

DISSERTATION

AN EXPLORATION OF THE USE OF PROBLEM-BASED LEARNING AT ALLOPATHIC  
FAMILY MEDICINE RESIDENCY PROGRAMS IN THE UNITED STATES

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## ABSTRACT

### AN EXPLORATION OF THE USE OF PROBLEM-BASED LEARNING AT ALLOPATHIC FAMILY MEDICINE RESIDENCY PROGRAMS IN THE UNITED STATES

Background: Problem-based learning (PBL) is a learner-centered approach that allows learners to be self-directed and learn content in the context where it will be applied. Recent research on outcomes shows strong evidence for a positive impact on physician competency. PBL was designed by Barrows to teach students in the preclinical medical school years; however, it is an approach well suited for adult learners, like those at the graduate medical education level. It is not known whether and to what extent PBL is used in graduate medical education in any specialty. This study provides an original contribution to knowledge by describing the use of PBL in graduate medical education specifically focusing on family medicine. Method: Surveys were sent to program directors at 444 allopathic family medicine residency programs in the United States. Results: One hundred seventy five programs (39.4%) responded to the survey. Of those responding, 82.9% used PBL as defined in this study; however only one-third of respondents used the term PBL at their programs. Use of PBL did not vary by program types or program location. Almost all (97.2%) programs used physician faculty to facilitate PBL and over half (56%) trained PBL facilitators with formal faculty development. Over 90% of programs relied on actual patient cases to provide case content for PBL. The majority of program directors felt their implementation of PBL was a success. Conclusions: PBL is widely used at family medicine residency programs and there is great consistency across programs for facilitator training, case creation, and perceptions of success with this method. It is a method that warrants further study based on its broad use.

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## DEDICATION

To my grandfather, Richard Kinder, who has never stopped asking me when I was going to graduate. There is so much you have taught me that I could never learn in school.

To my late father, Ronald S. Brezinski, happy birthday.

To my mother, Leslie, who inspired me to be a teacher of sorts.

To my husband who has supported me endlessly.

To my son who is everything in the whole world.

## TABLE OF CONTENTS

ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iii
DEDICATION.....	iv
LIST OF TABLES.....	viii
CHAPTER 1: INTRODUCTION.....	2
STATEMENT OF THE PROBLEM.....	2
SIGNIFICANCE OF THE STUDY.....	4
FOCUS OF INQUIRY.....	4
RESEARCH DESIGN.....	5
ASSUMPTIONS, LIMITATIONS, AND SCOPE.....	5
DEFINITION OF TERMS.....	6
SUMMARY.....	7
CHAPTER 2: REVIEW OF THE LITERATURE.....	8
HISTORY OF PBL.....	9
PBL AS SDL.....	10
THE PBL PROCESS.....	12
OUTCOMES.....	19
CONCLUSIONS.....	22
CHAPTER 3: METHODS.....	23
CONCEPTUAL FRAMEWORK.....	23
RESEARCH QUESTIONS.....	23

SETTING AND PARTICIPANTS .....	25
INSTRUMENT .....	25
PROCEDURE.....	26
DATA ANALYSIS.....	27
CHAPTER 4: RESULTS .....	29
PROGRAM DEMOGRAPHICS .....	29
TEACHING METHODS USE IN RESIDENCY PROGRAMS.....	31
PROBLEM-BASED LEARNING.....	32
NAMING PBL.....	34
INCORPORATING PBL.....	34
PBL PARTICIPANTS .....	35
PBL FACILITATORS.....	37
PBL CASES.....	38
EVALUATION OF PBL .....	39
SUCCESS WITH PBL .....	39
CHAPTER 5: DISCUSSION.....	41
USE OF PROBLEM-BASED LEARNING .....	42
PBL FACILITATORS.....	46
PBL CASES.....	48
EVALUATION OF PBL .....	48
SUMMARY AND CONCLUSIONS .....	49
REFERENCES .....	50
APPENDIX A: SURVEY INSTRUMENT .....	60

APPENDIX B: COVER LETTER OF INVITATION TO SURVEY PARTICIPANTS.....	62
APPENDIX C: VARIABLE CODING SCHEME.....	64



LIST OF TABLES

Table 1. Distribution of Responding Family Medicine Residency Program Types compared to Distribution of Program Types in the U.S .....29

Table 2. Average Program Age and Number of Residents in each Training Year for the Five Family Medicine Program Types (with Standard Deviations in Parentheses) .....30

Table 3. Percentage of Each Program Type Occurring in Suburban, Urban, and Rural Locations (with Number of Programs in Parentheses) .....31

Table 4. Percentage of Time each Program Type has Been Using PBL to Teach Residents (with Number of Programs in Parentheses) .....37

## CHAPTER 1: INTRODUCTION

After graduating from medical school, most students continue on to graduate medical education. It consists of a residency in a specialty of one's choice. The length of time of a residency varies based on the specialty. For example, a family medicine residency is three years long, while a student with aspirations of being a cardiologist would spend three years at an internal medicine residency and then another two to three years in a cardiology fellowship. By the time a student graduates high school, graduates college, graduates medical school and begins residency, s/he is an adult. The average age of a first-year medical school student is 24 years old (American Association of Medical Colleges [AAMC], 2012); add the four years spent in medical school, and the average age of a first-year resident is 28 years old.

Adults learn differently than children (Knowles, 1980; Merriam, 2001; Merriam & Caffarella, 1999). Researchers have been studying adult learning theory and strategies for teaching adults since Dewey (1963) introduced the concept of experiential learning in his text *Experience and Education*. He proposed the idea of education through meaningful experiences, which forms the basis for many teaching techniques geared toward adult learners (Dewey, 1963). Malcolm Knowles, one of the first to theorize how adults learn, included this *wealth of experience* in his set of crucial assumptions about the characteristics of adult learners; the others being: autonomy and self-directedness, readiness to learn, practical and goal orientation to learning, and motivation to learn (Knowles 1980; Merriam, 2001).

Based on Knowles and researchers who followed, teaching methods that capitalize on the characteristics of adult learners will: take experiences into account, actively engage learners in the learning process, stimulate the learner's intrinsic sense of motivation, and allow an element of control over the learning environment. Problem-based learning (PBL) is one such framework

that takes the characteristics of adult learners into account. PBL is used in various educational contexts, from elementary to graduate school. Since the 1960's, it has become increasingly used in medical education. Some have called PBL one of the most significant modern changes to American medical education (Donner & Bickley, 1993).

PBL is widely recognized as a learner-centered active learning approach. However, researchers note that there is no universally accepted definition of PBL in medical education and a lot of variations exist (Butler, Inman, & Lobb, 2005; Donner & Bickley, 1993; Taylor & Mifflin, 2008). Some PBL methods are well-designed and complex, while Barrows (1984) considers others to be “simple and intuitive, at best a fun experience or diversion to break up the monotony of a didactic experience,” (p. 17). PBL is flexible and used differently at different institutions, and this has been the case since the inception of its use in medical education.

### **Statement of the Problem and Purpose**

Though broadly used in medical schools across the U.S., the level of PBL use varies from school to school, and no data exists on the extent of its use at the graduate medical education level (Wood, 2003). Some schools, like McMaster University, have a PBL-only curriculum, while others incorporate PBL into only a percentage of the learning. Some strategies that medical schools have used to incorporate it include: PBL elective weeks, PBL courses, a PBL third-year of training, or PBL sessions included in conventional classes (Almaro & Schofield, 2012; Armstrong, 1997; Barrows, 1984; Doig & Werner, 2000; Donner & Bickley, 1993). While attempts to incorporate PBL are common all over U.S. medical schools, Kinkade (2005) surveyed 123 accredited medical schools in the U.S. and found that although seventy percent reported using PBL in preclinical training, the majority used it less than ten percent of teaching

time. Only six percent of schools surveyed by Kinkade reported PBL was incorporated into more than half of preclinical teaching.

Before Neufeld and Barrows' (1974) conceptualized PBL for McMaster University, PBL did not exist. The intent was that it would be used during preclinical education in the first two years of medical school, but would not continue into the clinical years. Educators soon saw the benefits of PBL and expanded its use beyond the preclinical years and into disciplines beyond medical education. Yet, given Barrows' connection to undergraduate medical education and the amount of medical schools reported to be using PBL, it is not surprising that most of the research on PBL in medical education is conducted at the undergraduate level. Few studies have been done at the graduate medical education level. These have focused on individual learning outcomes and spanned a wide variety of specialties, including dermatology, obstetrics, surgery, and psychiatry (Nguyen, et al., 2006; Ostbye, Krause, Gradison, Eisenstein, & Wagner, 2004; Ozuah, Curtis, & Stein, 2001; Schultz-Ross & Kline, 1999; Thomas, Aeby, Kamikawa, & Kaneshiro, 1999).

In over 40 years since PBL was created, evidence is just beginning to show that PBL is a method with improved outcomes over other methods. A 2008 systematic review of research assessed PBL on eight dimensions and found PBL was superior to other methods in social (teamwork skills, appreciation for the social and emotional aspects of healthcare, appreciation of the legal and ethical aspects of healthcare, and appropriate attitudes toward health and well being), and cognitive (coping with uncertainty, using evidence-based medicine, and using information resources) domains (Koh, Khoo, Wong, & Koh, 2008). Some educators in family medicine have argued this evidence to support PBL may have come too late (Egan & Mainous, 2012) despite the fact that it is not known how widely used PBL is in any specialty of graduate

medical education. Therefore, the purpose of this study is to expand on PBL research in medical education by conducting a survey research project that describes the landscape of PBL at the residency program level, specifically focusing on family medicine.

### **Significance of the Study**

This study will expand on PBL research in medical education by describing the use of PBL at family medicine residency programs. It will contribute information to the field of family medicine that is currently unknown. It will shed light on an educational method suitable for use with adult learners that may be underutilized, increasing understanding of how this particular method is used, to what extent, and with how much success. It will provide insight into how residency programs choose to teach family medicine residents and determine whether, and to what extent, future research should be conducted on PBL in family medicine education.

### **Focus of Inquiry**

The central research question for this project asks, “What is the state of problem-based learning at allopathic family medicine residency programs in the United States?” The question is designed to solicit input about the use, process, and success of residency programs employing PBL as a teaching method. It will be further investigated whether or not the use of PBL in residency programs varies based on program demographics, such as program size, program location, age of the program, or type of residency program. Specific research questions follow from the instrument and can be found in Chapter 3.

### **Research Design**

This study employs a survey research methodology to solicit input from all allopathic family medicine residency program directors in the United States. The survey instrument

contains both demographic questions about the type, size, and location of the responding residency program as well as questions specific to PBL as a teaching method. In advance of this project, the survey was piloted with a group of family medicine educators and surveys were modified based on their feedback. A first wave of mailed surveys was sent in May 2012. A second wave of electronic follow-up surveys was sent four weeks after the initial mailed surveys were sent. Survey data were entered into a data analysis software program and analyzed to answer research questions of interest.

### **Assumptions, Limitations, and Scope**

In this study, participants are program directors from family medicine residency programs in the United States. It is assumed that, as fellow educators and researchers in the field of family medicine, the participating program directors will respond honestly and to the best of their individual abilities.

There are limitations to conducting research with busy physicians, which could result in a poor response rate from participants. However, family medicine is a discipline that supports and encourages scholarship and past surveys of program directors, faculty, and research coordinators have been successful in answering important questions (Bragg, Warsaw, Arenson, Ho, & Brewer, 2006; Gibson & Hueston, 2007; Spitzer, Apgar, Brotzman, & Krumholz, 2001; Young, DeHaven, Passmore, Baumer, & Smith, 2007). The survey instrument was pilot tested with a group of family medicine residency faculty to ensure questions were capable of eliciting responses based on the research questions of interest. However, it is possible that questions can be misinterpreted and respondents' answers may not accurately reflect the use of PBL at their residency programs.

This research is delimited to residency programs training resident physicians in the specialty of family medicine. It is further delimited to allopathic residency programs accredited by the Accreditation Council for Graduate Medical Education.

### **Definition of Terms**

*Problem-based learning* is a teaching methodology where information about a case is revealed over time and learners are given an opportunity to ask questions and use resources to seek out information as a case is revealed and discussed. The implementation varies and sessions can take place over hours, weeks or months.

*Allopathic residency programs* are residency programs that train residents in the allopathic tradition of medicine and are accredited by the Accreditation Council for Graduate Medical Education. Allopathic residency programs accept medical students who have graduated from allopathic medical schools and received a Doctor of Medicine (M.D.) degree, or those who graduated from an osteopathic medical school and received a Doctor of Osteopathic Medicine (D.O.) degree.

*Osteopathic residency programs* are residency programs that train residents in the osteopathic tradition of medicine and are accredited by the American Osteopathic Association. Osteopathic residency programs accept only medical students who have graduated from an osteopathic medical school and received a Doctor of Osteopathic Medicine (D.O.) degree.

*Family Medicine* is one of many specialties within the Graduate Medical Education system in the United States.

*Family Medicine physicians* are those doctors who have been trained in the specialty of family medicine.

*Family Medicine residency programs* are three-year training programs for physicians seeking to be trained in the specialty of family medicine. After graduating from an allopathic or osteopathic medical school, physicians can choose to enter a residency in family medicine, which lasts three years. There are five types of family medicine residency programs:

1. University-based programs are programs sponsored by a university or university-based teaching hospital.
2. Community-based, university-administered programs are located at a community hospital, but which have administrative oversight from a university.
3. Community-based, university-affiliated programs are located at a community hospital, but with a minor connection to a local or regional university (e.g., faculty serve as adjunct clinical professors at the university).
4. Community-based, unaffiliated programs are programs located at a community hospital with no connections to a medical school or university.
5. Military programs are programs run by the United States military. The resident physicians training in these programs are members of a branch of the military.

### **Summary**

Problem-based learning is a learner-centered teaching method that was created in 1969 for use in medical schools but has been used more broadly in adult education in a variety of disciplines. It is not known how frequently this method is used in graduate medical education programs in family medicine but evidence would support that it is an appropriate method to use with adult learners in a residency training setting. This survey research project is designed to describe the use of PBL at family medicine residency programs in the United States.



## CHAPTER 2: REVIEW OF THE LITERATURE

### **History of PBL**

Barrows designed PBL and introduced it into the medical education scene in 1969 at McMaster University School of Medicine in Canada (Barrows, 1994; Neufeld & Barrows, 1974). Researchers believe that PBL was driven to the forefront of medical education when medical educators realized that doctors-in-training did not remember everything they learned in medical school (Hoover & Achilles, 1996). There was an increasing breadth of clinical knowledge required of physicians, and the successful implementation of PBL coursework at McMaster gave educators in the U.S. the confidence to try it also (Donner & Bickley, 1993).

In 1979, the University of New Mexico Medical School was the first in the U.S. to offer PBL as an alternative to the conventional curriculum track. Following its success in New Mexico, Mercer University School of Medicine made a full commitment to PBL in 1982 by moving to a PBL-only curriculum (Camp, 1996). The University of Illinois School of Medicine implemented a PBL curriculum with a small group of faculty, led by Barrows (Taylor & Mifflin, 2008). Harvard Medical School soon followed suit, adopting an alternative PBL track and now includes some PBL coursework for all students, in addition to a structured curriculum (Hoover & Bickley, 1993; Taylor & Mifflin, 2008).

Also noted in Chapter 1, despite its broad use, no universally accepted definition of PBL in medical education exists (Barrows, 1984; Butler, et al., 2005; Donner & Bickley, 1993; Maudsley, 1999; Taylor & Mifflin, 2008). Knowing that, even at its inception, PBL had different meanings for different people, Barrows (1986) proposed a taxonomy of PBL methods that had six levels. He noted that the major variables manipulated by PBL creators were the cases and how the cases were presented. He said lecture-based case presentations were the least contextual

use of cases, and led to the least self-directed learning (SDL), clinical reasoning, and student motivation. Beyond lecture-based cases were several versions of case-based methods, including case-based lectures, case method, and modified case-based method, with increasing amounts of self-directed learning, clinical reasoning, learning in context, and increased student motivation. Problem-based learning is the fifth method in his linear taxonomy. It allows for reasonably high levels of student motivation, SDL, context, and clinical reasoning. Students are allowed free inquiry, guided by prior knowledge and a tutor, towards a case's end solution. His final method in the taxonomy is referred to as "closed loop, or reiterative problem-based; it involves more cycles of evaluation of resources, prior knowledge, and the learner's own problem-solving skills" than the classic problem-based method (1986, p. 484).

Harden and Davis (1998) provided an alternative continuum for the stages between lecture-based and problem-based learning. Their eleven-step continuum moves from the most theoretical learning, where the goal is acquisition of information, through problem-oriented learning, problem-assisted learning, problem-solving learning, problem-focused learning, problem-based mixed approach, problem-initiated learning, problem-centered learning, problem-centered discovery learning, to problem-based learning and finally to task-based learning. Each level presents slightly more SDL and more examples leading to the learning of rules/theory. This focus on self-directed learning is what distinguishes PBL from many other teaching methods.

### **PBL as SDL**

Barrows (1984) presented readers with a basic set of core expectations for any undifferentiated physician entering any specialty. He suggested that what the public expects from physicians is an ability to manage health problems of patients in an efficient, effective, humane way and an ability to continue learning to meet the needs of patients and the changing medical

field (p. 4). He also suggested that PBL methods might be the best way to facilitate learners to meet these core expectations because they provide learners an opportunity to practice medicine under the guidance of a tutor, using patient scenarios designed to illuminate certain concepts, and which meet certain learning objectives.

In PBL, learners can explore a task and a series of concepts related to a patient case where no outside source directly transmits content to learners; it is self-constructed and internalized. PBL provides an opportunity to foster SDL (Dolmans, de Grave, Wolfhagen, & van der Vleuten, 2005; Mifflin, 2004a; Mifflin, Campbell, & Price, 2000). The skills of SDL are essential if physicians are to be lifelong learners and keep current on content after formal schooling has ended (Barrows, 1984). PBL offers a practical way to practice SDL with patient cases, and some medical schools have specified becoming a self-directed learner as a specific goal of their PBL curriculum (Neufeld & Barrows, 1974). However, this idea is controversial.

Knowles (1980) argued that SDL is what sets adults apart as learners, while others (Candy, 1991) feel that even adults have a mixed capacity for self-directed learning. They suggest that adults have a sense of what they want to know, and they do want to participate, but they also want clear expectations. Espey, Ogburn, Kalishman, Zsemlye, and Cosgrove (2007) found a structured PBL tutorial format with specific guidelines and expectations was well received by learners.

Wlodkowski (1999) suggested that promoting personal control over learning is a key strategy for educators of adult learners in order to enhance motivation to learn. This is accomplished by capitalizing on adults' inclination toward autonomy. PBL is a learner-centered approach, but provides guidance and some scaffolding towards a set of targets to be reached. It walks the line between learner-centered and teacher-structured (Barrows, 1994; Mifflin, et al.,

2000; Taylor, Marineau, & Fiddler, 2000; Taylor & Mifflin, 2008). PBL is seen as placing responsibility on learners, but not total abandonment of any direction (Greening, 1998; Mifflin, 2004). Research has found models without sufficient guidance to be counterproductive (Huang & Carroll, 1997).

Kirschner, Sweller, and Clark (2006) argued that minimally guided instruction, like PBL, is less effective than direct instruction in moving content from working memory to long-term memory. They perceive the method as incomplete and inefficient, with students focusing on problem solving instead of learning concepts. However, Barrows argued that although the method looks casual and inefficient, it is complex, carefully organized, and efficient (Barrows, 1994). He notes that knowledge is best retained and retrieved in a clinical context provided by PBL. He wrote, “The lifelong task of doctors is to encounter problems first, without prior preparation and to disentangle... that problem through inquiry” (1984, p. 23). Rather than acquiring knowledge, the use of knowledge - the learning how to learn - is seen as the more admirable goal, and one facilitated by PBL (Neufeld & Barrows, 1974; Savin-Baden, 2000).

### **The PBL Process**

PBL has core components to its structure including cases, resources, learning objectives, guidelines and the PBL tutor. However, variations in implementation exist. Davis and Harden (1999), Barrows (1994), Donner and Bickley (1993), and Camp (1996) provide extensive discussions of the PBL process.

Typically, PBL sessions begin with the presentation of a problem-situation. This problem-situation, or *case*, is designed to be a real-life scenario that learners might encounter as a medical professional. It is typically limited to a few body systems depending on the learners' levels of education. Guidelines, directions, guided questions, and resources are also made

available to the learners. These aids give learners information about the process, as well as where to find resources that might be applicable to the specific case.

It is important for faculty to design specific learning objectives in advance of the PBL session so that it flexibly moves in the desired direction. These objectives are not immediately shared with the learners to preserve the integrity of the activity. It is also necessary to provide learners with specific guidelines in terms of what, if anything, they need to produce for successive sessions (written essay, oral presentation, etc.). PBL sessions typically have a clear timeframe for the learning process, which will vary widely from institution to institution depending on the extent of PBL implementation and use. Group work is another key component to PBL, with learners always working in groups of three or more based on the size of the class. To monitor the group process and choreograph the problem-based learning session, a facilitator, sometimes called the PBL tutor, is needed.

### **Cases**

Some of the most important features of PBL cases are that the problems come first (Barrows, 1984), that problems are prevalent and relevant to practicing physicians (Barrows, 1994; Donner & Bickley, 1993), and that a clinical context is available to apply content (Barrows, 1984). PBL cases cover a breadth and wealth of topics from simple history taking to the complex diagnosis of an acute illness. They vary in length and are typically introduced over time, with additional information being provided to the learners at successive intervals as the case progresses (Capon & Kuhn, 2004).

Researchers note that PBL cases should be high quality, with objectives identified by faculty in advance of the sessions (Mifflin, et al., 2000; Wood, 2003). They should be a mix of prevalent problems and infrequent serious problems (Barrows, 1984); ideally, based on real

patients such that actual laboratory data and imaging studies can be presented as part of the case materials. Dolmans, Snellen-Balendong, Wolfhagen, and van der Vleuten (1997) presented seven criteria for effective case design that can be used by tutors to aid in case development, including: adapting to students' prior knowledge, stimulating self-directed learning, and enhancing student interest in the subject matter.

Despite available resources to aid in case creation, and a wealth of cases available in the published literature, several researchers have pointed out various limitations to PBL cases in medical education (Butler et al., 2005; Hays, 2002; Yamada & Maskarinec, 2003). Hays (2002) noted there were problems with PBL cases covering rural health learning objectives. He said cases typically illustrated poor rural patients rescued by large city hospital doctors, and suggested that people writing PBL cases should be more socially accountable to create accurate cases and illustrate problems consistent with real life. He concluded that biases come through and can be reinforced by poorly written PBL cases.

Finucane and Nair (2002) found PBL cases paid little attention to chronic disease scenarios. After analyzing 162 PBL cases at two medical schools in Australia, they found only twelve percent of cases involved patients over the age of 65. The majority of cases (62 percent) had presentation of illness less than one month in duration (i.e., more acute onset). Approximately 86 percent of illnesses were resolved by the end of the case, and only nine percent ended in the death of the patient.

This imbalance in the content of case scenarios and a heavier focus on acute and life-threatening illnesses may attempt to capitalize on an adult's capacity for recalling interesting information. Whitman (2004) wrote that it is important for cases to be interesting and memorable in order to facilitate later recall by students. Infusing cases with catchy patient names and strange

or rare diagnoses may help learners move elements of the case to long-term memory better than mundane cases. However, MacLeod (2011) argued that the “joke name” (e.g., alcoholic patient Jack Daniels) in PBL cases both labels patients as no more than their disease, and often makes a value judgment about a patient’s social or life situation through the fictitious name. Despite the memorable nature of the strange or rare, Wlodkowski (1999) and Irby (1994) argued that relevancy is equally important to engage learners; highlighting an importance of including typical illnesses and typical patient characteristics in PBL cases.

Yamada and Maskarinec (2004) noted that PBL cases pay limited attention to a patient’s cultural values and belief system. They argued that PBL cases should explicitly incorporate dialogue and patient narrative as opposed to presenting a series of medical facts about a patient. Barrows (1994) noted that the patient is a necessary partner in the diagnostic and treatment process, suggesting that incorporating dialogue and patient context highlighting each patient’s unique background would enrich PBL cases. Most authors agree that poorly written cases or underrepresented patient populations within cases lead to a narrowed understanding of content, as well as attitudinal learning that marginalizes certain populations (Finucane & Nair, 2002; Greening, 1998; Hays, 2002).

In addition to often-absent non-clinical information, Finucane & Nair (2002) noted that acute-focused PBL cases give learners the impression that all medical problems have solutions. Butler et al. (2005) similarly asserted that simply calling it “problem-based” implies there is a “solution,” although many medical problems have multilayered solutions or perhaps no true solution. Neufeld and Barrows (1974) argued to the contrary, they said the PBL process actually elucidates the fact that very few problems in medicine have solutions; wrestling with problems creates even more unanswered questions for learners, mirroring a process that often unfolds in

clinical practice. It is the journey (problem-based learning) rather than the solution that is important (Margetson, 1999).

## **Resources**

Self-directed learning involves learning the methods to manage information; therefore, utilization of resources is a key component of PBL (Neufeld & Barrows, 1974). Learners participating in PBL need enough resources to be successful at navigating through PBL cases.

Deretchin, Yeoman, and Seidel (1998) studied resource use during PBL. These resources can either stimulate problem solving or provide information. Resources take many forms, including: the PBL tutor, peers, the Internet, books, and faculty. The researchers looked at what and how resources were used over six months of PBL sessions and found that the use of all printed, electronic, and physical (labs, films) resources declined over the six-month study period. However, the use of human resources increased from 29 percent to 37 percent of the overall resources used. The authors designed this study to observe how resource use changes over time. They found that significantly fewer resources were used over time, as did the variety of resources decrease. They speculated that the increase in use of human resources could be due to ease of getting information from peers and colleagues, as well as an increased student comfort level over time in talking with faculty members and attending physicians (Deretchin, et al., 1998).

## **Learning Objectives**

Learning objectives are an important component of PBL. They are part of the directions or guidance offered by the tutor, but may not be revealed all at once to preserve the learning process. A common misconception with PBL is that the learners define the learning (Mifflin, et al., 2000). In PBL, the case defines the learning. It is specifically constructed and developed to lead learners toward a specific set of learning objectives (Barrows, 1984). Tutors are responsible



for guiding students toward the specific objectives, while allowing them to generate their own learning issues and goals (Miflin, et al., 2000; Wood, 2003). Any question posed by a student can become a learning goal in a PBL session. Learners look for answers and share them during successive PBL sessions or within the same session (Barrows, 1994; Donner & Bickley, 1993; Wood, 2003).

### **Group Process and the PBL Tutor**

PBL is designed to take advantage of cooperative learning as students rely on each other to discuss cases and pursue learning objectives. A functional group can facilitate the acquisition of knowledge, communication skills, teamwork, responsibility for learning, and respect for others (Wood, 2003). Peterson (1997) suggested several skills are necessary for an effective PBL group process. These included consensus decision-making, dialogue, discussion, maintenance of the group processes, conflict resolution, and adherence to a team leadership model. The group must be well designed and the PBL tutor must skillfully manage the group process.

Research has shown that goals are jeopardized if students withdraw due to frustration with the group process (Dolmans, Wolfhagen, van der Vleuten, & Wijnen, 2001; Huang & Carroll, 1997; Miflin, et al., 2000; Peterson, 1997). Ensuring an adequate mix of students with different learning styles within the PBL group has been shown to aid achieving PBL goals (Algrasham, 2012; Hur & Kim, 2007), as has controlling group size (with a suggested maximum of eight students) (Barrows, 1985; Miflin, 2004b). There are mixed reviews of the impact on group process of combining traditional PBL with e-learning. Some have found it eases the burden of group process on quieter students (Alamro & Schofield, 2012), while others have found technology to be disruptive (Kerfoot, Masser, & Hafler, 2005).

It was not intended that the self-directed learning of PBL groups become a sort of self-teaching. The tutor plays an important role in facilitating and guiding the PBL group process (Dolmans, de Grave, Wolfhagen, & van der Vleuten, 2005; Greening 1998). Tutor roles are critical to PBL success and should not be removed in an attempt to make the learners even more self-directed. The tutor role is critical to define goals, explain or clarify concepts, to pre-organize the sessions and scaffold so that students have the best chance of “finding the answer.” Mifflin (2004b) argued that medical education cannot turn PBL into self-teaching because doctors need to learn very complex things that put lives into their hands, therefore, learning must be monitored and facilitated by faculty. A PBL tutor connects basic science content to clinical judgment and patient care through encouraging, hinting, using examples and diagrams (Barrows, 1985; Kusurkar, Croiset, & ten Cate, 2011; Neufeld & Barrows, 1974). In a discourse analysis of PBL session transcripts, Gilkison (2003) found that tutors used questions to raise awareness or facilitate the group process fifty percent of the time.

The tutor must refrain from taking an authoritative role as a source of knowledge (Greening, 1998). This can be a daunting challenge for teachers, going from expert to facilitator (Whitman, 2004). Some researchers speculate that content experts do not make good PBL tutors because they have more trouble being hands-off and interrupt the process by adding their own experience and knowledge (Butler et al., 2005; Gilkison, 2003; Neville, 1999; Wood, 2003). Korschman, Glenn, and Conlee (1997) suggested that the tutor role is to facilitate, choosing learning issues based on the session or case objectives; it is not to direct the students to pick certain learning issues. The tutor serves as a scaffold to provide a framework for thinking about the learning issues, but not to define them for the learners; they facilitate without detracting from the self-directed learning (Barrows, 1985; Neville, 1999).

While researchers note good facilitation skills are critical for tutors (Greening, 1998; Harden & Crosby, 2000; Korschman et al., 1997; Miflin, et al., 2000), student perceptions are mixed (Kaufman & Holmes, 1998). When interviewed, students commented less specifically on facilitation skills, and placed more weight on the tutor's interest in teaching and the tutor's ability to create a positive atmosphere for learning (Steinert, 2004). One of the most important factors influencing learning is what the learner already knows. Successful tutors take the experiences of the learner into account and are able to use this prior knowledge to make learning more relevant (Miflin, 2004a). Learners liked tutors that went beyond the case and were able to generalize topics to other cases and body systems. The students felt that clinically relevant cases are essential; and too many cases or too little discussion time is ineffective (Steinert, 2004).

### **Outcomes**

Studies of PBL outcomes have not clearly concluded success of PBL over traditional curriculum, though PBL has seen a number of successes over the years (Albanese & Mitchell, 1993; Koh, et al., 2008). PBL students do no worse on examinations (Butler et al., 2005; Hoffman, Hosokawa, Blake, Headrick, & Johnson, 2006; Norman & Schmidt, 1992), and may do better in clerkships (Distlehorst et al., 2005) than students taught with traditional methods. While at least one study has shown a student preference for more traditional methods over PBL (Srinivasan, Wilkes, Stevenson, Nguyen, & Slavin, 2007), most PBL participants show high levels of satisfaction with the working environment of PBL (Albanese, 2000; Albanese & Mitchell, 1993; Davis, Kvern, Donen, Andrews, & Nixon, 2000; Loyens, Rikers, & Henk, 2006), increased self-directed learning (Ozuah, et al., 2001; Shokar, Shokar, Romero, & Bulik, 2002), improved teamwork (Bernstein, Tipping, Bercovitz, & Skinner, 1995) and lower attrition rates (White et al., 2004) than non-PBL comparison groups.

A 2008 systematic review of PBL research in eight dimensions found strong evidence to support PBL was superior to other methods in social (teamwork skills, appreciation for the social and emotional aspects of healthcare, appreciation of the legal and ethical aspects of healthcare, and appropriate attitudes toward health and well-being) and cognitive (coping with uncertainty, using evidence-based medicine, and using information resources) domains (Koh, et al., 2008). However, many individual studies have not found significant differences between PBL formats and other modes of delivering curriculum.

In a study by White et al. (2004), fifty-two family doctors were assigned to either PBL or lecture/discussion format training to learn asthma management. All participants received the same resource materials. There were no significant differences between the two groups' post-training on measures of knowledge, knowledge retention, or attitudes toward asthma management. Capon and Kuhn (2004) found similar results in a study of PBL versus lecture discussions to teach basic economics principles to medical students. There were no significant differences in knowledge acquisition on any of three assessment measures. However, the PBL group was more likely to include higher levels of explanation and analysis in their essays.

Distlehorst, Dawson, Robbs, and Barrows (2005) conducted a study comparing common medical school outcomes for PBL students versus standard curriculum students at the Southern Illinois University School of Medicine. Results showed that the students in both curricular tracks were similar upon admission, with the PBL group having slightly higher MCAT scores. Post-curriculum, students in both tracks had similar USMLE performance outcomes.

Smits, Verbeek, and de Buissonjè (2002) reviewed controlled evaluation studies that compared PBL curriculum to either other educational interventions or to no intervention at all. The outcomes of interest were: changes in knowledge, clinical performance, learner satisfaction,

or patient health. No studies were found that looked at PBL's impact on the preferred outcomes of clinical performance or patient health. There was also no consistent evidence that PBL was superior to other methods at increasing knowledge or performance. There was moderate evidence that PBL led to higher learner satisfaction (Smits, et. al, 2002), which was similar to research by Washington, Tysinger, Snell, and Palmer (1998) who also found improved clerkship examination scores in their study of family medicine clerks in a PBL program.

Some studies of PBL outcomes are limited due to the lack of a non-PBL comparison group. For example, Davis, et al. (2000) examined forty primary care physicians participating in a PBL workshop on osteoporosis. They were assessed pre and post workshop using standardized patients and tests of clinical knowledge. Results showed a statistically significant improvement on test scores from pre to post test. However, there is no indication that the PBL curriculum caused more improvement than traditional methods, as there was no comparison group. Ostbye, Krause, Gradison, Eisenstein, and Wagner (2004) studied a mixed-curriculum model where PBL and lecture/discussion sessions were both used to introduce research concepts. This study not only had no comparison group, but no outcomes were measured aside from the informal solicitation of participant satisfaction.

Some researchers have expressed concern that PBL curriculum cannot show outcome improvements over other methods due to the very nature of PBL (Butler et al., 2005; Dolmans, 2003; Leung, 2002). Leung (2002) speculated that students are raised in traditional curriculum and may have trouble transitioning to a PBL curriculum in medical school, and therefore, performance outcomes are limited. It may also be that PBL curriculum should not be evaluated using standard tests of knowledge retention, and rather should look beyond retention to higher level thinking skills like evaluation and synthesis of knowledge (Butler et al., 2005). It may be

argued that using a teaching method more consistent with adult learning theory, if it generates no worse outcomes, is still a better choice than traditional direct instruction techniques.

### **Limitations of PBL**

PBL is limited by several factors. Wood (2003) noted a greater need for staff development on facilitation skills and managing group dynamics. Others have found there is much difficulty correcting inappropriate tutoring behaviors of faculty without intruding into learning sessions (Distlehorst et al., 2005; Mifflin, et al., 2000; Wood, 2003) and an overall strong desire to have a single unified curriculum for all students (Distlehorst et al., 2005). Additionally, PBL has a higher cost to schools, involves greater faculty workload in supervising tutoring PBL sessions (Donner & Bickley, 1993; Egan & Mainous, 2012; Taylor & Mifflin, 2008) and has shown variable tutor quality (Donner & Bickley, 1993).

### **Conclusion**

Problem-based learning is a teaching method that fosters self-directed learning, engages learners to learn in the context in which learning may be applied, and relies on learner's past experiences and education in basic clinical sciences to evaluate and *solve* patient cases. This method, originally designed to be used in preclinical medical education, has expanded over time and is well suited for use in graduate medical education. The component parts of PBL have been well studied in medical schools and some residency programs, but there is no information about how and how widely PBL is used in graduate medical education. There is a gap in the literature on the various strategies residency programs use to incorporate PBL into residency training and with what success.

## CHAPTER 3: METHOD

### **Conceptual Framework**

As the literature review suggests, past research on PBL in medical education has employed a variety of methodologies. However, in order to describe the landscape of PBL in family medicine residency programs, a survey methodology is the best method. It allows participation from all family medicine residency programs in the country and can determine how programs are using this learning activity. Research employing interviewing as a data collection method was considered, but this method is more time consuming, and requires a smaller sample of programs to participate, therefore does not provide access to the larger landscape. Similarly, direct observation of PBL at a sample of family medicine residency programs would be interesting, but would not be suitable for answering the research questions. Describing how PBL is used, where it is used, and what differences exist across programs through a survey methodology approach will determine if PBL is a method used to teach family medicine residents.

### **Research Questions**

The central research question for this project asks, “What is the state of problem-based learning at family medicine residency programs?” Specific questions that follow from the survey include:

1. What teaching methods are commonly used at family medicine residency programs? Are there differences based on program type or location?
2. What percentage of responding family medicine residency programs use some form of an activity where information about a case is revealed over time and residents are provided

- the opportunity to ask questions and use resources to seek information before the rest of the case is revealed? Are there differences in this based on program type or location?
3. What percentage of programs refer to this method as Problem-based Learning (PBL)?
  4. How do programs implement PBL in their residency programs? Do these implementation strategies vary based on program type or location?
  5. What curricular areas commonly support PBL activities? Does this vary based on program type or location?
  6. How many resident learners participate in PBL activities at any one time? Are there differences based on program type or location?
  7. Which resident classes participate in PBL activities? Are there differences based on program type or location?
  8. Do all resident classes participate at the same time, or are the PBL activities individualized by class? Are there differences based on program type or location?
  9. Is participating in PBL required? Are there differences based on program type or location?
  10. How long have family medicine residency programs used PBL learning activities? Are there differences based on program type or location?
  11. Who most commonly facilitates PBL activities at family medicine residency programs? Are there differences based on program type or location?
  12. How are facilitators trained? Are there differences based on program type or location?
  13. Where does the content for PBL cases come from at family medicine residency programs? Are there differences based on program type or location?



14. What are the most common methods of evaluating PBL in family medicine residency education? Are there differences based on program type or location?
15. How successful do family medicine residency program directors think their program is at implementing PBL? Are there differences based on program type or location?
16. How successful do family medicine residency program directors think PBL activities are for educating residents? Are there differences based on program type or location?

### **Setting and Participants**

Participation in this survey research project was solicited from all allopathic family medicine residency programs in the United States. A list of the allopathic family medicine residency programs and program directors was obtained from the American Academy of Family Physicians web site (American Academy of Family Physicians [AAFP], 2007). Letters were addressed to program directors, who were also encouraged to request input from other members of their program, if appropriate, to best complete the questionnaire. Surveys were anonymous, with no identifying information. The survey was approved by the Colorado State University and the Poudre Valley Health System Institutional Review Board with a waiver of written informed consent.

### **Instrument**

The questionnaire was developed by the researcher. Demographic questionnaire items were based on items from Hinojosa, Benè, Hickey, and Marvel (2006). PBL items were based loosely on those used by Kinkade (2005) in his PBL survey of US medical schools and meant to broadly solicit information on the state of PBL at the family medicine residency program. The questionnaire was piloted with faculty at the local family medicine residency program as well as

a group of educational professionals employed at family medicine residency programs across the state of Colorado. Items were modified based on feedback and suggestions for revision.

The final draft of the two-page survey contained four demographic items on type of residency program, program size, age of the program, and program location. Four items on teaching methods used at the residency program were also included on the first page of the questionnaire along with a definition of PBL as defined in this study. The survey asked that participants complete only page one of the survey if their program did not use the described method. Participants who did use the described method, whether or not they used the term PBL, were directed to complete fourteen PBL specific items on page two of the survey.

### **Procedure**

This study employed a survey research methodology, and utilized both mailed surveys and electronic surveys. Research has shown an increased response rate (60 to 65 percent) from program directors receiving mailed surveys (Bragg, Warsaw, Arenson, Ho, & Brewer, 2006; Gibson & Hueston, 2007; Spitzer, Apgar, Brotzman, & Krumholz, 2001; Young, DeHaven, Passmore, Banner, & Smith, 2007) compared to the response rate (35 to 40 percent) from web-based and email surveys (Cook, Heath, & Thompson, 2000; Sheehan, 2001). Therefore, the first wave of surveys were mailed, to capitalize on this potentially increased response rate. The second wave of follow-up surveys was sent electronically, for cost-effectiveness and to provide initial non-respondents the opportunity to respond in a different format.

Program directors at each allopathic family medicine residency program in the United States received: (1) a one-page letter (email version for the second wave) introducing them to the research project and encouraging them to complete the attached questionnaire, (2) the questionnaire developed by the researcher (sent electronically through SurveyMonkey for the

second wave), and (3) a postage-paid business reply envelope in which to return the completed questionnaire (not sent with the second wave, as not needed).

The surveys themselves were anonymous. The business reply envelopes used for the initial mailing were numbered so that programs that responded (using their numbered postage paid envelope) did not receive a second mailing. Four weeks after the initial mailing, a second wave of questionnaires was sent electronically to those programs that had not yet responded. Programs were listed alphabetically and envelopes were numbered beginning with '1' for the first program. The list linking the numeric codes to the residency programs was kept separate from the data set used for analysis. The linked list was destroyed after the co-principal investigator's dissertation defense.

### **Data Analysis**

Survey data were coded into numeric variables for ease of data entry. A complete variable coding scheme can be found in Appendix C. Data were entered into IBM SPSS Version 20 ©. Missing data were considered as a nonresponse and not included in analyses. Descriptive statistics (means, standard deviations, percentages) were tabulated on demographic characteristics for all responding programs. To determine if a representative sample of programs had responded, respondents were compared to numbers of programs nationally on structure of the program. Descriptive statistics were also tabulated for all responding programs on the quantitative survey items related to teaching methods used at the residency program. One item solicited open-ended comments from respondents, asking PBL users to "describe these sessions in more detail". An open-coding process was used to categorize these comments into themes.

The fourteen PBL specific items on page two of the survey were analyzed only for the subset of programs who responded affirmatively to using the defined PBL method at their

residency program. Those programs that did not use the defined PBL method were not obligated to complete the fourteen items on page two of the survey, per the survey instructions. Descriptive statistics were tabulated for the quantitative PBL specific items and to determine the relationships between ordinal variables of interest the demographic variables of program type and program location. Open-ended comments specific to the use of PBL in curricular areas and evaluation of PBL were reviewed and categorized and are presented as frequencies.

## CHAPTER 4: RESULTS

A cover letter and questionnaire were mailed to 444 allopathic family medicine programs in the United States. Of this initial mailing, 163 programs responded, representing a 36.7% response rate. A follow-up electronic questionnaire was sent to the programs that had not yet responded; twelve additional surveys were received electronically. Combined, the final response rate of surveys was 39.5% (N = 175).

### Program Demographics

Family medicine residencies have five different program types: (1) Community-based, unaffiliated, (2) Community-based, university-affiliated, (3) Community-based, university-administered, (4) University-based, or (5) Military. Table 1 shows the distribution of responding programs compared with the distribution of programs nationally.

*Table 1. Distribution of Responding Family Medicine Residency Program Types compared to Distribution of Program Types in the U.S.*

	Percentage of Responding Programs	Percentage of Family Medicine Programs in the U.S.
Community-based, Unaffiliated	11.5	6
Community-based, University-Affiliated	61.7	59
Community-based, University-Administered	11.4	20
University-based	12.6	12
Military	2.3	3

Among the 175 programs responding, the average age of the program was 29 years (SD = 10.7), with a range of three to fifty years. It is typical for a family medicine residency program to have the same total number of residents each year of training. Programs in this sample had an

average of 7.7 first-year residents (SD = 2.6), 7.7 second-year residents (SD = 2.6), and 7.7 third-year residents (SD = 2.6). The range of residents for any class across all programs was from one to eighteen. Table 2 shows the average age of the program and average number of residents per training year for each of the five program types.

**Table 2. Average Program Age and Number of Residents in each Training Year for the Five Family Medicine Program Types (with Standard Deviations in Parentheses)**

	Program Age	First-Year Residents	Second-Year Residents	Third-Year Residents
Community-based, Unaffiliated	27.45 (10.29)	7.30 (1.87)	7.15 (1.84)	7.15 (1.84)
Community-based, University-Affiliated	29.81 (10.85)	7.81 (2.69)	7.82 (2.69)	7.81 (2.69)
Community-based, University-Administered	28.37 (10.26)	6.90 (3.06)	6.80 (2.76)	6.75 (2.79)
University-based	29.18 (10.64)	8.00 (2.96)	7.77 (2.74)	7.91 (2.69)
Military	26.00 (17.76)	10.00 (2.31)	10.00 (2.31)	10.00 (2.31)

Over one-third (35.4%) of the programs indicated their residency was located in a suburban area; 45.7% indicated they were located in an urban area; 17.7 % of programs considered their location to be rural. Two programs (1.1%) checked both “suburban” and “urban”; one noted below their selection that their residency program had two training sites. Table 3 shows the percentage of each program type within each geographic location (suburban, urban, or rural). All of the military programs indicated their location as suburban with no

military programs in urban or rural locations. Three of the four other program types (community-based, unaffiliated, community-based, university-administered, and university-based) were more likely to have urban locations. Community-based, university-administered programs were equally likely to have urban and rural program locations.

**Table 3. Percentage of Each Program Type Occurring in Suburban, Urban, and Rural Locations (with Number of Programs in Parentheses)**

	Suburban	Urban	Rural
Community-based, Unaffiliated	35.0 (7)	50.0 (10)	15.0 (3)
Community-based, University-Affiliated	38.0 (41)	44.4 (48)	15.7 (17)
Community-based, University-Administered	20.0 (4)	40.0 (8)	40.0 (8)
University-based	22.7 (5)	63.6 (14)	13.6 (3)
Military	100.0 (4)	0.0 (0)	0.0 (0)

### **Teaching Methods Used in Residency**

All programs (100%) use didactic lectures as a teaching method. Almost all programs (98.3%) responded that they used case presentations as a teaching method, while 93.7% noted using self-directed learning techniques for residency training. Group discussion was used at 94.8% of programs and 95.4% responded that they use journal clubs to teach residents. The teaching method used least frequently was online/computerized training modules (82.8%). Over one-fourth of programs indicated using some sort of other teaching method (26.4%).

Respondents had the opportunity to include “Other” teaching methods in a comment area. Thirteen programs (7.4%) indicated they used simulations as a teaching method, eleven programs (6.3%) indicated using the Objective Structured Clinical Examination (OSCE), seven programs (4%) noted that they used procedure workshops as a teaching method, and six programs (3.4%) used independent quality improvement projects as a teaching method. Other methods reported by less than five responding programs included: clinical rotation time, videos, games, role plays, interactive lectures using an audience-response system, morbidity and mortality presentations, core content review, and resident professional workshops.

### **Problem-Based Learning**

Among the 175 programs responding, 145 (82.9%) indicated that they used a method that could be described as one that “engages the learners in asking questions and seeking out information as a case is revealed and discussed. The implementation varies and sessions can take place over hours, weeks or months.” Between 79 to 100 percent of program types reported using this method, with military programs using it with the highest frequency (100%). Between 80 to 82 percent of programs report using the method regardless of location.

Over three-fourths of respondents (77.2%) who use PBL provided open-ended comments describing their PBL sessions in more detail. An open-coding strategy was used to analyze the qualitative comments for themes. Upon reviewing these comments, several themes emerged. The first theme related to how case details were revealed. Programs in this study typically reveal PBL case details progressively within the same learning session, as opposed to across several learning sessions. The following are sample participant responses related to this theme:

- “‘Senior case presentations’ in these sessions a case is presented starting with the *[chief complaint]*. the group will come up with pertinent questions. Once this is done



(obtaining the full history) a [*differential diagnosis*] is formed. Then group comes up with appropriate [*Physical exam*]. Did this change the ddx? Then tests. Did this change ddx?”

- “Inpatient case – presented first with a one line description and chief complaint. The resident group must decide what pertinent questions to ask and what information they want in the history, physical exam, and diagnostics.”
- “Group didactic session – initial case is presented. Group discussion ensues concerning diagnostic and therapeutic options. Case is revealed stepwise as options are employed.”

The second theme which emerged from a close examination of the open-ended comments was that the most utilized resource in PBL in family medicine residency programs is the human resource. Numerous comments included an iterative process where questions are asked of the facilitator and additional information is provided. One respondent wrote “Morning report and some case based presentations are run in this format. At specific times, points of the case are presented, the audience is solicited for questions and directing the desired information. When a certain tally or minimal threshold of directed questions is reached more of the case is revealed.” Other resources noted in open-ended comments were phones and specific electronic resources such as UpToDate, but these were offered by very few respondents.

The third theme is the lack of mention of learning objectives in participants’ PBL descriptions. One respondent noted that “Case presentations unveiled in PBL sequential disclosure format, then discussion. Resident leading the discussion has prepared learning issues to present to the large group.” However, this was not typical of the comments provided; most comments did not specifically address learning objectives.

Some respondents included information not about the details of PBL sessions, but rather about the venues in which the PBL format is used. Examples of this include “morning report”, “on our inpatient service” or “during case conferences”.

### **Naming PBL**

Almost two-thirds (62.6%) of the 145 programs who used the PBL method quoted above, did not use the term problem-based learning at their residency program. This was compared to fifty-one programs (36.7%) that did use the term problem-based learning. Military programs were more likely (75%) to use the term problem-based learning than were the other four program types (23.5 to 40 percent). Thirty five to forty percent of programs at the three program locations (suburban, urban, and rural) used the term PBL. Programs using the term PBL to name this teaching method were approximately the same age (29.2 years) and size (7.6 residents per class) as programs who did not use the term (29.2 years and 8.1 residents per class).

### **Incorporating PBL**

Residency programs incorporate PBL into their programs in a variety of ways. Nearly three-fourths of programs using PBL (73.8%) incorporated it into *some* educational conferences while a third of programs using PBL (35.5%) indicated having PBL-only educational conferences at their residency program. About half of the programs using PBL include it into large-group learning sessions (51.8%). A similar percentage of programs indicated using it in small-group learning sessions (47.5%). Only one-third (34%) of programs using PBL indicated using computer based self-directed learning modules. Four programs (2.8%) noted using PBL in “Other” ways; those other ways included during morning report or rounds at the hospital (two programs), as part of clinic quality improvement projects, and during resident orientation. PBL-only educational conferences were used at 25 to 40% of programs regardless of program type or

program location. The majority of program types and locations (65-100%) incorporated PBL into some educational conferences; military programs were the most likely to do this (100%). Nearly half (46.7% to 50%) of all program types reported using PBL in large group learning sessions. Rurally located programs were more likely to report using PBL in large group learning sessions (72.0%) compared with suburban (43.1%) or urban (52.4%) programs. Military and community-based, university administered programs were less likely (25-27.8%) to use PBL in small group learning sessions than were other program types (40-57%). One quarter to one third of programs were likely to use computerized or online PBL modules regardless of program type or program location. There were no substantive differences in the strategies used based on age of the program or size of the program.

One (6.7%) community-based, unaffiliated program and one (1.2%) community-based, university-affiliated program reported having a PBL-only curriculum, while the majority of programs responding to the open-ended question about which curricular areas utilize PBL indicated that most or all curricular areas use PBL. Some programs indicated that PBL is primarily used in core rotations like medicine, pediatrics, and obstetrics.

### **PBL Participants**

Of the 145 programs that use PBL, 141 responded to the survey item that asked in which resident training years (PGY1, PGY2, or PGY3) PBL was included. All (100%) of programs included PBL in PGY2 or PGY3 training. Two urban programs (1.4%) indicated that they did not use PBL with their PGY1 class. Most programs (88.7%) indicated that all residents participate in PBL at the same time. Few programs (16%) indicated that their program individualizes PBL sessions by class. Some programs indicated both types of PBL structure (participation by all and individualization by class) therefore percentages do not add up to 100%.

Participants were asked if their program purposely limited the PBL group size, and if so, to how many residents. Most programs (88.6%) indicated PBL group size is not limited. Of the 11.4% of programs that limited PBL group size, the average size was 7.2 residents per group (SD = 2.6) with a range of three to twelve residents per group. Most programs (94.2%) indicated that PBL sessions were required of residents; only 3.6% indicated PBL sessions were optional. This did not vary substantially across the five program types or the three program locations. One program indicated that PBL sessions at their program were both required of some and optional for others, but that was not elaborated on.

Among the 145 programs using PBL to teach resident physicians, ten percent have been using the method for one to two years, 25 percent for three to five years, 17 percent for six to eight years, and nearly half of programs (48.2%) have been using PBL for over nine years. Table four shows the percentage of time each program type has been using PBL to teach residents. Nearly half (44-54%) of programs in all three locations (suburban, urban, and rural) have been using PBL to teach residents for over nine years. The length of time a program had been using PBL did not vary substantially by program age or size of the program.

**Table 4. Percentage of Time each Program Type has Been Using PBL to Teach Residents  
(with Number of Programs in Parentheses)**

	1-2 Years	3-5 Years	6-8 Years	9+ Years
Community-based, Unaffiliated	20.0 (3)	6.7 (1)	20.0 (3)	53.3 (8)
Community-based, University-Affiliated	7.2 (6)	28.9 (24)	15.7 (13)	48.2 (40)
Community-based, University-Administered	5.6 (1)	22.2 (4)	22.2 (4)	50.0 (9)
University-based	20.0 (4)	15.0 (3)	0.0 (0)	45.0 (9)
Military	0.0 (0)	50.0 (2)	0.0 (0)	50.0 (2)

### **PBL Facilitators**

Survey data were collected on facilitators of PBL sessions at residency programs. Of the 145 responding programs that use PBL, almost all (97.2%) utilize physician faculty as facilitators compared to 36.2% utilizing non-physician faculty facilitators. All five program types and programs at all three locations frequently (94-100% of time) used physician faculty facilitators. Few programs (17.7%) rely on rotation preceptors to facilitate, and even fewer (3.5%) utilize staff facilitators. Responding military programs never utilize rotation preceptors to facilitate PBL; urban programs are more likely (23.8%) to utilize rotation preceptors to facilitate PBL than suburban (13.7%) or rural (12.0%) of programs. Almost one fifth (20.6%) of programs selected the “Other” option for PBL facilitators with the majority of those (17.2%) writing in that senior residents often serve as PBL facilitators. One program indicated fellows are sometimes used to

facilitate PBL, and two programs indicated that visiting consultants sometimes serve as facilitators.

Of the programs that use PBL, 56% utilized formal faculty development sessions to train PBL facilitators, 57.4% offer informal training for facilitators, 16.3% offer readings about PBL, and very few (7.8%) offered individualized training for facilitators. The kinds of training offered did not markedly differ based on program type though seventy five percent of military programs trained PBL facilitators with formal faculty development, compared to forty to sixty percent of the other four program types.

Rural programs were much more likely (80%) to train PBL facilitators with formal faculty development compared to suburban (52.9%) or urban (47.6%) programs. The two programs who indicated they had dual training sites (both suburban and urban) were more likely (100%) to offer individualized training than expected compared to other locations (2-8%). Programs located in a rural area were much less likely (36%) than suburban (58.8%) or urban (66.7%) programs to use informal training for PBL facilitators.

Seven programs (five percent) selected the option for “Other” training and indicated that they trained faculty through Objective Structured Teaching Examinations (OSTEs), faculty fellowships, or mentoring. One program selected “Other” but did not offer a written comment; one program indicated that a faculty joined the program already trained so they did not receive any additional training.

### **PBL Cases**

Programs use various resources to develop PBL cases. Of the 145 programs using PBL, most (90.1%) relied on actual patient cases to provide content for PBL cases. Almost half (48.2%) of the programs used faculty-created or at least partially fictitious cases, while 21.3

percent relied on journal cases to provide PBL content. Very few programs (4.3%) used textbooks to create PBL cases. Five programs (3.5%) noted getting case content from other sources, including: the American Board of Family Medicine (two programs), the Society of Teachers of Family Medicine (one program), a proprietary board preparation company (one program), and monthly modules provided by McMasters University (one program). Sources of PBL case content did not noticeably vary by program type or location of the program.

### **Evaluation of PBL**

Nearly ninety percent of program directors using PBL at their programs responded to the open-ended question about how PBL was evaluated. Among those responding, 17.2% (25 programs) indicated they “don’t evaluate it” and one additional program said they evaluated it, but “not well.” Of the programs that do evaluate PBL in some way, the majority indicated it is evaluated as other didactics are evaluated, with an evaluation form/survey/questionnaire after the didactic session. Another 22 programs (15.1%) indicated they get verbal feedback from residents to aid in evaluating the PBL sessions. Eighteen programs directly observed PBL participant discussion and the questions asked during a PBL session to evaluate PBL. Less than five percent used: post-tests or quizzes after the PBL session, standardized tests of medical knowledge, objective structured clinical examinations (OSCEs), self assessment, observation of patient care skills, or yearly curriculum reviews to evaluate PBL.

### **Success with PBL**

Program directors were asked if they thought their program was successful at implementing PBL. Among the programs utilizing PBL, 50.7% felt they were somewhat successful with implementation, 39.1% felt their implementation was moderately successful, and 10.1% felt highly successful at implementing PBL. Ratings of success of PBL implementation

were similar across the five program types and the three program locations. All programs were more likely to rate their implementation success as somewhat successful or moderately successful compared to highly successful.

Nineteen percent of program directors felt that PBL activities were somewhat successful in teaching resident physicians. Over half (54.3%) felt that PBL activities were moderately successful at teaching residents, and just over one quarter (26.1%) indicated they felt PBL was highly successful at teaching residents. University-based (45%) and military (50%) programs were more likely to consider PBL highly successful in teaching residents than the other three program types (14-25%).



## CHAPTER 5: DISCUSSION

This national survey of family medicine program directors was conducted to determine the use of problem-based learning as a teaching method in family medicine residency programs across the nation. The major findings of the survey are that most family medicine residency programs do use problem-based learning as part of a toolbox of teaching methods and the strategies for including PBL in residency training vary. However, use of the term problem-based learning was less frequent and evaluation of the method is inconsistent.

Most programs use actual patient data to create cases and most offer some type of training for the PBL facilitators. The program's implementation of PBL and PBL's ability to teach residents were both rated as successful. The information from this survey, while not sufficient to draw definitive conclusions, indicates the variety of strategies to incorporate PBL into residency training and lays the foundation for more extensive research on this well-utilized teaching method.

This study, the first known attempt to map the landscape of problem-based learning in U.S. allopathic family medicine residency programs, has some important limitations. The self-reported nature of the data may be at risk for reporting bias, wherein respondents may have provided responses that are perceived to make them look more successful in implementing a complex and difficult teaching method. In addition, over eighty percent of respondents reported using problem-based learning to teach resident physicians. It is possible that residencies employing PBL were more likely to respond to this survey, and the results may thus overestimate the percentage of residency programs using this method. However, the response rate of 39.4 percent is similar to that observed in other surveys of program directors in family medicine.

Further, the findings are consistent with data from a 2005 study by Kinkade, which found that PBL was used at about seventy percent of responding medical schools for pre-clinical training.

### **Use of Problem-based Learning**

The results show widespread use in graduate family medicine education of a method that “engages the learners in asking questions and seeking out information as a case is revealed and discussed. The implementation varies and sessions can take place over hours, weeks or months.” This use did not vary as a function of program type or program location. Between 79 to 100 percent of programs reported using this method, with military programs using it with the highest frequency. Urban, suburban, and rural programs were also equally likely to use this method (80-82%).

The above-quoted method has been described as problem-based learning throughout this study; however, only 36.7 percent of the responding programs actively use that term in their programs. There are many possible explanations for this finding, some of which were offered by the respondents themselves in survey comments. Problem-based learning, as seen from the literature, was developed for use in preclinical medical education (early medical school years). Its broad use in residency education in family medicine can be appreciated from this survey, but calling this method “problem-based learning” may too closely associate it with medical school training. One respondent wrote that they do not call the method PBL because “they want to distinguish it from PBL often used in medical schools.” An alternative explanation for not calling this method PBL was offered by other respondents who indicated they do not “officially call it PBL to the residents,” or “don’t really label it.” These comments indicate perhaps a focus on the *doing* of PBL and less on defining or naming it.

PBL is often considered a very specific process, rather than a continuum of methods; therefore, educators may likely think what they are doing couldn't possibly be PBL. A review of the open-ended comments describing PBL sessions shows that implementation of PBL at family medicine residency programs does fall along a continuum. Most programs indicated that PBL sessions involved an initial case presentation with very little information provided, followed by a period of time where residents could ask the facilitator questions about the case to elicit additional information. A list of differential diagnoses was created and then narrowed with each successive round of information gathering. Most programs indicated this was all done within the same session. Very few programs specifically noted that there was a time lapse of days or weeks between PBL sessions which is the more traditional construction of PBL sessions initially designed by Barrows. However, conducting the PBL activity within the same session does not negate the fact that this activity is still PBL. It seems to be an approach to PBL that is geared toward learners at a higher level, who do not need a week to investigate learning issues or review literature to find answers to questions. This also may be generational; today's learners do not rely on books as much as they rely on technology like phones and laptops to provide them instant resources. Even the residency programs in this study rarely relied on text books for case creation, so the necessity of learners needing a week between PBL sessions to look up information in books might be outdated.

The open-ended comments also showed that the primary resources used by programs during PBL sessions are people. Many respondents indicated that multiple opportunities exist for the participating residents to ask questions of the facilitator or presenter. Asking questions and gaining more information about the case seems to be the only way the case information is revealed. One program indicated residents look up information on their phones, but other

respondents did not specify resources. One explanation for respondents not noting specific resources could be that non-human resources (books, articles, media) are less necessary at the graduate medical education level where resident physicians are entering the PBL session with much more knowledge of basic sciences and much more clinical experience than that of a first or second year medical student. This level of human resource utilization and reliance on intelligence and experience could be a natural progression from medical student learner to resident physician learner. However, another explanation for this could be limitations of the survey. This survey did not specifically ask what resources are used by learners in PBL sessions and thus respondents were not prompted to offer specific resources used. Similarly, the lack of information about resources could be brevity on the part of the respondents. In an open-ended survey question, it is possible that respondents did not write an exhaustive description of their PBL sessions and everything that is involved. Future studies may want to focus on resource use in PBL sessions in graduate medical education settings in order to determine whether resources are little used, or were just not often commented on in this study.

Residency programs incorporate problem-based learning into their programs in a variety of ways, which may also lend itself to the less frequent use of the term. Educators may hesitate to use a specific term to describe things that “look different.” Particularly when programs use PBL in multiple ways, calling all the permutations PBL might feel less appropriate. It was common for responding programs to incorporate PBL into educational conferences, likely as a teaching method alternative to a lecture or discussion. Only about a third of programs using PBL have PBL-only educational conferences, where PBL stands alone as the only teaching method for that session instead of being used alongside other methods. Given PBL’s historical roots in medical schools, and the small number of medical schools with PBL-only curriculum, it was not

surprising that very few family medicine residency programs have a PBL-only curriculum for training residents. However, given the clear definition survey respondents were provided, and their agreement about using the method described, one can conclude that regardless of what each program names it, residency programs in family medicine are using problem-based learning with great frequency.

Almost 95 percent of programs indicated using group discussion as a teaching method; only about half of programs using PBL incorporate it into large or small group learning sessions. Most programs indicated that the PBL group size was not limited, despite Barrows suggestion that group size be limited to eight for the most benefit. Of the programs that limited group size, the average size of a PBL group matched Barrows' guidelines (7.2 residents). Whether a large or small group, programs felt equally successful at both implementing PBL and PBL's ability to teach residents. This highlights the versatility of a method sometimes considered more narrowly.

Only one-third (34%) of programs using PBL indicated using computer based self-directed learning modules; much lower than the general use of online or computerized training modules in residency training in this sample. Given the presence of tutor guidance and group discussion in most variations of PBL, it is not surprising that computerized versions of PBL are less commonly used. Still, some recent research has successfully incorporated technology into PBL to facilitate group dynamics (Alamro & Schofield, 2012).

Whether or not a program used a specific strategy to incorporate PBL into residency training was not a function of program demographics. No matter what setting or size of a program, PBL was frequently incorporated into residency training in a variety of ways. No one implementation method was limited to a certain kind of residency, or a residency of a certain size or in a certain locale; all programs were able to implement PBL in ways that suit their program

needs. Results on self-perceived success of implementation further suggest that all programs can, at least somewhat successfully implement PBL in ways that suit their program needs.

Respondent comments on what curricular areas often utilize PBL as a teaching method also support that PBL can be used in all or almost all areas of the curriculum. Some did indicate that it was used only in core inpatient areas such as medicine, pediatrics, and obstetrics.

About ten percent of respondents indicated PBL was a newly implemented teaching method (used only one to two years). This indicates the discipline's commitment to exploring PBL as a teaching method for the future, particularly now, as evidence becomes more available on outcomes of PBL on physician competency (Koh, et. al, 2008). Nearly half of the programs using PBL responded that they had been using the method for greater than nine years. Given the wide variety of strategies to incorporate PBL into residency training and the positive ratings of its successful implementation, it is not surprising that many programs have been using this method for at least a decade. This strong history of using PBL to train residents speaks to the discipline's dedication to PBL as a teaching method. This fact disputes the recent argument that the PBL movement may not be salvageable due to an historical lack of organized research (Egan & Mainous, 2012).

### **PBL Facilitators**

Given the debate within the literature about expert versus non-expert tutors, it was surprising that almost all responding programs utilize physician faculty as PBL facilitators compared to only 36.2 percent that utilize non-physician faculty facilitators. Physician faculty would certainly be considered experts in medical knowledge or patient care aspects of PBL cases. Residency programs are required to have at least one non-physician behaviorist faculty (e.g., clinical psychologist) responsible for teaching residents about behavioral aspects of patient care. It is

speculated that this person is typically the non-physician faculty facilitator referred to by survey respondents, though participants were not asked to name the non-physician faculty to whom they referred. While PBL literature would suggest the use of well-trained non-expert tutors and facilitators, the physician faculty do most of the teaching at residency programs. Based on the results seen here, PBL is included in that teaching.

The literature also suggests that PBL tutors need training to successfully facilitate PBL sessions. Among the programs that utilize PBL to teach family medicine residents, over half utilized formal faculty development sessions to train PBL facilitators. Family medicine residency programs are required to have a structured faculty development program to keep faculty current on the various administrative, teaching, research, and clinical knowledge and skills necessary to train residents.

Interestingly, programs in rural locations were more likely to use formal faculty development to train PBL tutors than were programs located in urban or suburban locations. Rurally located programs were also less likely to use informal training methods for PBL facilitators. One might have expected that rurally located programs would be more likely to do things informally, due to the smaller amount of faculty or the physical distance from a university or other academic training center. One explanation for these results could be that rural programs do things more formally specifically because they have fewer staff, faculty, and residents, and a faculty development to train everyone might be more efficient. It is less likely in rural environments that faculty can be trained informally by simply talking with colleagues or observing a PBL session facilitated by a different faculty, which were some of the “other” training methods offered through comments from more urban program directors.

The two programs that indicated they had dual training sites (both suburban and urban) were more likely to offer individualized training to PBL tutors. With faculty and residents in two different locations for training, it seems logical that these programs conduct individual training more often than provide more formal training for faculty as a group. It is not known what type of training is provided to the resident facilitators at the 17 percent of programs who indicated senior residents sometimes serve as PBL facilitators.

### **PBL Cases**

Programs use various resources to develop PBL cases, though most relied on actual patient cases to provide content. This is the best way to guarantee that the case content is consistent with the patient cases residents will see in their clinical training, something Barrows himself always intended (1994). Almost half used faculty-created or at least partially fictitious cases, which can also help to guarantee that the cases are clinically relevant because faculty practicing at a given residency program should be well aware of the types of patient issues likely seen within their patient population. Actual and faculty-created patient cases have other benefits associated with them as well. It would be easy to incorporate patient dialogue, cultural context, and lifestyle and behavioral issues into cases when the cases are based on actual patients or when thoughtfully created by faculty. Faculty-created cases could be at risk for introducing value judgments compared to journal cases that are presented more objectively, although in this study, only 21 percent of programs indicated they relied on journal cases to provide PBL content.

### **Evaluation of PBL**

Not all programs using PBL evaluated their use of the method, and some indicated they did so “subjectively” or “not well.” The programs that did evaluate PBL seemed to evaluate it similarly to other didactic evaluations, with a written survey or evaluation form about the



session. However, this survey did not specifically explore which aspects of PBL were evaluated by programs. Some programs utilized direct feedback from participating residents to aid in evaluating the PBL sessions while other program faculty observed PBL sessions to garner information on the success of the method. Limited numbers of programs used quizzes or standardized tests for evaluation, though the literature would support that perhaps PBL may not impact scores on these types of assessments.

### **Summary and Conclusions**

Some have argued that PBL outcomes are mixed and that it is cost-prohibitive. Even its creator never intended it for use beyond preclinical education. The research on adult learning has shown that learners with more experiences and a better context for learning might be more engaged and learn more. PBL provides an opportunity for residents to rely on their preclinical and clinical experiences in medical school and apply this to a PBL case. Further, PBL cases provide a context crucial for learning clinical medicine and how to apply it. This study provides an original contribution to knowledge by determining that PBL is well incorporated into graduate medical education in family medicine. Residency programs may not consistently use the term problem-based learning to describe this method, but their descriptions and survey responses provide support for the fact that they are utilizing PBL to a great degree.

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APPENDIX A  
Survey to Program Directors Page 1 of 2

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**Definition:** Problem-based learning (PBL) is sometimes referred to as “case-based” learning, though PBL is somewhat more complex in that it engages the learners in asking questions and seeking out information as a case is revealed and discussed. The implementation varies and sessions can take place over hours, weeks or months.

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**Directions:** Please complete the following questionnaire and return it to me in the postage-paid envelope provided. Thank you in advance for your time.

**Program Information**

1. What type of program do you direct?
    - Community-based, unaffiliated
    - Community-based, university affiliated
    - Community-based, university administered
    - University-based
    - Military
  2. What is the full capacity of your program? (e.g., 6-6-6, 10-10-10) \_\_\_\_\_
  3. How many years has your program been in existence? \_\_\_\_\_
  4. How would you describe the location of your program?  Suburban  Urban/Metropolitan  Rural
- 

**Educational Teaching Methods**

**1. Which of the following teaching methods are used at your program? (Please check all that apply)**

- Didactic lecture
- Case presentations
- Self-directed learning
- Online learning/computerized modules
- Group discussion
- Journal club
- Others; please list \_\_\_\_\_

**2. Does your program use any teaching methods where information about a case is revealed over time (within the same learning session or across sessions) and residents are provided the opportunity to ask questions and use resources to seek out additional information before the rest of the case is revealed to them?**

- Yes
- No

**3. If yes, can you describe the sessions in more detail?**

**4. If you answered “Yes” to Question #2, do you call this Problem-based Learning (PBL)?**

- Yes
- No

In the questions that follow we are going to use the term Problem-based Learning (PBL) for a method where information about a case is revealed over time and residents are given an opportunity to ask questions and use resources to seek out information before the rest of the case is revealed. This may be different than the name you would give this method in your program. If your program currently uses this kind of teaching method in ANY capacity, please continue. If not, please stop here and return the questionnaire in the envelope provided. Thanks so much!

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–Over –

Survey to Program Directors Page 2 of 2

**Definition:** Problem-based learning (PBL) is sometimes referred to as “case-based” learning, though PBL is somewhat more complex in that it engages the learners in asking questions and seeking out information as a case is revealed and discussed. The implementation varies and sessions can take place over hours, weeks or months.

**1. In your program, where is Problem-based Learning utilized?** *(Please check all that apply)*

- PBL-only resident educational conferences       Incorporated as part of other curriculum  
 Incorporated into some educational conference       Small group learning sessions  
 PBL-only curriculum       Large group learning sessions  
 Self-directed online/computerized modules       Other; please describe

**2. Which learners participate in PBL activities?** *(Please check all that apply)*

- PGY1    PGY2    PGY3

**3. Which best describes your PBL activities:**

- All residents participate at the same time.       Activities are individualized by class.

**4. During PBL activities, do you purposely limit the group size? \_\_\_\_\_ If so, to how many residents?**

**5. In what curricular areas is PBL utilized?**

**6. Participation in PBL activities is:**

- Required       Optional       Other; please describe

**7. How long has PBL been used for education at your program?**

- 1-2 years       3-5 years       6-8 years       9+ years

**8. Who facilitates PBL activities at your program?** *(Please check all that apply)*

- Physician faculty       Non-physician faculty       Non-faculty staff person  
 Rotation preceptor/specialist       Other; Please describe

**9. What training do facilitators receive related to PBL activities?** *(Please check all that apply)*

- Faculty Development       Individualized training       Reading       Informal training  
 Other; please describe

**10. Where does typical PBL case content come from?** *(Please check all that apply)*

- Journal cases       Textbook cases       Actual hospital-based or clinic cases  
 Faculty created/at least partially fictitious       Other; please describe

**11. How do you evaluate the learning that occurs during PBL sessions?**

**12. How successful do you think your program is at implementing PBL activities?**

- Highly successful       Moderately Successful       Somewhat Successful       Not at all Successful

**13. How successful do you think PBL activities are in teaching residents?**

- Highly successful       Moderately Successful       Somewhat Successful       Not at all Successful

**14. Please feel free to include any additional information about Problem-based learning at your residency program:**

## APPENDIX B

### Cover Letter of Invitation to Survey Participants



*Knowledge to Go Places*

School of Education  
209 Education Building  
Colorado State University  
Fort Collins, CO 80523-1588  
Voice: 970.491.6317

Date XX, 2012

Residency Program Name

Residency Program Address

City, State, Zip code

Dear Program Director,

My name is Kristen L. Benè and I am the Educational Associate Director of the Fort Collins Family Medicine Residency Program. I am currently a doctoral candidate from Colorado State University in the School of Education conducting a research study on whether and how family medicine residency programs are using Problem-based Learning (PBL) as a teaching method. The title of the project is *An Exploration of the State of Problem-based Learning in Family Medicine Residency Programs*. The Principal Investigator is my faculty co-advisor, Dr. William Timpson, from Colorado State University's School of Education.

Problem-based learning (PBL) is a learner-centered approach to teaching and learning that many medical schools use as part of their curriculum. It is also sometimes referred to as "case-based" learning, though PBL is somewhat more complex in that it engages the learners in asking questions and seeking out information as a case is revealed and discussed. Little is known about the use of problem-based learning in graduate medical education in family medicine, though research has shown it may be a valuable teaching method.

I am asking Program Directors nationally to complete the enclosed questionnaire and return it in the postage-paid envelop. This will take approximately 10 minutes. **If you feel there is a faculty or administrative person at your program more appropriate to answer the questions, we encourage you to pass the questionnaire on to him or her.**

There are no known risks to completing this survey. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty. While there are no direct benefits to you, we hope to gain more knowledge on this teaching method's use in graduate medical education in Family Medicine. Your identity will remain completely confidential.

If you have any questions, please contact the investigator, Kristen L. Benè at 970-495-8879 or [klb7@pvhs.org](mailto:klb7@pvhs.org). If you have any questions about your rights as a volunteer in this research, contact Janell Barker, Human Research Administrator at Colorado State University, at 970-491-1655 or Kim Woods-McCormick, RN, Manager of the PVHS Institutional Review Board at 970-237-7972. This study has been approved by the Poudre Valley Health System and the Colorado State University Institutional Review Boards.

Sincerely,

Kristen L. Benè, PhD Candidate  
Educational Associate Director  
Fort Collins Family Medicine Residency Program  
Graduate Student, Educational Leadership Program  
School of Education, Colorado State University

William Timpson, PhD  
Professor  
School of Education, Colorado State University

APPENDIX C  
Variable Coding Scheme

Variable Name	Description	Numeric Code
<b>PROGTYPE</b>	Family Medicine residency programs fall into 5 types based on relationship with a university or military establishment. Variable is the type of program.	1 = Community-based, unaffiliated program 2 = Community-based, university affiliated 3 = Community-based, university administered 4 = University-based 5 = Military program
<b>PGY1</b>	Number of intern positions at the residency program	# of intern positions on a scale of 1-∞
<b>PGY2</b>	Number of second year resident positions at the residency program	# of second year positions on a scale of 1-∞
<b>PGY3</b>	Number of third year resident positions at the residency program	# of third year positions on a scale of 1-∞
<b>PYEARS</b>	The number of years the program has been in existence	# of years on scale of 1-∞
<b>LOCATION</b>	Location of the program in terms of community size	1 = Suburban 2 = Urban/Metropolitan 3 = Rural 4 = Other (both suburban and urban)
<b>TMDID</b>	Is didactic lecture used as a teaching method?	1 = Yes 0 = No
<b>TMCASE</b>	Are case presentations used as a teaching method?	1 = Yes 0 = No
<b>TMSDL</b>	Is self-directed learning used as a teaching method?	1 = Yes 0 = No
<b>TMWEB</b>	Is online learning/computerized modules used as a teaching method?	1 = Yes 0 = No
<b>TMGRP</b>	Is group discussion used as a teaching method?	1 = Yes 0 = No
<b>TMJC</b>	Is journal club used as a teaching method?	1 = Yes 0 = No
<b>TMOTHER</b>	Do you use other teaching methods?	1 = Yes 0 = No
<b>OTHERS</b>	Please list other teaching methods used	Open-ended comment
<b>PBLYN</b>	Does your program used the defined teaching method?	1 = Yes 0 = No



<b>SESSIONDET</b>	Please describe a PBL session in detail	Open-ended comment
<b>PBLNAME</b>	Do you call this method PBL?	1 = Yes 0 = No
<b>PBLUSE1-PBLUSE8</b>	A series of 8 variables about where PBL is utilized in a program curriculum	All 8 variables are scored 1 = Yes, 0 = No
<b>PBLUSE1</b>	Does the program have PBL-only resident educational conferences?	1 = Yes 0 = No
<b>PBLUSE2</b>	Does the program have PBL incorporated into some conferences?	1 = Yes 0 = No
<b>PBLUSE3</b>	Does the program have PBL-only curriculum?	1 = Yes 0 = No
<b>PBLUSE4</b>	Does the program have PBL incorporated as part of other curricular areas?	1 = Yes 0 = No
<b>PBLUSE5</b>	Does the program have PBL in large group learning sessions?	1 = Yes 0 = No
<b>PBLUSE6</b>	Does the program have PBL in small group learning sessions?	1 = Yes 0 = No
<b>PBLUSE7</b>	Does the program have PBL in self-directed online/computerized modules?	1 = Yes 0 = No
<b>PBLUSE8</b>	Does the program utilize PBL in some other way?	1 = Yes 0 = No
<b>PBLUSEOTH</b>	Please describe other ways PBL is used	Open-ended comment
<b>PGY1YN</b>	Do PGY1 residents participate in PBL?	1 = Yes 0 = No
<b>PGY2YN</b>	Do PGY2 residents participate in PBL?	1 = Yes 0 = No
<b>PGY3YN</b>	Do PGY3 residents participate in PBL?	1 = Yes 0 = No
<b>ALL RES</b>	Do all residents participate in PBL at the same time?	1 = Yes 0 = No
<b>BYCLASS</b>	Are PBL activities individualized by class?	1 = Yes 0 = No
<b>LIMIT</b>	Do you purposely limit the PBL group size?	1 = Yes 0 = No
<b>LIMITNUM</b>	How many residents is PBL limited to?	# of residents in a PBL group on a scale of 1-∞
<b>CURRIC</b>	In what areas of the curriculum is PBL used?	Open-ended comment

<b>PARTICIPATE</b>	Participation in PBL is	1 = Required 2 = Optional 3 = Other, please describe
<b>LOFTIME</b>	Number of years PBL has been used at a program	1 = 1-2 years 2 = 3-5 years 3 = 6-8 years 4 = 9+ years
<b>FACILITATE1-FACILITATE6</b>	A series of 6 variables about who facilitates PBL at a residency program	All 6 variables are scored as 1 = Yes, 0 = No
<b>FACILITATE1</b>	Do physician faculty facilitate PBL?	1 = Yes 0 = No
<b>FACILITATE2</b>	Do non-physician faculty facilitate PBL?	1 = Yes 0 = No
<b>FACILITATE3</b>	Do non-faculty staff persons facilitate PBL?	1 = Yes 0 = No
<b>FACILITATE4</b>	Do preceptors/specialists facilitate PBL?	1 = Yes 0 = No
<b>FACILITATE5</b>	Do other people not those above facilitate PBL?	1 = Yes 0 = No
<b>OTHFAC</b>	Please list other PBL facilitators	Open-ended comment
<b>TRAIN1-TRAIN5</b>	A series of 5 variables about which training facilitators receive related to PBL activities	All variables are scored as 1 = Yes, 0 = No
<b>TRAIN1</b>	Is faculty development used for training?	1 = Yes 0 = No
<b>TRAIN2</b>	Is individualized training used?	1 = Yes 0 = No
<b>TRAIN3</b>	Are readings used to train facilitators?	1 = Yes 0 = No
<b>TRAIN4</b>	Is informal training used to train facilitators?	1 = Yes 0 = No
<b>TRAIN5</b>	Are other training methods used?	1 = Yes 0 = No
<b>TRAINOTH</b>	Please describe other training methods used	Open-ended comment
<b>CASE1-CASE5</b>	A series of 5 variables about where PBL case content comes from	All 5 variables are scored as 1 = Yes, 0 = No
<b>CASE1</b>	Do you use cases from journals?	1 = Yes 0 = No
<b>CASE2</b>	Do you use textbook cases?	1 = Yes 0 = No

<b>CASE3</b>	Do you use actual hospital-based or clinic cases?	1 = Yes 0 = No
<b>CASE4</b>	Do you use faculty created/partially fictitious cases?	1 = Yes 0 = No
<b>CASE5</b>	Do you get cases from other sources?	1 = Yes 0 = No
<b>OTHCASE</b>	Please describe other sources of case content	Open-ended comment
<b>EVALUATE</b>	How do you evaluate PBL at your program?	Open-ended comment
<b>SUCCIMPL</b>	Subjective rating of success in implementing PBL	5 = Highly successful 4 = Moderately successful 3 = Somewhat successful 2 = Moderately unsuccessful 1 = Highly unsuccessful
<b>SUCCTEACH</b>	Subjective rating of success of PBL at teaching residents	5 = Highly successful 4 = Moderately successful 3 = Somewhat successful 2 = Moderately unsuccessful 1 = Highly unsuccessful