basic knowledge strategies that have been outlined in previous research (Berkson, 1993). For example the responses of school-based faculty included; "PBL student are lacking in methods courses", "come with fewer teaching strategies", "seem to lack methodology", and "do not have basic teaching strategies". It is important to remember that these comments come from a minority of the participants but should be pursued as an area for future research when it is linked to the comments of the tutors and method specialists. The tutors and methods specialists would like to see changes in the manner in which method courses are organized. Additionally, they would like changes to the content information presented to the students and the manner in which the content information is presented to the students.

The issue of basic knowledge acquisition is not reflected in the perception of the professional preparedness of the students. The majority of university and school-based personnel reported that the PBL and non-PBL students were equally prepared. However, the school associates felt that PBL students did not have as many basic strategies as the non-PBL students. Of note is that the school associates scored the PBL students higher on reasoning. These findings reflect previous research findings that have rated PBL students more highly on measures of clinical performance and lower on measures of basic knowledge (Albanese & Mitchell, 1993). The present study does not provide any direct illumination on this result. It is clear from the present study that the constructs of professional preparedness and reasoning need to be more clearly defined in subsequent research. For example, should professional preparation be defined as level of confidence and readiness (Housego, 1990)? Should it be measured as the amount of basic knowledge that the student has or their conceptual
understanding and flexible use of knowledge (Hmelo & Lin, 2000)? Additionally, the present study suggests that the relationship between these variables may be complex and further research is needed to explore these relationships.

All of the participant groups indicated their satisfaction with PBL (i.e., 90% of the school, 86% of the school associates, 86% the PBL tutors and 100% of the method specialists). As with other PBL programs (Vernon, 1995), it is not clear if the high levels of satisfaction with the program may be a result of the self-selection of faculty and school based personnel with respect to working in PBL and participating in the present study. A further research area would be a comparison of the levels of satisfaction of faculty and school based personnel in other programs and an investigation of the determinants and characteristics of the personnel involved with PBL.

In the present study 100% of the tutors and 80% of the methods specialists reported that, in their opinions, PBL students demonstrated higher levels of interest and enthusiasm than traditional students did. These findings are consistent with previous research that has shown that, at the university level the perception of the faculty who have evaluated PBL is that PBL students display higher levels of interest and enthusiasm when compared to non-PBL students (Kaufman & Holmes, 1996; Vernon, 1995). The present investigation also sought to examine comparisons of student teacher interest and enthusiasm at the level of practice. That is, would there be differences between the two groups at the school or practical level? The results from the present study are not consistent. That is, school administrators found PBL students displayed higher levels of interest and enthusiasm than non-PBL students did but the individual school advisors found the two groups to be equal. One possible interpretation for these findings may be that individual teachers and school administrators each have a unique vantage point for evaluating student teachers. Student teachers find their practicum experiences to be the most valuable part of their education training (Joram &
Gabrielle, 1998) and teachers work intensely with the teacher education students in a one-on-one situation and respond to each individual they are working with as they interact with them or watch them interact with students in the class. In this situation, it is not surprising that the school advisors find all of the students in teacher education interested and enthusiastic. School administrators are aware of the student teachers as members of a whole school community and this may account for some of the differences in their perceptions. That is, school administrators may only become aware of individual students when they interview them, during formal or informal observations or during school functions. Additionally, school administrators may have responded to the questionnaire not at the level of individual students but as a response to all of the teacher education students in their school. Finally, there was a difference in the amount of teaching experience between the school associates and the school administrators and it may be that the additional years of experience the school administrators possess may have had an effect on their opinions about the interest and enthusiasm of the PBL students compared to non-PBL students.

These results of the present study suggest that PBL does have an effect on: a) teacher education students' perceptions of the relevant components their teacher education program, b) changes in beliefs about the inclusion of students with special needs, c) school associates' and school administrators' perceptions of teacher education students' reasoning, d) levels of staff satisfaction, and e) tutor perceptions of teacher education students' reasoning. These results suggest that there is no difference between PBL and non-PBL programs with respect to professional preparation and therefore provide ample justification for pursuing the links between a PBL teacher education curriculum and the opinions of university and school based personnel of the outcome variables described in the present study in more depth.
Strengths and Limitations of the Present Study

The present study extends the research into the opinions and attitudes of PBL students and PBL faculty in two ways. First, while the majority of previous research has focused on a PBL curriculum in medical education, the present study examines a uniform PBL curriculum (Barrows, 1986) in teacher education. Thus, the findings of the present study suggest that a PBL curriculum that follows the guidelines outlined by Barrows (1986) can be applied in an educational setting with positive or neutral outcomes. Second, the design of the present study includes the opinions and attitudes of the tutors who work with students both at the university and the school, the methods specialists who work with the students at the university and the school-based staff who work both directly and indirectly with the teacher education students in their practica. This provides additional information about the perceptions of faculty with respect to the effects of participation in a PBL program. That is, the findings of the present study suggest similar effects (i.e., faculty satisfaction, perceptions of reasoning, perceptions of basic skill knowledge) to those effects reported for PBL in medicine (Antepohl & Herzig, 1999; Iputo, 1999; Kaufman & Mann, 1996; McGrew, Skipper, Palley, & Kaufman, 1999; Norman & Schmidt, 1992). Further, adding to the information about the effects of PBL.

There are a number of issues associated with validity that limit the present study. The number of PBL students (58% of the total PBL enrollment) who participated in the present study constitutes problems with respect to the generalizability of these results. The proportion of PBL students (42% of the total PBL enrollment) who did not participate in the present study could have had differing opinions and attitudes. Therefore, in future larger participation should be encouraged. The lack of a comparison group for the pretest measures is a further limitation to this study as the results demonstrate changes in this group of PBL students only. Therefore, although the results support previous research done at UBC comparing PBL students to non-PBL students, it is unclear as to
whether or not the increases are a result of participation in teacher education or a result of participation in PBL. A comparison group would have increased confidence that the increases in scores were a result of participation in PBL. Future studies should ensure that a comparison group is recruited. A further limitation to this study is the issue of self-selection of PBL students and staff. The issue of self-selection is two-fold. First, both the students and the faculty involved with PBL at UBC choose to be involved with the program. Therefore, measures need to be included that assess possible differences (e.g., openness, flexibility) between the participants who choose PBL and those who choose non-PBL programs. Second, the faculty and the teacher education students also volunteered to participate in the present study and the issues associated with self-selection of treatment associated with non-randomization must also be recognized.

Another problem, which may have emerged with respect to the tutors, was the possible effect of the tutors working with a small group of students over an extended period of time. It may be that these tutors developed positive relationships with the PBL students and the tutor's attitudes and opinions may have been influenced by these relationships.

The possibility that some of the participants may have reported increases in desirable behavior as a result of being part of a new program must be recognized as a limitation in the present study.

The present study relied on rating scales and did not include performance data. There are two reasons for this: a) the PBL teacher education program at UBC uses a pass/fail grading system and therefore there was no program performance data available, and b) the province of British Columbia does not have a licensing examination and therefore there is no provincial performance data available. However, while there is no performance data available all of the PBL students who participated in the study had successfully completed their teacher education year and 90% of the total PBL student
enrollment successfully completed their teacher education year. This completion rate is similar across the three years of the program. Unfortunately, there are no comparative data available for the non-PBL students.

The present study included both rating scales and short-answer questions to assess the attitudes, concepts and beliefs of the students. A limitation of rating scales is that accurate measurement is difficult and there are a number of factors that can effect the validity of the results. For example, as mentioned earlier rating scales can be effected by response set. However, the inclusion of short answer questions supported the results from the rating scales used in the present study.

The questions that remain unanswered in the present study with respect to basic knowledge and method courses represent a limitation in the present study. In addition to the reasons listed above, these questions may be a result of a difference in the expectations of the school associates and the expectations of the PBL faculty. The goal of the majority of PBL faculty is to assist students in their conceptual understanding and use of knowledge though self-directed learning. It may be that the expectation of the school associates is that teacher education students should have a beginning knowledge base similar to the one they had and this expectation may be influencing the PBL teacher education students. The expectations of the school associates and information regarding the type of teacher education program that they completed and their attitudes towards their teacher education and teacher education as it currently exists was not addressed in the present study and should be examined in future research.

A final limitation in the present research design is that it does not address the effects of different components of the program. That is, although the results from this study suggest year-long practicum did not have an effect on PBL student teachers' beliefs, the other components of the program (e.g., course work, group dynamics, and
previous experience) have not been assessed. Therefore, future research should include longitudinal data collected from structured interviews and journal entries that create the opportunity for the researcher to understand how the many variables included in the teacher education students' experience interact over time and influence teacher education student development.
Educational Implications

Allowing for the limitations listed above, the results from the present investigation suggest that there are three positive features (i.e., linking theory to practice, reasoning, changed beliefs) that distinguish PBL teacher education students from their non-PBL peers and provide justification for researchers and educators to continue to investigate PBL. With respect to students' ability to link theory to practice, Calderhead (1991) has indicated that teacher education programs do not create the opportunity for students to link theory to practice. However, the present study suggests that there is positive effect of PBL on students' perceptions of their ability to link theory to practice.

The present study suggests that PBL is linked to positive differences in reasoning. If one considers the development of reasoning skills to be a goal of teacher education, it would appear that continued investigation of PBL would be justified.

Recent investigations (Lonka et. al., 1996; Joram & Gabriele, 1998) have demonstrated that the prior beliefs of students are robust and difficult to change. The present study suggests that PBL is linked to changes in the attitudes of teacher education students and this finding also justifies the continued investigation of PBL.

The results from the present study suggest that there are many similarities between the attitudes and opinions of the PBL students and the non-PBL students (e.g., satisfaction with their program, feelings of being prepared, self-directed learning) and these similarities cannot be overlooked in future investigations.

Investigations such as these contribute to our understanding of teacher education student development and provide important information regarding the design and implementation of teacher education programs.
References


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University of British Columbia. (1998). *Teacher education program handbook*. (Available from the Teacher Education Office, Faculty of Education, University of British Columbia, 2125 Main Mall, Vancouver, B.C., V6T 1Z4)


Journal of Teacher Education, March-April, 53-60.


1. Canadians belong to many ethnic or cultural groups such as Native/Aboriginal, French, Chinese, Irish, or East Indian. To which ethnic or cultural group(s) do you belong, if any? (If necessary, circle more than one answer).

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>1</td>
</tr>
<tr>
<td>Native/Aboriginal</td>
<td>2</td>
</tr>
<tr>
<td>German</td>
<td>3</td>
</tr>
<tr>
<td>French</td>
<td>4</td>
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<tr>
<td>Italian</td>
<td>5</td>
</tr>
<tr>
<td>Dutch</td>
<td>6</td>
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<tr>
<td>Scottish</td>
<td>7</td>
</tr>
<tr>
<td>Ukrainian</td>
<td>8</td>
</tr>
<tr>
<td>Persian</td>
<td>9</td>
</tr>
<tr>
<td>Portuguese</td>
<td>10</td>
</tr>
<tr>
<td>East Indian</td>
<td>11</td>
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<tr>
<td>Polish</td>
<td>12</td>
</tr>
<tr>
<td>Greek</td>
<td>13</td>
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<tr>
<td>English</td>
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<tr>
<td>Irish</td>
<td>15</td>
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<tr>
<td>Jewish</td>
<td>16</td>
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<tr>
<td>Hispanic</td>
<td>17</td>
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<tr>
<td>Filipino</td>
<td>18</td>
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<tr>
<td>Vietnamese</td>
<td>19</td>
</tr>
<tr>
<td>Japanese</td>
<td>20</td>
</tr>
<tr>
<td>Eastern European</td>
<td>21</td>
</tr>
</tbody>
</table>

Other ethnic or cultural group (specify): ________________________________

2. Sex

Male...1  Female...2

3. What is your age? ____________

4. Do you have any children? Yes No
   If yes, what are their ages? _______________________________________

5. Please, mark all the degrees you have received in Column A. Please indicate your area of major/specialization in Column B.

<table>
<thead>
<tr>
<th>Specialization</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor's degree</td>
<td></td>
</tr>
<tr>
<td>Biological sciences</td>
<td>1</td>
</tr>
<tr>
<td>Business</td>
<td>2</td>
</tr>
<tr>
<td>Education</td>
<td>3</td>
</tr>
<tr>
<td>Engineering, other applied science</td>
<td>4</td>
</tr>
<tr>
<td>Humanities or arts.</td>
<td>5</td>
</tr>
<tr>
<td>Physical science</td>
<td>6</td>
</tr>
<tr>
<td>Social science</td>
<td>7</td>
</tr>
<tr>
<td>Other bachelor's degree</td>
<td>8</td>
</tr>
<tr>
<td>Graduate Degree</td>
<td></td>
</tr>
<tr>
<td>Masters of Arts</td>
<td>9</td>
</tr>
<tr>
<td>Masters of Sciences</td>
<td>10</td>
</tr>
<tr>
<td>Doctor of Philosophy</td>
<td>11</td>
</tr>
<tr>
<td>Other professional teaching degree</td>
<td>12</td>
</tr>
</tbody>
</table>


6. Listed below are a number of experiences outside of a formal school setting that provide opportunities for working with children. Please circle all that apply to you. For the ones you circled, please record the number of years that you worked in that capacity.

<table>
<thead>
<tr>
<th>Please circle all that apply</th>
<th>How many years?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Coaching</td>
<td></td>
</tr>
<tr>
<td>2. Tutoring</td>
<td></td>
</tr>
<tr>
<td>3. Youth leader (e.g. camp counselor, religious group leader, scout leader)</td>
<td></td>
</tr>
<tr>
<td>4. Teaching Assistant/Special Education Assistant</td>
<td></td>
</tr>
<tr>
<td>5. Nanny</td>
<td></td>
</tr>
<tr>
<td>6. Teen Crisis Hotline</td>
<td></td>
</tr>
<tr>
<td>7. Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B

STUDENT TEACHERS' FEELINGS OF PREPAREDNESS TO TEACH.
APPENDIX C

GIBSON TEACHER EFFICACY SCALE
APPENDIX D
LANCASTER APPROACHES TO STUDYING INVENTORY
**Section 11**

Please answer every item quickly by giving your immediate response. Circle the appropriate code number to show your general approaches to studying.

Scale: 1=Definitely disagree 2=Disagree with reservation 3=Cannot give a definite answer 4=Agree with reservations 5=Definitely agree

<table>
<thead>
<tr>
<th></th>
<th>Definitely disagree</th>
<th>Disagree reservations</th>
<th>Not definite</th>
<th>Agree reservations</th>
<th>Definitely agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I find it easy to organize my study time effectively.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I try to relate ideas in one subject to those in others, when ever possible.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Although, I have a fairly good idea of many things, my knowledge of the details is rather weak.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I like to be told precisely what to do in essays or other set work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. The best way for me to understand what technical terms mean is to remember the textbook definitions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. It's important to me to do really well in the courses here.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I usually set out to understand thoroughly the meaning of what I am asked to read.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. When I'm doing a piece of work, I try to bear in mind exactly what that particular teacher/lecturer seems to want.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I am usually cautious in drawing conclusions unless they are well supported by the evidence.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. My main reason for being here is so that I can learn more about the subjects that really interest me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. In trying to understand new ideas, I often try to relate them to real life situations to which they might apply.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. I suppose I am more interested in the qualifications I'll get than in the courses I'm taking.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. I'm usually prompt at starting work in the evenings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. Although, I generally remember facts and details, I find it difficult to fit them together into an overall picture.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. I generally put a lot of effort into trying to understand things which initially seem difficult.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. I often get criticized for introducing irrelevant ideas into essays or discussions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. Often I find I have to read things without having a chance to really understand them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18. If conditions aren't right for me to study, I generally manage to do something to change them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
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<td>---</td>
<td>---</td>
<td>---</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td>19. Puzzles or problems fascinate me, particularly where you have to work through the material to reach a logical conclusion.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20. I often find myself questioning things that I hear in lectures or read in books.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21. I find it helpful to &quot;map out&quot; a new topic for myself by seeing how ideas fit together.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22. I tend to read very little beyond what's required for completing assignments.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23. It is important to me to do things better than my friends, if I possible can.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24. Tutors/teachers seem to want me to be more adventurous in making use of my own ideas.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25. I spend a good deal of my spare time in finding out more about interesting topics which have been discussed in classes.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26. I seem to be a bit too ready to jump to conclusions without waiting for all the evidence.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27. I find academic topics so interesting, I should like to continue with them after I have finished.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>28. I think it is important to look at problems rationally and logically without making intuitive jumps.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>29. I find I have to concentrate on memorizing a good deal of what we have to learn.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
APPENDIX E

QUESTIONNAIRE ON STUDENT SATISFACTION
### Section V

<table>
<thead>
<tr>
<th>Statement</th>
<th>Scale</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>The content of the tutorial fitted with my level of knowledge.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>The PBL cases illustrated educational concepts.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>The tutor steered the group strongly.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>The tutor generated the learning objectives.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>The tutor conveyed interest in PBL.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>The group climate facilitated the learning process.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>The tutor's interventions were adequate.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>PBL was fun.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>The learning outcome of the tutorial was large.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I consider PBL to be an effective learning style for myself.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I will recommend PBL to other students.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>In the PBL group, I learned something about dealing with others.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>In the PBL group, I could improve my communication skills.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Before the starting PBL, I was aware of the method.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Before starting PBL, I was open for the method.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Scale: 1=Definitely disagree 2=Disagree with reservation 3=Cannot give a definite answer 4=Agree with reservations 5=Definitely agree</td>
<td>Definitely disagree</td>
<td>Disagree reservations</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>1. The content of my classes fitted with my level of knowledge.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>2. The classes illustrated educational concepts.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>3. The instructor steered the group strongly.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>4. The instructor generated the learning objectives.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>5. The instructor conveyed interest in education</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>6. The group climate facilitated the learning process.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>7. The interventions were adequate.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>8. Teacher education was fun.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>9. The learning outcome of my classes was large.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>10. I consider my teacher education program to be an effective learning style for myself.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>11. I will recommend my teacher education program.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>12. In teacher education, I learned something about dealing with others.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>13. In teacher education, I could improve my communication skills.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>14. Before starting the teacher education program, I was aware of the method.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>15. Before starting the teacher education program, I was open to the method.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
### Section VI

**Scale:**

1. Definitely disagree  
2. Disagree with reservation  
3. Cannot give a definite answer  
4. Agree with reservations  
5. Definitely agree

<table>
<thead>
<tr>
<th>Definitely disagree</th>
<th>Disagree reservations</th>
<th>Not definite reservations</th>
<th>Agree reservations</th>
<th>Definitely agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

My teacher education program has developed my ability to:

1. Identify my specific learning needs (i.e., in terms of a specific educational problem or issue)  
   - 1  
   - 2  
   - 3  
   - 4  
   - 5

2. Identify and locate a range of relevant resources.  
   - 1  
   - 2  
   - 3  
   - 4  
   - 5

3. Critically evaluate the scope and accuracy of the information.  
   - 1  
   - 2  
   - 3  
   - 4  
   - 5

4. Evaluate the effectiveness of the application of this knowledge.  
   - 1  
   - 2  
   - 3  
   - 4  
   - 5

---

### Section VI

**Scale:**

1. Very low  
2. Moderately low  
3. Cannot give a definite answer  
4. Moderately high  
5. Very high

<table>
<thead>
<tr>
<th>Very low</th>
<th>Moderate low</th>
<th>Not definite</th>
<th>Moderate high</th>
<th>Very high</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rate how important or relevant to your learning do you perceive the following items to be:

1. Identifying my specific learning needs (i.e., in terms of a specific educational problem or issue)  
   - 1  
   - 2  
   - 3  
   - 4  
   - 5

2. Identifying and locating a range of relevant resources.  
   - 1  
   - 2  
   - 3  
   - 4  
   - 5

3. Critically evaluating the scope and accuracy of the information.  
   - 1  
   - 2  
   - 3  
   - 4  
   - 5

4. Evaluating the effectiveness of the application of this knowledge.  
   - 1  
   - 2  
   - 3  
   - 4  
   - 5
APPENDIX G

STUDENT TEACHERS' FEELINGS ABOUT THE TEACHER EDUCATION PROGRAM
How have your attitudes towards inclusion of students with special needs changed from September?

What aspects of your teacher education year influenced your attitudes towards inclusion of students with special needs?

Please describe how you have found the teacher education program relevant to the practice of teaching?

How prepared did you feel to teach in your practicum? Please briefly describe how your teacher education program had an impact on your feelings of preparedness to teach in your practicum.

Describe how your teacher education program has had an impact on your attitude towards your own learning?

Describe how your teacher education program has had an impact on your beliefs about teaching?
APPENDIX H

ATTITUDES AND OPINIONS OF TEACHING STAFF
School Associate Questionnaire

A. Please tell us about yourself

1. Years of teaching ________________________________

2. Years of having a student teacher ________________________________

3. Degree(s) ________________________________

4. Have you had experience with either traditional or PBL teacher education students? Yes No
   If your answer is yes, please briefly describe your experience. ________________________________

B. Please compare PBL student teachers with traditional teacher education student teachers.
   Scale: 1 = traditional significantly better  2 = traditional generally better
         3 = both the same  4 = PBL generally better  5 = PBL significantly better

1. Interest and enthusiasm  1  2  3  4  5
2. Knowledge of basic teaching strategies  1  2  3  4  5
3. Understanding of general principles of teaching  1  2  3  4  5
4. Reasoning ability  1  2  3  4  5

How do you perceive PBL student teachers to be alike or different from student teachers from a traditional teacher education program.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Would you be a school associate for PBL again? Yes No Please explain your answer.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
APPENDIX I

SCHOOL PRINCIPALS ASSESSMENT OF PBL TEACHER EDUCATION STUDENTS
School Administrator Questionnaire

A. Please tell us about yourself

1. Years of being a principal ________________________________

2. Years of teaching ___________________________ ________________________________

3. Degree(s) __________________________________________

4. Have you had experience with either traditional or PBL teacher education students?
   Yes  No
   If your answer is yes, please briefly describe your experience. __________________________

B. Please compare PBL graduates with traditional teacher education graduates.
   Scale: 1 = traditional significantly better  2 = traditional generally better
   3 = both the same  4 = PBL generally better  5 = PBL significantly better

1. Graduates' interest and enthusiasm  1  2  3  4  5
2. Graduates' knowledge of basic teaching strategies  1  2  3  4  5
3. Understanding of general principles of teaching  1  2  3  4  5
4. Graduates' reasoning ability  1  2  3  4  5

How do you perceive PBL graduates to be alike or different from graduates from a traditional teacher education program.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Would you have a PBL student again? Would you hire a PBL graduate?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
APPENDIX J

OPINIONS AND ATTITUDES OF UNIVERSITY PERSONNEL
Faculty Questionnaire

A. Please tell us about yourself

1. Years of teaching PBL

2. Years of teaching in traditional teacher education

3. Degree(s)

4. Helped writing PBL cases yes no

5. Involved in PBL exams yes no

6. Would like to tutor again yes no

B. Please rate you overall satisfaction with the following aspects of your tutoring experience.

Scale: 1=Very Dissatisfied 2=Dissatisfied 3=Neutral 4=Satisfied 5=Very Satisfied

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Very Dissatisfied</th>
<th>Dissatisfied</th>
<th>Neutral</th>
<th>Satisfied</th>
<th>Very Satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students' learning in your group</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Group dynamics in your group</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. The role you played in your group</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Students' interest and enthusiasm</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Grading system for your tutorial (pass/fail)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Your overall performance as a tutor</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Please describe the one thing you liked the most about PBL

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Please describe the one thing you disliked the most about PBL

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Please describe the one thing you would change about PBL

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________