THE USE OF A REAL LIFE SIMULATED PROBLEM BASED LEARNING ACTIVITY IN A CORPORATE ENVIRONMENT

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This narrative study examines using a real life simulated problem base learning activity during education of clinical staff, which is expected to design and develop clinically correct electronic charting systems. Expertise in healthcare does not readily transcend to the realm of manipulating software to collect patient data that is pertinent to the care of patients. To gain the expertise, troubleshooting abilities and knowledge required to maintain their clinical system, each participant in this study has gone through the RLSPBL activity.

Education in the corporate world must be effective and efficient while providing a good return on the educational investment. Corporate education must use material contextually similar to a workplace, and the techniques for education must provide both near and far transfer of the material. Ten individuals (eight clinical, two non-clinical) who work across the United States were interviewed; their reflections on their career as a clinical interface designer are told here. The participants varied in their age, educational background, and current work responsibility and computer experience. Their insights revealed four major themes which summarize their stories: problem-based learning, collaboration, hands-on activities and the use of a real-life simulated problem-based learning activity.

The clinical environment requires patient safety as a paramount parameter in building a clinical charting system. Up to the moment information along with trending capabilities is critical to a clinician caring for a patient. Adhering to best practices and maintaining an efficient data entry system must seamlessly blend technology into the clinician's practice. An understanding of the education of individuals who have created such charting systems is

presented here in hopes that what these participants have found to be significant can be shared with others in similar situations.

ACKNOWLEDGEMENTS

I thank my family: Anna my wife and Claire my daughter, who have endured almost 9 years of my isolation from them as I went on my journey in pursuit of this degree. Working full-time in a Corporate Environment plus teaching as an Adjunct Faculty Member prevented me from fully interacting with them. Creating and updating text books for college classes while travelling nationwide to teach hospital staff provided me few opportunities to vacation or relax with them. Now I can use the same meticulous research efforts I have utilized in this research to investigate their daily lives.

Next, thanks to the thousands of clinicians I have tried to instruct over the past 16 years. They have provided me with their insights on the reality of education and the way many professional learn while doing their job. Further thanks to the ten individuals whose thoughts and insights comprise this dissertation; their agony has become a guide for others.

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CHAPTER 1

INTRODUCTION

Many years ago before computers, Lindeman (1926) stated, "The approach to adult education will be via the route of situations" (p. 8). This statement is true for current adult education endeavors (Fenwick, 2000; McLagan & Suhadolnik, 1989; Tobin, 2000; Watkins, 1989; Zielinski, 2001). Any educational technique that does not incorporate contextually relevant situations is destined to be ineffective (Carnevale, 2000; Hansman, 2001). This research explores a method of education that allows clinicians the ability to create and use charting systems in the workplace in a successful manner.

1.1 Description of Problem

How do clinicians acquire the knowledge and experience they need to design and develop clinically correct electronic charting systems (Biley & Smith, 1998; Fraser & Greenhalgh, 2001; Smith, 2002)? Their expertise is in healthcare, which requires an expert understanding of interface design – an area where clinicians may have limited or no experience (Sticht, 1976, 1988; Taylor, 1997). What is the process they can use to obtain that knowledge (Boud & Garrick, 1999; Creedy & Alavi, 1997; Hoberman & Mailick, 1994; Perlman, 1984)? A thorough examination of this process has not occurred in adult education literature (Holloway & Wheeler, 2002; McDonagh & Coghlan, 2001).

Education in the corporate world must be effective and efficient and provide a return on investment (Broad & Newstrom, 1992; Watkins, 1989). Corporate education must use material contextually similar to a workplace, and the technique of education must provide both near and far transfer of the material (Singley & Anderson, 1989). Adults in corporate positions must learn

using different techniques than were used during their academic years (Long, 1983; Tobin, 2000; Watkins, 1989; Zielinski, 2001).

Adults who are out of academia are learning for multiple reasons; one primary reason is work (Argyris, 1993; Argyris & Schön, 1974; Barnett, 1999; Boud, 2001; Boud & Solomon, 2001). Employers need employees who are able to handle the tasks assigned; learning must be reality based. Knowledge is often detached from real world cases (CTGV, 1990; Fenwick, 2000; Harp, 1995; Tobin, 2000) because it is presented as context independent. Caprio (1994) indicates it is very difficult to transfer problem-solving skills from the classroom to the real world. Caprio describes students' goals during traditional teaching, "The goal of learning in this setting is to regurgitate the accepted explanations or methodology expostulated by the teacher" (p. ix). Bransford, Sherwood, Vye, and Reiser (1986) point out that traditional teaching is context independent, and the student does not have an understanding of the application of the presented material. Doing homework problems in school does not directly tie to the same activity in a job; one has a set answer while the other may not. Carnevale (2000) suggests a goal of academia is to transfer knowledge as students complete a project or an assignment.

Learning at work is an extension of the education gained in school, but the methods must be different. The work environment often has replaced the university as the place where adults learn (Anderson & Herr, 1999; Daley, 2002; Haskell, 1998; Spear, 1988). Learning should be a productive part of everyday activities at a business, if that business is to keep up with society (Boud & Solomon, 2001). The learning that must occur in the workplace improves efficiency of the group, improves the employees' intellectual growth, and helps to provide for future changes to the work environment (Boud & Garrick, 1999). In a workplace, ambiguity, access to vast amounts of information, and inaccurate data make it difficult to find correct solutions (Marsick

& Watkins, 1990). The amount of information expands as the business environment becomes more complex. In the business world, there is no educational setting to help employees become problem solvers (Billet, 1998, 1999; Hodges, 2001). Trial and error may be the best technique as employees search for a solution, however using trial and error is costly and inefficient in the business world, and it may not resolve the problem (Boud & Garrick, 1993; Marsick & Watkins, 1990).

Education is important for both those who will be learning and those who will be helping, guiding, and facilitating learning in others. It is essential to understand learning because there are specific actions and techniques that can have an impact on the quantity and quality of what is learned (Boud & Garrick, 1993). Understanding how learning occurs and understanding contributing factors makes it easier to increase a learner's proficiency (Mezirow, 1990; Taylor, 1997; Uden & Beaumont, 2006).

This subject requires a broad spectrum of educational techniques and philosophies. Areas researched are:

1. Use of problem based learning
2. An examination of workplace learning
3. Exploring the inclusion of real life simulated PBL activities in education
4. Transfer of learning

Literature related to these areas is in chapter 2 and in chapter 3 the methodology to gain insight to the student's experiences is presented.

As organizations rely on more electronic processes and services, they constantly update their employees' knowledge, skill, and information systems education.

> Proprietary information, changing demographics and values, and external regulations, as well as changing corporate policy, are all information producers. As long as new ideals,

> new materials, new equipment, and new ways of adapting come about, there will be a continuing need for training. The lifelong learning movement has come about partly because the information explosion confronts us with increasingly frequent intellectual, emotional, and technical adjustments to the world around us. (Hawthorns, 1987, p. 19)

Clinical organizations must watch every educational dollar spent as they seek to balance the cost associated with employees versus money spent on direct patient care (Creedy & Alavi, 1997; McDonagh & Coghlan, 2001). Regrettably, the money and time allocated to education may not yield a good return on investment, and implementations of improvements may not occur at the conclusion of the education (Broad & Newstrom, 1992; Harp, 1995). Thus, corporate educators must justify costs by insuring that students understand educational content, and successfully transfer knowledge and skills. Hollenbeck and Ingols (1990) indicate that organizations are demanding that the money spent on education is justified by the intrinsic value gained by the organization.

1.2 Need / Purpose of Study

This research probes facets of the process clinicians use to learn user interface design (Heliker, 1994). The intent of this research is to discover if a real life simulated problem based learning (RLSPBL) activity enhances students' learning and supports the transfer of skills and knowledge presented in a corporate educational environment to the workplace (Funk & McBride, 2002; Taylor, 1997). Adult education in the business world is not an extension of academic education; an instructor is not present to design courses that last sixteen weeks. Answers may not be available, and an adult worker must think independently without an instructor present (Fraser & Greenhalgh, 2001; Mezirow, 1990; Tobin, 2000). Technology changes in the workplace require employees to maintain their skills with technology or fall behind those who have educated themselves (Kolb, 1984; Little, 1983).

Specifically, the focus is the near and far transfer of knowledge of an electronic clinical charting system by adult learners who return to work. Therefore, the principle focus is students' impressions of the RLSPBL activity and its usefulness in work related tasks. Literature describing this style of education is limited (Carroll, 1990; DeBono, 1967; Hoberman & Mailick, 1994; Spiro, Coulson, Feltovich, & Anderson, 1988). As the researcher, I talked with participants' to understand their perceptions of the troubleshooting and problem based learning activity and determine whether this activity helped them overcome obstacles in their work.

Problem based learning using simulated real life activities can provide contextual experiences to the learner; however, the scope of the class may not provide enough experiential learning (Biley & Smith, 1998; Newell & Simon, 1972; Usher, 1993). These activities may not be contextually correct and provide enough content to help the learner (Mezirow, 1997). This dissertation offers another solution to workplace education, the purposeful inclusion of RLSPBL in a classroom activity. Students receive hands on experience in a realistic work situation and are challenged to think beyond rote memorization to find feasible solutions. This process has characteristics of many established educational philosophies (Dewey, 1938b; Jarvis, 1987b; Knowles, 1975; Uden & Beaumont, 2006). The researcher determines if the activity is effective and gains insight from participants' thoughts and attitudes about the activity. The findings are presented in Chapter 4.

Employee knowledge is a corporate asset that must be maintained (Darkenwald & Merriam, 1982). Each day changes in technology can render this asset less valuable (Krell, 2001). Corporate knowledge depreciates like any asset, lessening in value over time. Corporations need to either update their intellectual assets by hiring new employees with needed

skills or educate their current staff (Billet, 1998, 1999; Gee, Hull & Lankshsear, 1996; Hoberman & Mailick, 1994; Hodges, 2001; Perelman, 1984; van Aalst, 1979a, 1979b).

Effective, efficient, and contextually valid education must be available for corporations to update their skill sets and replenish their intellectual assets (Krell, 2001). Adult learning using an experiential, problem based format provides a viable avenue. Dewey (1938b), Keeton (1976), Knowles (1990), Kolb (1984), and Uden & Beaumont (2006) have documented this method of education.

Adults perceive the learning experience as a whole. Jarvis (1987a) says, "learning and teaching must be more closely related if the teaching process is to be more meaningful to the learner" (p. 190). Each student must comprehend problems and solve them. The path/method for solving problems may be unique each time, so the student must learn problem-solving skills that encompass a wide range of discovery. A lecture style class may provide teacher led insights to standard problem solving; adult learners need to develop solutions beyond classroom material. Intellectual growth by a student in a designed learning activity can establish the techniques to solve a wide spectrum of difficulties and help them apply these techniques to situations they have not seen before (Gmelch & Chan, 1994; Hutchings & Wutzdorff, 1988, Mezirow, 1990). Adults with higher self-esteem and a more positive self-concept are more ready to accept change (Jarvis, 1987a, 1987b). A learner's sense of self (self-efficacy) relates to his or her own image, esteem, and idealism. Does the learner believe he can handle the material (Van Merrienboer & Ayers, 2005)? How does the learner feel about changes that precipitate learning new content (Jarvis, 1987a, 1999)? Jarvis outlined four characteristics of quality education:

1. Practice/experimentation – Experiment to learn new and practice to repeat developed patterns

2. Evaluation – Determine if students are learning. Did the material make sense; does it matter?

3. Memorization – Commit functions and process to memory

4. Person changed and more experienced – Did the experience fulfill the expectations? (p. 113)

Fulfillment of the four characteristics provides the learner with a path to intellectual growth and a more complete learning experience.

1.3 Background

1.3.1 Participants' Assigned Tasks

Students' responsibilities include the design and creation of clinical user interface systems for their healthcare facilities. Their jobs require in depth clinical knowledge and expertise in clinical processes, regulations, and workflow. Limited fiscal settings have forced hospitals to create new positions that blend clinical tasks with computer operations. These positions require design ability, but more importantly, they demand clinical expertise and knowledge. Zielinski (2001) defined the ever changing work environment facing today's workforce when he said, "Welcome to the 21st century training organization, where time honored titles are slowly disappearing, responsibilities are shifting, standalone jobs are melting into far broader roles and new career ladders are emerging" (p. 31).

1.3.2 Gaining Information Through Experience

Many authors have discussed self-directed learning processes used by adults to gain experience and knowledge (Knowles, 1984; Luckner & Nadler, 1997; Oakeshott, 1933; Woods, 1996). Tough (1979) indicated that adult learners are placed in situations where they are

responsible for systems and processes of which they have no knowledge. These individuals must learn and gain expertise quickly: They may face the need to perform a task or accept a new responsibility. In order to perform the action at a higher level of performance, they may spend some time beforehand gaining certain knowledge and skill. They will then use or apply the knowledge (p. 50).

Knowles (1984) suggests that individuals who have to be self-taught should develop an understanding of needed competencies, assess their present level of performance in each of the competencies, and perform a gap analysis between the two. Adult learning theories, including action learning, PBL, experiential, and workplace learning, all contain an individual learning component. Danis (1992) suggested establishing a goal, determining information to be acquired, obtaining that information, and then integrating the new knowledge into one's reality. Wlodkowski (1999) indicates that individuals must thoroughly know the content if they are going to teach it to another. Students designing clinical systems must be able to teach their coworkers to use the interfaces they have developed. To test this, the following must be asked:

1. Do I understand what I am going to teach?
2. Can I give more than one good example of what I am teaching?
3. Do I know the limits and consequences of what I am teaching?
4. Do I know how to bridge what I am teaching to the world of learners, their knowledge, experience, interests, and concerns?
5. Do I know what knowledge I am missing? Where are the boundaries of my own knowledge and skill? How far am I from the cutting edge of my discipline ? (Wlodkowski, pp. 28-29)

1.4 Research Focus

This study is qualitative in nature. Interviews with adult clinicians guide discovery and reveal participants' thoughts about a RLSPBL. This research has no specific questions designed to steer the participants; however, there are some topics of questioning that arise:

1. What were the critical aspects of the class that enabled you to learn the material?
2. Was it the class or some combination of prior experiences that helped you gain new knowledge?
3. Were you able to transfer classroom material to your workplace?
4. Are you able to create successful clinical charting interfaces?

1.5 Origin, Significance and Assumptions of this Study

1.5.1 Origin

The origin of this study is from the successful inclusion of a RLSPBL learning activity in a corporate learning environment (Heliker, 1994). Students in an instructor led, hands on computer class have indicated that the inclusion of an activity with planned errors provided them enlightenment on the material and the overall human, computer interface design process (Laurent, 2009). Lecture along with hands on activities provides students a limited set of insights and does not explore all possible solutions (Brakke & Smith, 2008; Eizenberg, 1990; Fraser & Greenhalgh, 2001). Students indicate the inclusion of RLSPBL activity filled voids left by other teaching techniques (Laurent, 2009).

The class which presents the RLSPBL activity teaches hospital staff (70% clinicians) how to create clinically correct user interface screens (Laurent, 2009). These screens are used throughout the medical facility for electronic patient charting. All facets of a hospital are accommodated; the charting ranges from admissions to vital signs. Each screen designer can

create unique interfaces for their staff depending on the unique characteristics of the clinical area (Fenwick, 2000; Fraser & Greenhalgh, 2001). Pediatrics has charting relative to newborn issues while an Obstetrics charting presentation deals with expectant mothers, their families, and the delivery of a child. Simple differences such as a weight in grams versus pounds affect calculations for medicines and treatment.

The educational class to create these varied screens is five days long. After a student has taken the class, they must use the software to create, modify, and manage an entire hospital's electronic charting system. This system is the repository for the patient's permanent medical record. The clinician creating the charting screens must be an expert in the design and use of this software (Tennant, 1999). The arena of medicine changes often enough to require redesign of components of the entire system. Troubleshooting skills are required as the student may be required to modify previously created presentations. Errors are possible, so the student must have troubleshooting and problem solving skills (Barrows & Tamblyn, 1980; Cannon & Schell, 2001; Fraser & Greenhalgh, 2001).

To educate students efficiently on the design of screens, software, and troubleshooting, a RLSPBL activity called the BOB Lab is used. During the fourteen years of use, students indicate in class and on class evaluations that the BOB Lab enables them to view the work from another perspective, and they gain insights to the presented material. They find the lab is relevant to their work and very similar to tasks they would perform on the job (Laurent, 2009). Chapter 3 describes the research method in detail, and it describes the procedure for capturing participants' feedback.

1.5.2 Significance

This research contributes to adult, workplace learning, and educational literature in many ways, such as: incorporating PBL in classroom situations, scaffolding education in the workplace and utilizing contextual pertinent clinical content. Many authors (Boyatzis, Cowen & Kolb, 1995; Caffarella, 2002; Danis, 1992; Grice & Skinner, 1998; Houle, 1972; Knowles, 1980, 1990; Kowalski, 1988; Long, 1983; McLagan & Suhadolnik, 1989; Verderber, 1997; Wlodkowski, 1999) have examined knowledge acquisition; however, the venue of clinicians creating medical graphical user interfaces needs further investigation.

Corporations have a need to refresh and maintain their intellectual assets by re-educating their employees (Clarke, 2002; Funk & McBride, 2002). A high return on their educational investment is expected (Perez, 2008). A hands-on RLSPBL activity provides students with the experience they need to perform at an expert level in their job. Other corporate educational settings can include such an activity to make adult education more effective and efficient and avoid a low return on any intellectual investment (Bernthal, Colteryahn, Davis, Naughton, Rothwell, & Wellins, 2004; Harp, 1995; Hollenbeck & Ingols, 1990).

1.5.3 Assumptions

The following assumptions exist at the start of this research:

1. Participants answered and participated in a truthful manner. They arrived at their position after some reflective thinking. The researcher did not direct them.

2. Outside forces beyond the scope of this research were the same for all participants. They should all have similar responsibilities.

3. The information being researched is ever changing, and its dynamic nature makes for unforeseen variations, which may appear after the start of the research. The interviews were consistent for all participants.

1.6 Research Discussion

Problem based learning and experiential learning are useful educational methods (Dewey, 1938b; Knowles, 1990; Kolb, 1984). The inclusion of a real life simulated PBL (RLSPBL) activity enhances the educational process and allows a more introspective form of education (Bradford, 2001; Daley, 2002; Malinen, 2000; Spear, 1988). Over the years, the question 'what is knowledge' has been investigated more than how to obtain knowledge (Jarvis, 1987a). Jarvis indicates that knowledge is the output regardless of the path taken to get the knowledge and learners are measured by the amount of knowledge they have, not how they obtain the knowledge. Jarvis defines processes that adults take to learn. Some are beneficial while others do not lead to an increase in knowledge. He points out that the student may learn, remain unaffected, or possibly experience harm because of an educational experience (p. 24).

Dewey (1981) relates that learning events surround us. The important concern is the meaning of these learning events. Kolb (1984) indicates that an experience in education has two distinct processes: apprehension, which is obtaining the experience, and comprehension, which explains how the experience becomes knowledge. After the educational activity, the student has more experiences, which provide more knowledge, build skills, or model an attitude. Marton and Säljö (1984) proposed five different approaches to learning: an increasing quantity of knowledge, memorizing, collecting facts, understanding the meaning of abstraction, and analyzing reality. These approaches identify how knowledge is obtained, and they link learning with the methods used.

The lack of literature related to using RLSPBL in a corporate world indicates that this phenomenon has not been adequately studied. Chapter 2 presents literature that is related to adult education; including problem based learning, experiential learning and workplace learning.

Strauss and Corbin (2008) propose the use of qualitative methods to "uncover and understand what lies behind any phenomenon about which little is yet known" (p. 19). This thought is seconded by Merriam (1988): "A qualitative approach allows discoveries to be made about the phenomenon under investigation. There are no predetermined hypothesis, which direct and limit what one looks for, no treatments, and no restrictions on the end product" (p. 166). As stated earlier, there are no set questions and no hypothesis in this research.

Some authors indicate that the planned acquisition of knowledge is a process that can be examined (Cross, 1981; Knowles; 1975; Merriam, Caffarella & Baumgartner, 1991; Spear, 1988; Tough, 1979). Patton (1990) relates that qualitative research focuses on how education occurs (the process) and not on the final product. Patton outlines four reasons why qualitative research is suitable for studying processes: 1) the researcher must describe the process in detail; 2) each person experiences the process differently; 3) the process is fluid and dynamic; and 4) the perceptions of the participants are key to understanding the process (p. 94). Other qualitative researchers, Marshall and Rossman (1999) and Strauss and Corbin (2008), concur that qualitative research is an ideal method to use to gain an understanding of educational processes.

A phenomenological inquiry research method was used for this investigation. This research uses purposeful sampling to find information rich participants (Altrichter, 1990; Clandinin, 2007; Clandinin & Connelly, 2000; Eizenberg, 1990; Guba, 1978). The participants were found through use of criterion, convenience, and maximum variation purposeful sampling methods (Clandinin, 2007; Clandinin & Connelly, 2000; Connelly & Clandinin, 1990). Once potential participants were identified, the researcher contacted each of them personally to determine whether they would participate in the study. The initial interviewee came from this pool of participants (Corbin & Strauss, 2008; Glaser & Strauss, 1967; Huberman & Miles, 2002).

The first participant had as many measureable facets as feasible (age, years of nursing experience, years of computer experience, education, and educational background). From this initial interview, solicitation of names of other possible participants from the aforementioned criteria occurred (Creswell, 1994, 1998).

The participants were asked to describe how they acquired the knowledge they needed to develop clinical graphical user interfaces. From this information, I searched for themes mentioned by the participants. Each interview was recorded using a tape recorder. A second individual (peer review) examine the transcribed material. Then I used the constant comparative method to analyze and categorize the information to identify common themes and patterns (Auberbach & Silverstein, 2003; Boyatzis, 1998; Corbin & Strauss, 2008; Smith, 2000). The interviews continued until thematic saturation (Thomson, 2009; Whitehead & McNiff, 2006a, 2006b); chapter 3 further describes this methodology.

The initial participants had follow up interviews to explore thematic areas that appear in later interviews. Once all participants were interviewed equally, a summary of data collected and determined themes were revealed (Boyatzis, 1998). Lincoln and Guba (1985) indicate that trustworthiness can measure validity and reliability. This was done in a qualitative study by establishing credibility, transferability, dependability, and confirmability (Maxwell, 1992). Member checks, referential adequacy, and peer reviews ensure the credibility of the findings. Member checks consist of providing each participant with a copy of their transcribed interviews and the researcher's interpretations. The participants confirm the information or change it as desired to reflect their thoughts (Maxwell, 1992).

To achieve referential adequacy, a tape recording of all interviews allows examination later in the research. Peer reviews were held as interviews arrive and themes are determined.

Ancillary information was added to allow for thick descriptions. This provides future researchers with the opportunity to make decisions concerning the transferability of this study to other clinical settings (Creswell, 1998; Lincoln & Guba, 1985; Merriam, 2002).

Lincoln and Guba (1985) indicate that dependability and confirmability can be established through a well-documented audit trail so that an outside party can adequately inquire. To insure dependability and confirmability, the researcher maintained files, including the researcher's journal, the recording of the interviews and discussions, peer review materials, and documents from the data analysis process.

1.7 Definition of Terms

RLSPBL: A planned hands on experiential activity in which the content and context of a clinical charting screen has modifications made. The students, who have learned the basics of the system and have built an interface, are required to recover from changes made to the system and restore their charting presentations to their original form.

Charting screen (Figure 1): The interface between a computer system and the clinician who is collecting information on a patient. All aspects of patient care are included in the hospital's set of charting screens. The charting screens are the data entry forms, which offer clinically correct electronic forms for the clinician to complete. This user interface (to clinicians treating patients) is critical to any healthcare facility and must be designed uniquely for each distinct department of a hospital.

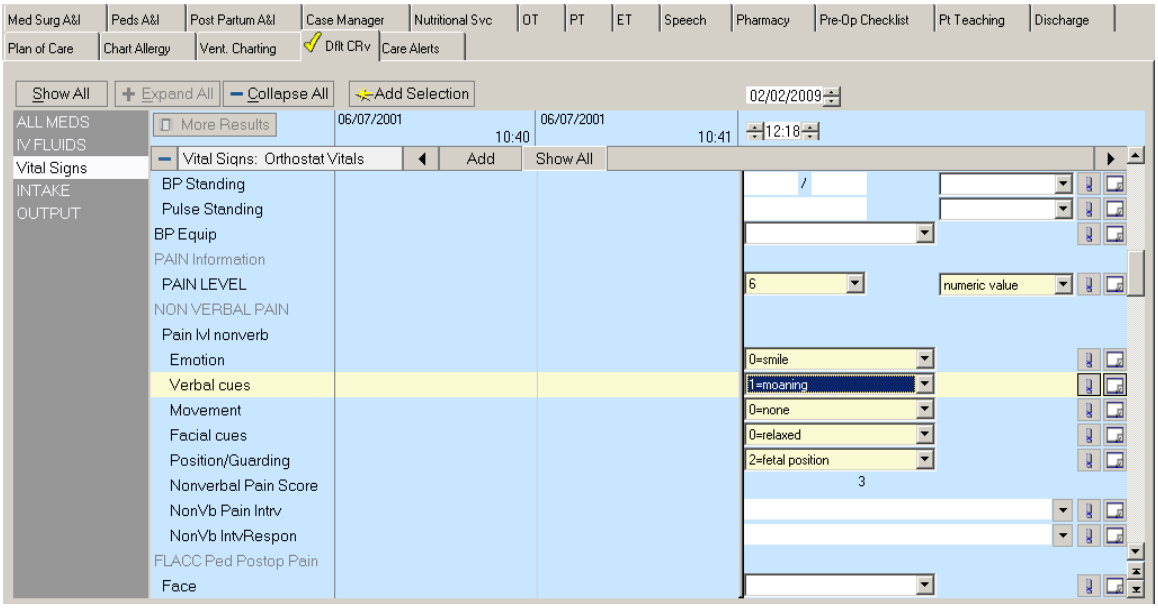

Figure 1. Charting screen example created by class participants.

Charting: The process of collecting patient characteristics, which denote their status. A clinician measures the values and records them into the hospital's database by entering the data into a charting screen.

Far transfer: Use of skills and knowledge learned in activities and experiences that are applied in the workplace. This transfer suggests the student learned the material and was able to use it in a real world situation (Haskell, 1998; Singley & Anderson, 1989).

Constant comparative method: A process of qualitative data analysis where comparison between each succeeding interview with prior interviews occurs before additional information is composed. As Bogdan and Biklen (1982) indicate when using the constant comparative method, analysis begins with the first interview and is nearly complete by the last interview. Further explanation of this method is in chapter 3.

Content expertise: In-depth knowledge a person has as well as the ability to inform another effectively about a subject. This level of knowledge allows the individual to work independently (Benaim, 2002).

Expert: An individual who possesses great knowledge, skill, and experience in a particular field or subject matter. Often times these individuals are lifelong learners and continuously attempt to add to their knowledge base (Benaim, 2002).

Knowledge: Personal understanding, awareness, and comprehension. The ability to apply analyze, synthesize, evaluate and make judgments based on perceptual skills, physical skills, competent performances, response tendencies, habits, attitudes, emotional reactions, recall sensitivity, insight, confidence and/or some other personality characteristic, inner behavior, or overt behavior (Tough, 1979).

Learning: Continuous, specified, and purposeful actions to acquire knowledge of a subject or acquire a previously unknown skill (Symonds, 1968; Tough, 1979).

Learning Processes: "The various possible interactions of a series of interdependent components which lead to the acquisition and/or application of new knowledge" (Danis, 1992, p. 48).

Linear process of self-directed learning: Clearly measured, well thought out series of activities that indicate a linear progression. This is categorized by determining learning needs, forming goals and objectives, locating resources, choosing and applying learning strategies, and evaluating learning (Knowles, 1975). Variations in learning are not incorporated.

Member checks: A means of establishing credibility in a qualitative study by returning transcripts and interviewer interpretations to the participant for review, clarification, correction, and suggestions (Lincoln & Guba, 1985). More information on Member Checks is presented in chapter 3.

Peer reviews: The process of having a colleague or joint researcher scan some of the raw data from an interview to determine whether the researcher's findings are viable based upon the data (Merriam, 2002).

Phenomenological inquiry: Qualitative research method that concentrates on the perceived core of an experience that expresses how complex meanings are built out of simple slices of a directed experience (Merriam, 2002).

Purposeful sampling: A planned method of sampling. The researcher selects particular participants to include because they may facilitate the expansion of an evolving theory by providing information rich descriptions of their experience (Bogdan & Biklen, 1992).

Problem solving ability: The capacity to solve problems by using mental faculties to identify the problem, evaluate the data, develop a plan to solve the problem, and evaluate the effectiveness of the plan (Curry, 1983).

Referential adequacy: A method of capturing interviews with a tape recorder, which can later establish credibility in the data analysis portion of a qualitative inquiry (Lincoln & Guba, 1985).

Self-directedness: An internal force that compels individuals to analyze, reflect upon their past knowledge, and critically reflect upon new information (Fisher, 1995).

Self-directed learning: "Self-directed learning is characterized by a process in which the learner has control over both the goals and the means for learning, regardless of whether or not the reason for learning is under the learner's control" (Spear, 1988, pp. 199-200).

Subject matter expert: A person who has extensive knowledge and experience in a particular area. They have the ability to perform tasks that require a high level of problem solving and data analysis (Bennett & Clasper, 1993).

1.8 Limitations

This research included individuals who were responsible for designing and maintaining clinical charting systems. This critical facet of a hospital environment was always serviceable. No participants in this study failed to develop the charting system needed by their facility.

1.9 Delimiters

This research is delimited in the following ways:

1. Because of participant restrictions, a sample of convenience is being used for this study. The participants were from the clinical setting, thus reducing the potential generalizability of the findings to other employment arenas (Duffy, 2007; Eizenberg, 1990).

2. Because the researcher is the primary instrument of data collection and analysis in qualitative studies (Merriam, 1988) and natural bias is brought into any research by the investigator (Lincoln & Guba, 1985; Merriam, 2002; Strauss & Corbin, 2008; Wilkinson & McNeil, 1996), the results of the study depend upon the interviewer's ability to remain objective.

3. A purposeful sampling technique that utilizes information rich subjects took precedence over attempts to have equal representation in other factors such as ethnicity, economic status, or age (Duffy, 2007; Holloway & Wheeler, 2002).

4. Once individuals were identified as possible participants who meet the required criterion, they were invited to participate in the study.

5. All can speak English and are adults.

6. All have used the software and are familiar with the clinical environment. Prerequisites are available that cover the language and clinical terminology; however, any employee of a facility may be sent to class without sufficient knowledge. The vast majority of the participants use in-depth clinical knowledge for this class to create clinical presentations. Some participants, who have a management role, do not actually use the software (Duffy, 2007; Holloway & Wheeler, 2002; Merriam, 1988; Schein, 2001).

1.9 Summary

This chapter provided the setting for the phenomenological inquiry into the process clinical staff uses to acquire the knowledge and experience they need to develop clinically correct user interfaces on software on which they were educated by the researcher (Heliker, 1994). These individuals are moving outside of their roles to do more than they ever have in the past (Bernthal et al., 2004; Caffarella, 1988, 2002; Zielinski, 2001). This requires them to acquire knowledge and expertise in a short amount of time. This chapter provides a short analysis of the literature that examines gaining expertise through knowledge acquisition, experiential learning, and hands on activities along with an explanation of terms present in the education. The use of real life simulated PBL parallels Merriam's (1988) suggestion that real life situations often present research problems.

CHAPTER 2

LITERATURE REVIEW

The literature on adult education covers a wide spectrum of techniques, philosophies, and concepts. The four sections of the literature review explore the same question: How do adults learn? These four areas are:

1. Use of problem based learning
2. Examination of workplace learning
3. Exploring the inclusion of real life simulated PBL activities in education
4. Transfer of learning

This literature review included clinical environments and any particular educational methods that are advantageous to learning in a corporate setting. Luckner and Nadler (1997) compiled a list of 12 constructivist principles that enhance the learning experience:

1. All people are learners, always actively searching for and constructing new meanings. Thus, they are always learning.
2. The process of learning is self-regulating and self-preserving.
3. Knowledge consists of past constructions.
4. The best predictor of what and how someone will learn is what they already know.
5. Learning often proceeds from whole to part.
6. Errors promote growth and are critical in learning.
7. Meaningful learning occurs through reflection and resolution of cognitive conflict and thus serves to negate earlier, incomplete levels of understanding.
8. People learn best from experiences about which they are passionately interested and involved.
9. People learn best from people they trust.

10. The purpose of education is long-term knowledge that can be used flexibly and independently.

11. Teaching is a process of providing learners with experiences, activities, and prompts that enable them to make meaning through self-regulation.

12. Instructional goals change momentarily as learners gain knowledge and acquire new skills. (p. 15)

Novak (1998) highlighted the need for learning to be meaningful for it to have some value for the learner. "I will claim that the central purpose of education is to empower learners to take charge of their own meaning making. Meaning making involves thinking, feeling, and acting, and all three of these aspects must be integrated for significant new learning and especially in new knowledge creation. In some ways, this is not a new idea" (p. 9). Novak lists the three requirements for meaningful learning:

1. Relevant prior knowledge – learner must know some information that relates to the new information.

2. Meaningful material – knowledge to be learned must be relevant to other knowledge and must contain significant concepts and propositions.

3. The learner must choose to learn meaningfully. That is, the learner must consciously and deliberately choose to relate new knowledge to knowledge the learner already knows in some nontrivial way. (p. 19)

Continuing, Novak stated:

> To return to the idea that meaningful learning requires prior knowledge, we can see that for any learner, the quantity and quality of the relevant knowledge he or she has will vary from topic to topic. Therefore, even with intense willingness to learn meaningfully, any learner has limitations on the degree of meaningfulness that can occur in a given learning task… Knowledge that we have learned meaningfully, that we have constructed from the union of our actions, feelings, and conscious thought, is knowledge we control. Think of any domain of knowledge where you can relate what you know to how that knowledge operates to make sense out of experience in that domain, and you have an example of knowledge you have learned meaningfully. This is knowledge you control and with which you feel a sense of ownership and power. Then think of a domain of knowledge that you learned mostly by rote. By contrast, this will be knowledge that you have largely forgotten, or for which you see little relationship to experience and over which you feel little sense of power or control. (p. 24)

Schön (1983) used reflection to describe the process of solving real-life problems:

> From the perspective of Technical Rationality, professional practice is a process of problem solving. Problems of choice or decision are solved through the selection, from available means, of the best one suited to establish ends. Problems arise that are very ill defined and dynamic, so the professional must do some "problem setting" (the process by which we define the decision to be made). This creates boundaries for the professional to operate under while solving a real problem. Reflection in action allows the professional to redefine the situations and the problem definition. A surprise occurs, and they turn thought back on action to reflect their determined solution. Reflection must occur. (pp. 39-40)

Documentation and explanation of the theories involved during the use of a real life simulated problem based learning (RLSPBL) in a corporate learning environment is the focus of this chapter. Education in a corporate realm must be repeatable, effective and realistic to justify the cost of the education. Determining a definable process that can consistently provide meaningful, contextually correct competences to clinicians is an objective. Creating a consistent educational process that is fiscally responsible and satisfies the clinical needs of clients is of utmost importance to healthcare facilities. Lastly, an efficient educational process that is repeatable in other venues can add to current adult educational theories.

2.1 Problem Based Learning

2.1.1 History

Problem based learning (PBL) is an instructional approach used often in the medical field. In PBL, students working in groups take on the responsibility for solving a professional problem. In the traditional approach, it is generally assumed that knowledge is learned most effectively when it is organized around the discipline and taught through lectures. In PBL, learning involves both knowledge and doing (Uden & Beaumont, 2006, p. x).

PBL is a teaching strategy that shifts the classroom focus from teaching to learning. The central premise of PBL holds that most students will learn information and skills better if they need them; need arises as students try to solve specific, open-ended problems (Duch, Groh, & Allen, 2001). Principles of PBL include building on current and previous knowledge, student stimulation, and authentic and contextual activities (Moore, 1997; Uden & Beaumont, 2006). Carnevale (2000) relates that employers hire individuals who have skills in problem-based learning. A classroom that uses problem based learning enables the student to learn when they face problems they have not encountered. Education based on PBL equips students with many practical group interaction skills, trial and error, and experimentation.

Difficulties addressed in problem based learning activities varied by student based upon their reason for seeking the education. The solutions to their complications are not rote memorization; rather, each student determines their solutions based upon their particular needs. Adults do not need rote memorization in their workplace education. Rote memorization is not effective in achieving the goals of companies, which have an increasing need for creativity and new knowledge (Anderson, 1993; Boud & Feletti, 1997; Duch, Groh, & Allen, 2001; Epstein, 1970, 1972; Kearsley, 2008; Scandura, 1977; Woods, 1996). "PBL originated in the 1950s in the medical schools of Case Western Reserve University and McMaster University in Canada in the 1960s" (Uden & Beaumont, 2006, p. 30). While this may be, Uden and Beaumont recognize other uses of PBL. "The origin of PBL can be traced to John Dewey. Dewey believed that students should have experiential, hands on, direct learning. It is generally accepted that students learn best by doing and thinking through the problem" (Uden & Beaumont, 2006, p. 32).

2.1.2 Researchers and Theories

Barrows and Tamblyn (1980) described their interpretation of PBL. "Problem-based learning is the learning that results from the process of working toward the understanding or resolution of a problem. The problem is encountered first in the learning process" (p. 1). These authors continue with their explanation of why PBL should be incorporated in education:

> The primary objective of problem-based learning is to give the student skills and information that he will transfer to his work with real patients, both as he is learning and for the rest of his professional life. It is hoped that he not only will develop and apply efficient and effective reasoning skills with his patients, but will use each patient experience as an evaluation of what he needs to learn and will engage in continual self-study to keep his knowledge and skills contemporary and appropriate to his tasks. (p. 193)

Duch, Groh, and Allen (2001) presented PBL as the ability to "think critically, use learning resources, work in teams, have effective communication skills and become continual learners." Cannon and Schell (2001) discussed the education needed for clinicians:

> The rationale for integrating PBL into nursing curricula is obvious when one considers the most common practice responsibilities. For example, nurses use the scientific, problem-solving method known as the nursing process during care delivery in many settings. Five common steps are involved: 1) collect history and physical assessment, 2) prescription and or review of lab tests, 3) collaborative planning, 4) deliver coordinated care with other clinicians, 5) evaluate response to the intervention. (p. 166)

Burch (2001) illustrated the need to change the focus of education. "PBL is a teaching strategy that shifts the classroom focus from teaching to learning. The central premise of PBL holds that most students will better learn information and skills if they need them; need arises as students try to solve specific, open-ended problems" (p. 194).

Boud and Feletti (1997) discussed the origin of using PBL in education. "The origin of problem-based learning was introduced at McMaster University in Canada. It was intended to make their work more student centered and promote a multi-disciplinary education as the foundation for lifelong learning in the students' professional practice" (p. 2). They described the

background of PBL, PBL is not static. It is changing from the approach which arose from the unique context of medical education. Nevertheless, those original ideas were sufficiently robust that they have produced the foundations for many others elsewhere. Some of the compelling features of PBL which have generated interest are as follows:

- It takes account of how students learn.
- The expanding knowledge base of most professions means that it is impossible to include all knowledge that is required for the beginning practitioner in the pre-service curriculum.
- It supports the views of the professional related to their field of activity. The problem-based course has high face validity for the practitioner.
- It places different demands on the colleges but is sufficiently adaptable to fit. (p. 4)

Students engaged in PBL use learning resources, work in teams, maintain effective communication skills, and become continual learners (Anderson, 1993; Boud & Feletti, 1997; Duch, Groh, & Allen, 2001; Epstein, 1972; Scandura, 1977). Duch, Groh, and Allen (2001) discuss the use of PBL, "Despite the advantage of improving the undergraduate experience that problem based learning offers, it became clear that, for many instructors, the adoption of PBL as a mode of instruction was a change not undertaken lightly" (p. 9). The authors found that giving up the safety of predefined classrooms challenged their traditional definition of their jobs. Duch, Groh, and Allen indicate the movement to PBL at the University of Delaware did not occur overnight; they had to work through much resistance. Acceptance and movement into the mainstream of the university took four years.

Creedy and Alavi (1997) discussed the reason behind using PBL to teach nurses:

> In response to healthcare demands there have been widespread curricular changes favoring PBL in nurse education. PBL prepares students very well for professional work because the processes of learning mirror those required in the practice. For example, PBL is a well-established and effective method in the teaching of clinical reasoning. A

> specific clinical situation becomes the stimulus for identifying what is necessary in order to understand and manage the situation, as a level appropriate for the student at the time. This differs from 'problem solving' which focuses on bringing previously learned information to bear on finding the correct answer to the problem. (pp. 219-220)

Colin Coles (1997) introduced issues with class activities that only focus on PBL rather than context. "Arguably, the kind of learning students should engage in, not just in higher education generally, but more particularly when preparing for a profession, should reflect 'deep processing.' People going into a profession should understand the meaning of what they are learning" (p. 314). Coles highlights three components that are important to PBL:

- The context must be appropriate
- The information they are learning should be meaningful
- The student should have an opportunity to handle the information – it should link together with other information that they have found or worked with (p. 316)

John Drinan (1997) outlined further considerations when using PBL:

- Motivation for learning through use of professionally relevant material
- Developing the ability to make decisions
- Acquisition of, or exposure to, a body of knowledge
- Raising awareness of complexity of real-world issues
- Developing the capacity for self-directed learning
- Developing the ability to extend learning beyond the presented situations into new ones
- Generating the desire and ability to think deeply and holistically
- Generating an enthusiasm for learning from all of life's experiences in personal, professional, and community development
- Encouraging a search beyond one's own preconceptions, so becoming ultimately innovative and positively critical with respect to self and one's profession and society (p. 334)

Barrows and Tamblyn (1980) regarded the best approach when doing PBL activities:

> Many times, students will not take on the problem as an unknown because they feel they must have some background knowledge in the area in order to work with the problem. Instead, they will review texts in the area of the problem before it is encountered. They run the risk of wasting considerable time in study that will be of no value with the specific problem and of not studying what will turn out to be important. One of the major advantages of problem-based learning is lost in this inefficient approach. The student can determine what he already knows and what he really needs to learn only if the problem is taken on first. In doing this, he develops as far as possible his skills in reasoning with an unfamiliar problem. The student's self-study is focused better and is more likely to meet his personal needs, and the information sought is seen as relevant and probably more memorable if the student takes on the problem first. (p. 190)

In her paper, Joanna Dunlap (2005) discussed PBL and the effect upon students' self-efficacy:

> In problem-centered learning environments, students have opportunities to practice applying their content knowledge and workplace skills while working on authentic, contextualized problems and projects. The approach to learning is context sensitive and situated, and the process students follow replicates the commonly used systemic approach to resolving problems or meeting challenges encountered in the workplace and world at large; the problems that students work on reflect the true nature of the world and are, therefore, complex and ill structured, and without simple, formulaic solutions; students are actively involved in the learning process from problem introduction to solution implementation and process reflection; students set learning goals and create action plans to drive learning activities; students conduct information gathering and research; students reflect on what they have learned and how they have learned; and students work collaboratively with colleagues to pool their knowledge and skills, share the results of their inquiry, engage in peer teaching, and ultimately solve the problem. Hence, problem-centered, or problem-based, learning environments may help prepare students for their professions because students actually work on problems in ways that require them to develop expert knowledge, problem solving proficiency, lifelong learning skills, and team participation skills. (p. 65)

Chapter 1 mentions the constant requirement for students to manage problems/difficulties that arise at their workplace. Every clinical situation that may arise must be accommodated by the computer interface created.

The algo-heuristic theory (Landa, 1974, 1976) is concerned with identifying processes that assist students in understanding expert learning. This technique helps individuals identify

with expert learners and performers and understand the processes they use. Expert learners have processes that enable them to be more efficient while learning. These processes could help others who are not expert become more efficient in their learning. Problem based learning is an excellent educational method to illustrate Landa's research. Students learning how to troubleshoot can gain insight by studying the steps used by experts. A novice learner can mimic these steps to hasten their learning.

Some PBL activities have definable step instructions that a student with any level of skill can accomplish. There are also problems that contain ambiguous instructions; for these types of problems, it is possible to create instructions that contain a certain degree of uncertainty (Fraser & Greenhalgh, 2001; Kolb & Kolb, 2005). When detailed instructions are not possible, educators should teach novices the knowledge and the insights of experts. Teaching expert insights provides a novice learner the opportunity to create their own solution and possibly detailed instructions (Luckner & Nadler, 1997; Van Gog, Ericsson, Paas & Rikers, 2005).

The double loop learning theory, proposed by Argyris and Schön (1974), pertains to a student's re-evaluation of their initial beliefs and assumptions. The focal point of this theory is solving problems that are dynamically complex and poorly developed. Students alter the solution by attempting to solve the problem. The learners can change their perspective as they solve the problem, which further influences the constraints of the problem. Solving the problem causes the answer to change. The students discard their initial theory for the solution and operate with a "theory in use" (Argyris & Schön, 1974, p. 6).

Problem based learning can use this theory to determine if current theories are correct when testing new situations. Testing default theories using problem based learning allows learners to achieve insight to situations by re-evaluating their perspective (Argyris & Schön,

1974, 1991). This theory is one that helps learners gain personal insight and create better troubleshooting techniques. This theory is very useful in a dynamic PBL environment. Students attempt a problem solution and re-evaluate their condition based upon the results of their initial solution. Complex problem solutions require interrelated actions (Argyris, 1993; Kearsley, 2008).

Barrows and Tamblyn (1980) summarize PBL as a technique for solving a real life problem that allows a student to develop a solution and add the information gained to their existing experiences. PBL provides students a problem they can solve and an experience that will enhance their education (Boud & Feletti, 1997; Uden & Beaumont, 2006).

Uden and Beaumont (2006) indicate four requirements to create a valid PBL problem: (1) The problem must be complex; (2) many solutions should be available; (3) the problem should require participant reflection and; (4) the problem should require meta-cognitive skills to solve. These triggers enhance the effectiveness of PBL education. The purpose of PBL is to produce students who will engage in a challenge, be able to reason, collaborate effectively, and assess their own learning as they work toward their desired solution (Uden & Beaumont, 2006; Uden & Dix, 2004).

Problem based learning is a teaching technique used in many medical schools to facilitate the learning of basic science concepts in the context of clinical cases (Biley & Smith, 1998; Boud & Feletti, 1997; Duch, Groh, & Allen, 2001). Cannon and Schell (2001) discuss PBL:

> The use of real life problems is essential for preparing students for practice, making a strong case for the use of problem-based learning throughout the curriculum. The rationale for integrating PBL into nursing curricula is obvious when one considers the most common practice responsibilities. For example, nurses use the scientific, problem solving method known as the nursing process during care delivery in many settings. (p. 166)

Five common steps are involved:

1. Collect history and physical assessment
2. Prescribe and review lab tests
3. Plan collaboration
4. Deliver coordinated care with other clinicians
5. Evaluate the response to the intervention

These steps lead to focused inquiry and problem solving essential for efficient and effective care. "Dramatic changes in health care have created many new challenges that require the critical thinking skills that are so much a part of PBL" (Cannon & Schell, 2001, p. 166). "Incorporating PBL into typical undergraduate courses, particularly at research universities, is a challenge that is worth meeting in order to help undergraduate students develop the lifelong skills that will help them succeed in college and beyond" (Duch, Groh, & Allen, 2001, p. 44). Cannon and Schell continue stressing how PBL is ideal for nursing education:

> To strengthen the case for implementing PBL in nursing curricula, it must be remembered that those in nursing practice have long criticized those in nursing education for distancing students from the real world of healthcare. Traditional teaching strategies do not produce the desired outcomes of critical thinking, independent decision-making, and autonomy that are needed by today's graduates. (p. 167)

The use of PBL provides students with three goals in Burch's (2001) courses: (1) core knowledge, (2) cognitive skills, and (3) action skills. Students learn how to analyze a problem, create possible solutions, apply the solution, and then evaluate accuracy of their solutions (p. 199). Incorporating PBL helps students retain information longer, recall information faster, and improve the accuracy (Barrows, 1996). The approach of PBL is one where the student has a new role in the educational process (Biley & Smith, 1998). Students must take on the responsibility to solve problems; the instructor is not always the source of answers. The entire paradigm of

how we learn must change to encourage students to learn how to learn and pursue education that allows them this freedom (Uden & Beaumont, 2006).

Inquiry skills are capabilities that students must obtain to become adept at using PBL. Boud and Feletti (1997) found students must be able to ask the correct questions when solving problems. These skills then help them understand similar problems beyond the initial problem (Uden & Beaumont, 2006).

The Institute for Transforming Undergraduate Education at the University of Delaware implemented PBL to improve student education. They established ten goals, including learning to think critically, the ability to work independently and collaboratively, understanding diverse ways of thinking and integrating academic knowledge with the experiences that exist outside the classroom (Watson & Groh, 2006).

Woods (1996) identified five skills related to problem based learning: problem-solving, work in teams, coping with change, conducting a self-assessment, and performing a self-directed learning. These capabilities are present in all proponents of PBL, and educators should assess them during PBL activities. Woods indicates that examining the final product helps determine if the PBL techniques worked.

Duch, Groh, and Allen (2001) suggest the inclusion of problem based questions, educators should use a central concept and create problem in a real world context. They should then stage the steps to solve the problem to provide scaffolding. These steps allow the student time and information resources to research and find underlying principles. Duch, Groh, and Allen also suggest making a teacher's guide to establish the questions and steps. Lastly, resources for students must be available so that as students research, their path is less random. Professor Herman Epstein (1970, 1972) of Brandeis University changed a standard introductory

biology course for non-biology majors into a class that read and discussed articles about biologists' jobs and responsibilities. He did not teach his students biology; instead, they read to understand the context of an expert in the field. This approach widened the students' learning and provided them more insight into the field of biology (White, 2001). Another example of using Duch's method is the use of a plea bargaining exercise in an undergraduate course on criminal courts as documented by Hans (2001, pp. 143-145). Simulating a real court case, the students researched and prepared to argue their clients' cases. Using PBL, the students prepared to argue either side of the case.

Uden and Beaumont (2006) relate many principles from others' research, which can be incorporated to make PBL more effective; learning skills should be focused on actual problems, and the interrelationship between concepts should be included along with reflection, scaffolding, articulation, and exploration of the problem. These principles tie together the experience for the learner and give context to the educational experience. Lastly, base the students' assessment on the material taught; this will complete the capturing of the context of the problem and its solution.

2.2 Workplace Learning

2.2.1 History

The workplace has replaced the university as an environment where adults learn (Boud & Garrick, 1999; Little, 1983; Marsick & Watkins, 1990; Marriam, 2001a, 2001b; Merriam, Caffarella & Baumgartner, 1991). Learning is a productive part of everyday at a business if it is to keep up with society. Knowledge in the workplace is an asset that companies try to gain and

prevent from depreciating or devaluing over time (Funk & McBride, 2002; Krell, 2001; Marquardt, 2004; Marsick & Watkins, 1990).

Problems covered in problem based learning activities vary by student based upon their reason for seeking the education (French & Bell, 1995). The solutions to their problems are not derived from rote memorization; rather, each student determines their solutions based upon their particular needs. Adults do not need rote memorization in their workplace education. Rote memorization is not effective in helping to achieve the goals of companies, which have an increasing need for creativity and new knowledge generation (Billet, 1999; Boud, 2001; van Aalst, 1979a, 1979b; Wick & Pollock, 2004).

Many authors have discussed self-directed learning processes used by adults to gain experience and knowledge (Knowles, 1984; Luckner & Nadler, 1997; Oakeshott, 1933; Woods, 1996). Tough (1979) indicated that adult learners are placed in situations where they are responsible for systems and processes of which they have no knowledge. These individuals must learn information and gain expertise quickly:

> They may be faced with the need to perform a task or accept a new responsibility. In order to perform the action at a higher level of performance, they may spend some time beforehand gaining certain knowledge and skill. He or she will then use or apply the knowledge. (p. 50)

Knowles (1975) discussed some of the attributes an adult learner in the workplace must have. Most adults only know how to be taught; few know how to learn:

1. Evidence that individuals who take the initiative to learn actually learn more
2. We become independent as adults – psychological reason to learn alone
3. New developments in learning put the responsibility on the learner (p. 14)

As outlined in chapter 1, this research focuses on improving the workplace experience of clinicians in hospitals. Simulating a contextually accurate environment for clinical staff during the education process provides an ideal learning setting (Laurent, 2009). The activities that are student centered and are relevant to their unique workplace setting expose the learners to the reality of the demands of their workplace.

2.2.2 Researchers and Theories

"Work is directed towards producing what the organization is in the business of offering, or some related output, whether that is a tangible product of service, either now or in the future. Learning is directed towards the acquisition of knowledge or the capacity to gain further knowledge" (Boud & Solomon, 2001, p. 35). "Work based learning as a pedagogical site challenges most of our conventional assumptions about teaching, knowledge, and curriculum" (p. 225). Higher education has been under control of academia, but the needs of the business world require methods more suitable for adult learners (Boyatzis, 1998; Boyatzis, Cowen, Kolb, 1995; Fenwick, 2000; Kilgore, 2001: Pasmore, 2001; Tobin, 2000).

> Because assimilation involves less effort than accommodation, learners prefer to engage in assimilation, rather than accommodation. Hence, learners prefer to use existing knowledge because engaging in knowledge building is demanding and challenging. Accordingly, there has to be sufficient motivation to engage in accommodation. (Billett, 1999, p. 153)

To refine this view further, research proposes that learning occurs through problem solving (Boud & Feletti, 1997; Drinan, 1997; Duch, Groh, & Allen, 2001). The types of problem solving are routine and non-routine. Routine problem solving activities are available, and established procedures exist. Non-routine problem solving deals with new activities and tends to

take the individual beyond their knowledge; this will often result in the creation of new knowledge (Boud & Solomon, 2001; Haskell, 1998).

Boud and Garrick (1999) discussed today's workplace educational needs. "The nature of work is changing with 'knowledge' being regarded increasingly as the primary resource, thus giving rise to unprecedented demands for learning – delivered flexibly and in authentic work settings" (p. 3). They continued with thoughts on workplace education. "The learning that must occur in the workplace improves efficiency of the group, improves the employees' personal growth and helps provide for future changes to the work environment" (p. 6).

Hills (2001) discussed how the education must be tied to work. "Learning and memory are context driven. Our brain sorts information depending on whether it is associated with content or context" (p. 75). Content driven by rote memorization requires effort to retain. Context driven learning is effortless compared to content driven learning. Hills continued, "Information that is contextually embedded is easier to learn. The brain is not skilled in learning isolated, sequential bits of information but very quick to learn in situations that are true to real life." Hills further clarified, "Learning involves the creation of meaning. In order to make meaning of new information, the brain will connect new experiences to previous ones, activating consciousness" (p. 79).

Supervised learning in the workplace is a guided activity where the knowledge to be gained is already determined (Billet, 1999; Funk & McBride, 2002). An employee/learner may have to work outside of their experience. This may cause confusion and a reluctance to try new activities. The educator must build the learner's confidence and provide assistance to help the learner acquire needed skills. Education in the workplace develops robust knowledge and addresses many of the shortcomings of an academic education (Boud & Garrick, 1993;

Hoberman & Mailick, 1994; van Aalst, 1979a, 1979b). Learners must respect their educators and have confidence in their credibility. If the educator or supervisor merely lectures rather than illustrates, the education gained might be quite weak, and learners remain unengaged in the process (Funk & McBride, 2002; Hodges, 2001).

"The nature of work is changing with 'knowledge' being regarded increasingly as the primary resource, thus giving rise to unprecedented demands for learning—delivered flexibly and in authentic work settings" (Boud & Garrick, 1999, p. 3). The learning that must occur in the workplace improves efficiency of the group, improves the employee's personal growth, and supports change in the work environment.

"We live in a world characterized by contestability, challenge ability, uncertainty, and unpredictability" (Barnett, 1999, p. 29). The secure workplace is no longer present as companies look for the best employees who can help them move to a more complex environment (Fraser & Greenhalgh, 2001). "It is a world not just of complexity, but of super complexity" (Barnett, 1999, p. 29). The use of electronics has decreased the time we have to respond to changes and dictates that we must face more changes at a faster rate (Hasan, 2006). Information overload occurs as the Internet makes the content of the world available through our desktop computer systems (Beaumont, Sackville, & Chew, 2004; Funk & McBride, 2002; Uden & Dix, 2004).

Barnett (1999) sees three major forces inciting change: globalization, governments, and technology. Each of these affects how we interact and how we communicate. Business interactions, at one time, were primarily face-to-face. The first movement away from face-to-face was the use of a phone. A phone call became a proper method of doing business; it was not as interactive as face-to-face, but allowed discussion. Now, businesses use email, texting, and websites. No human may interact with you as you buy or sell a service. A legal signature no

longer requires your manual signature; an electronic device can digitize the signature and capture it for later use. Learning is serious; learning has become work in the business world. "Learning cannot be taken lightly" (Barnett, 1999, p. 41).

The corporate method of education may be effective for learning some tasks, but not all (Novak, 1998; Spear, 1988). Duch, Groh, and Allen (2001), state that teaching with a lecture format does not work in the corporate realm. High-level skills in communication, computerization, and technology cannot be taught with lecture. Workplaces need employees who can solve problems with little or no data (Babbage, 2004). Employees may have to solve problems that never existed before. Poor performance may take place after learning because the participants do not have the systems available to them or they lack the skills to perform the required work (Boud & Garrick, 1993; Hodges, 2001; Perelman, 1984). Learning may not take place because the material is too difficult for the students; another possibility is the students did not have the prerequisite skills and are unprepared to attend training (Hodges, 2001).

> Virtually, the entire adult population needs retraining and new learning to be economically productive. One fifth of the present adult population is functionally illiterate. Most of the rest, including skilled workers, managers, and professionals, have knowledge and skills that technological change is rendering obsolete. (Perelman, 1984, p. xvi)

Employees are not receiving the education they need in the workplace. "Today, traditional training programs often fail because of the broad lack of basic skills or functional literacy among prospective students. One third of dislocated workers lack a high school diploma, and another one third have diplomas but are functionally illiterate" (Perelman, 1984, pp. xvi-xvii). This affects employers' success in a changing workplace. "The emergence of a knowledge based economy requires a new synthesis of the functions of training, education, and

other forms of communication and learning under the single umbrella of the learning enterprise" (p. xvii).

Paul Barton (1976) suggests providing new workers experiences to help them learn. "The biggest reason that employers want to hire young workers who already have experience is that American industry does not offer a great deal of formal training, particularly for entry level positions" (p. 120). He indicates that the corporate world uses on-the-job training and other informal training to make new hires productive. "This informal training is really nothing but experience in the job, making mistakes, learning somehow from another worker who knows the task" (Barton, 1976, p. 120). Making mistakes is a part of the new employee education; incorporating mistakes into a learner's education helps them to become knowledgeable in a faster way, Barton contends.

SOAR by Newell (1990) is a theory related to human cognition and the premise that all cognitive acts are merely information retrieval. We search through our experiences and recover chunks of information. This theory does not specifically address workplace education, but rather continues the thought that workplace education is problem based learning with skills needed for employment. Learning tasks and chunks of information, that have a context in everyday life, enable workplace learners to gain the knowledge they require for continued employment.

In a workplace, ambiguity makes solutions hard to find. The information available in a workplace is not limited; it grows as the business situation becomes more complex; there are many rather than one correct answer to many corporate problems (Fraser & Greenhalgh, 2001; Krell, 2001). In the working world, a formal educational system to teach problem solving is absent (Boud & Solomon, 2001). Inexperienced employees may rely on trial and error as the primary technique for finding solutions to problems they encounter. This technique is costly and

may not resolve the issue (Harp, 1995; Hawthorns, 1987). When trying to learn informally in the workplace, situations are full of unknown outcomes that may come as a surprise to the worker (Marsick & Watkins, 1990). The results of an action may not be visible easily or in a timely manner; some work processes take days to complete.

2.3 Real Life Simulated Problem Based learning

2.3.1 History

> In our work, we sometimes design specific events to create new experiences for participants; at other times, we work with their past and present experience, helping them draw learning from it. In doing this, our awareness of the potential for such learning has been heightened. (Boud, Cohen, & Walker, 1993, p. 1)

The above quote illustrates that a simulated PBL lab can be beneficial in the learning process. "Learning requires interaction, either directly or symbolically, with elements outside the learner. It is only by counterpoising experience with something which is external to the learner that meaning can be created" (p. 2). Barrows (Barrows & Tamblyn, 1980) designed an educational group at McMaster University utilizing normal education modes incorporated with packaged problems that complemented students' work using simulated and real patients. "Students found these units to be engrossing, motivating, a challenge to their clinical problem solving, and a useful stimulus for reviewing basic science information" (p. xi). When examining other medical students, these authors found that most students did not think; they merely followed established procedures. "Subsequent experience with other students and other schools reinforced this uncomfortable observation and revealed even rich pathologies in thinking" (p. xi).
Stinson and Milter (1996) outlined how to create an educational experience that will provide the experiences and knowledge that clinicians need.

1. Learning outcomes should be holistic, not divided by narrow disciplinary boundaries.

2. Problems should mirror professional practice; this makes them authentic.

3. Problems should be ill-structured. Students need to develop the ability to confront ambiguous, ill-defined situations and make sense of them.

4. Problems should be contemporary, authenticity should be emphasized, and students should see the problems as real. It's hard to be engaged when discussing a Harvard problem that occurred ten years before, and in a historical case, they are looking for the correct answer. (p. 36)

Greening (1998) described the learning process as one of scaffolding. He cited Savery and Duffy (1995):

1. Understanding is based on experiences with content, context, the learner's goals, etc., and these factors are woven together inextricably. Thus, understanding is a construction that is unique to the individual.

2. Meaning is not transmitted although it may be tested for compatibility with the meanings of others. From another perspective, cognition may be regarded as being distributed rather than individually localized.

3. Puzzlement is the factor that motivates learning.

4. Social negotiation and the ongoing testing of the viability of existing concepts in the face of personal experience are the principle forces involved in the evolution of knowledge. (p. 32)

Greening discussed the use of scaffolding to improve the situation with appropriate activities to lessen the severity of the impact associated with dramatic changes that occur in the RLSPBL. That is, surprise can be managed to reduce the severity of its impact; this represents one justification for scaffolding before the RLSPBL activity occurs. Barrows and Tamblyn (1980) indicated the need to simulate activities tied to the workplace. "The more opportunity we have to use this information in our day-to-day activities, the more ingrained and unforgettable it becomes" (p. 1). They further clarify, "Facts related to us by others or information we have read

ourselves rarely seem to have the tenacity of the information we have gained from our own daily confrontation with problems." (p. 1)

2.3.2 Researchers and Theories

Hutchings and Wutzdorff (1988) presented education as an emotional journey. "Learning through experience is an idea whose time came long ago. Medieval apprentices worked side by side with goldsmiths and masons, and Renaissance painters learned their art by copying and filling in their masters' drawings" (p. 5). These authors believed in creating emotional, realistic experiences for their students. Some instructors have found that students did not have the needed experiences and would have to work harder to keep up with the class material. Classes are organized to drop the inexperienced students into the subject matter with little or no guidance. "The instructors intervene only occasionally during the first weeks of the semester believing that the students' confusion and frustration is a necessary part of the experience and thus a necessary stage in learning the concepts" (p. 11). "In a nursing course, a student might spend a day in a wheelchair to know more completely the reality of being handicapped in a society only minimally attentive to special needs" (p. 12). This will affect the physical aspect of a student along with an emotional perspective that ties them to the clinical situation of their patients.

The authors found that learning is defined in terms of outcomes. They are looking for results, the desired impact, or the new vision that education has brought about:

> Course materials and methods are directed toward producing specified changes in students, changes not only in what they know but in what they can do. A related characteristic is a focus on performance. To think of learning as performance is to think in terms of acting out, or applying what is learned. Performance is the integration of knowing and doing, a kind of learning in which the student is actively engaged and involved, whether it be in performing a piano concerto, solving an engineering design problem, or writing a report on marketing strategies for a local firm. (pp. 75-76)

The minimalist theory (Carroll, 1990, 1998) is a design of instruction that has a close link with a learner's experience. The theory has five tenants: (1) learning tasks should be meaningful and limited, (2) the activities should be realistic, (3) the students are self-directed, reasoning after an initial presentation, (4) the materials should allow for errors and indicate how to solve them, and (5) the education should closely link with the actual system (computers). This theory utilizes and builds on the learners' experience. It also minimizes the obstruction to learning by the instructor or the material. This theory uses errors as learning events. Carroll feels that other instructional theories (e.g., Gagné, Merrill) are too passive and fail to exploit the students' knowledge by using errors as learning opportunities. Learners should troubleshoot immediately; reading should be minimized while hands on activities are maximized; and error recognition and problem solving are included. Lastly, the exercises should be self-contained and allow many paths to a solution (Carroll, 1990, 1998).

Marsick and Watkins (1990) submitted the concept of using un-announced activities to teach. "Learning is experience-based, non-routine, non-planned and often implied" (p. 13). They introduced the social aspect of learning. "We believe that context is more important to learning from experience when the nature of the task is interpersonal or social in nature, and thus subject to a greater number of differences in interpretation" (p. 16). These authors posited that learning occurs under a condition of surprise. Conducting an experiment with chaos incorporated in it will help individuals learn better. This is a non-routine situation which requires "heightened attention, experimentation, and determination of the nature of the problem" (p. 17). Critical reflection is needed along with experiencing situations where the conditions do not meet the expected rules. We learn by experiencing what people say and do; we infer from their perspectives. The researchers explained the use of less structured education. "Informal

learning is non-routine because it occurs in an indeterminate, uncontrolled context and may be totally unplanned" (p. 23). Barrows and Tamblyn (1980) indicated that the student should not know what the testing problem is before they see it; they must be forced to see it new, reason it out and create their own solutions, or they are deprived of deep learning and its impact.

Bruner (1960, 1961, 1966) and Bruner, Goodnow & Austin (1956) described the importance of structure while teaching:

> Teaching specific topics or skills without making clear their context in the broader fundamental structure of a field of knowledge is uneconomical in several deep senses. In the first place, such teaching makes its exceedingly difficult for the student to generalize from what he has learned to what he will encounter later. In the second place, learning that has fallen short of a grasp of general principles has little reward in terms of intellectual excitement. The best way to create interest in a subject is to render it worth knowing, which means to make the knowledge gained usable in one's thinking beyond the situation in which the learning has occurred. Third, knowledge one has acquired without sufficient structure to tie it together is knowledge that is likely to be forgotten. (p. 31-32)

The social learning theory of Bandura (1997) defines the significance of learning by observing successful experts. We need to view how others engage, examine their motor skills, understand how they receive feedback, and comprehend their motivation. Riding a skateboard or playing a piano are examples. Watching these activities is the best way to explain them. New learners often follow experienced students and model their behavior when they fail to get the ideal solutions that the other student gets (Bandura, 1997; Elliot, 2005). When an experienced learner solves a problem, an inexperienced learner can copy the steps. A new learner can troubleshoot unique problems due to a chaotic event by watching an experienced learner solve a similar problem (Reigeluth, 2008).

Boud, Cohen, and Walker (1993) suggested utilizing specific activities to improve the learning experience. "In our work, we sometimes design specific events to create new experiences for participants; at other times, we work with their past and present experience,

helping them draw learning from it. In doing this, our awareness of the potential for such learning has been heightened" (p. 1).

Marsick and Watkins (1990) discussed trial-and-error as it affected their work. "In our research, mistakes especially were potent learning experiences, as were novel or unique experiences. On the other hand, when experiences looked or felt like previous experiences or childhood memories, learning often was suppressed and automatic" (p. 231). They expounded, "Experiences produce emotional results" (p. 235). The creation of this emotional response ties the learner to the event; the authors believed this emotion improves retention among learners. "We believe the cutting edge of professional practice for adult educators and human resource developers is the successful integration of the affective with the cognitive in adult learning" (p. 235).

Anchored instruction is a theory developed by the Cognition & Technology Group at Vanderbilt (CTGV, 1990). The theory creates anchors (starting points) which are interesting, realistic contexts that encourage the active construction of knowledge by learners. The stories used are realistic situations that the students investigate. Problems allow exploration for the students since they must solve them without directed instructions. This creates a chaotic assignment that challenges the student and actively engages them. Bransford and Stein (1993) have used this method by incorporating stories where mathematical concepts are used. This technique is based upon Bransford and Stein's general model of problem solving. Clinicians, who are tasked to create clinical user interfaces, are already experts in the clinical realm (Barrows & Tamblyn, 1980; Laschinger, 1990). This approach uses problem based learning rich with context. Learners presented with PBL activities that reflect realistic experiences find the material easier to understand and use because it is like a real world situation (Bandura, 1997;

Carroll, 1990, 1998; Daley, 2002; Eizenberg, 1990; Elliot, 2005; Heliker, 1994; Uden & Beaumont, 2006).

DeBono's lateral thinking (1971) theory approaches problems using creative thinking. Discovering novel solutions to problems is a core facet of lateral thinking. A characteristic of problem-based learning is that many problems require a different perspective to solve successfully. DeBono (1967) suggested taking any problem and breaking up the solution into basic elements. Once the elements are determined, students try recombining the elements to arrive at a solution. There are four core factors related to this theory: (1) understand which ideas are slanting perceptions of a problem, (2) search for different viewpoints, (3) open the range of possibilities while thinking, and (4) guess and use chance while solving problems. This theory is appropriate for those developing PBL solutions (DeBono, 1971). The following story is an example of this approach:

> A merchant who owes money to a moneylender agrees to settle the debt based upon the choice of two stones (one white, one black) from a moneybag. If his daughter chooses the white stone, the debt is canceled; if she picks the black stone, the moneylender gets the merchant's daughter. The moneylender, however, "fixes" the outcome by placing two black stones in the bag. The daughter sees this and when she picks a stone out of the bag, she immediately drops it onto the path full of other stones. She then points out that the stone she picked must have been the opposite color of the one remaining in the bag. Unwilling to be unveiled as dishonest, the moneylender must agree and cancels the debt. The daughter has solved an intractable problem through the use of lateral thinking. (DeBono, 1967, p. 155)

Mezirow (1997) agreed with the inclusion of an upsetting educational event. "A learning sequence is established as a result of a discordant experience, which may be depicted in the form of a learning cycle" (p. 102). Jarvis (1983) said, "Learning is especially motivated when there is a disharmony between an individual's experience and his perception of the world" (p. 114). Many of the processes in life are learned by practice and failure and then retrying. Schön (1987) indicated that the experience of failure adds to success:

> In similar fashion, we learn to execute such complex performances as crawling, walking, juggling, or riding a bicycle without being able to give a verbal description even roughly adequate to our actual performance. Indeed, if we are asked to say how we do such things, we tend to give wrong answers which, if we were to act according to them, would get us in trouble. (p. 24)

An instructional theory called cognitive flexibility addresses learning in complex and ill-structured domains. In an adult learning situation using PBL, there often are situations where the problem is ill-defined (Fraser & Greenhalgh, 2001; Spiro, Coulson, Feltovich, & Anderson, 1988). These authors suggest using multiple perspectives when trying to solve a problem. They suggest listening to all available perspectives, and then each person attempts to reconstruct their perspective by incorporating others' perspectives. This provides a student a new perspective that develops beyond their initial view. The learner constructs knowledge as they solve the problem (Gmelch & Chan, 1994; Gunter, Estes, & Schwab, 1990; Reigeluth, 2008).

Mezirow (1991) contemplated the effect of such an overwhelming activity. "Critically reflective thinkers move from abstract critique to critical self-reflection, thereby 'recovering the personal' and a stronger sense of self-understanding" (p. 192). Osborne, Houston, and Toman (2007) discussed the implementation of education in the workplace. "The integration of work and learning is seen as essential in work environments and increasingly in educational institutions. In workplaces, it is now taken for granted that while working we learn, and in secondary and post-compulsory education, employment and the production of workers is understood to be central to learning programs" (p. 115). These authors further discussed the use of activities that reflect the workplace. "Simulation activities are built into a teaching module and take the appearance of some kind of work practice. It is not a practice that students bring to the classroom from their work experiences, but it is designed by the teacher" (p. 116). Osborne, Houston, and Toman indicated that often in educational situations, the final educational product

is a real-work situation that the instructor created from an actual work situation. Lastly, they suggested designing a realistic simulation, where real-work problems must be incorporated instead of just creating hands-on activities for students to do busy work.

Chapman, McPhee, and Proudman, (1995) discussed using experimental activities tied to future jobs to engage students.

> Good experiential learning combines direct experiences that are meaningful to the student with guided reflection and analysis. It is a challenging, active, student-centered process that impels students toward opportunities for taking initiative, responsibility, and decision making. An experiential approach allows numerous opportunities for the student to connect the head with the body, heart, spirit, and soul. Whatever the activity, it is the learning and teaching process that defines whether a learning experience is experiential. (p. 241)

The triarchic theory of intelligence by Sternberg (1977) proposes ways to understand intelligence. Three sub-theories comprise this theory pertaining to knowledge acquisition, experiential learning, and how education must be contextual. Sternberg (1983) details these theories related to teaching gifted students, outlining learning styles and creativity (Sternberg, 1977). This theory contains some facets related to Simulated PBL. The education must be socio-culturally relevant, links must be available to the real world, and the student creates instructions when dealing with novel task situations.

The affordance theory (information pickup) by Gibson (1977) suggests that perception depends entirely upon information in the "stimulus array" rather than sensations influenced by cognition. The affordances that this theory does not deal with are the visual cues that can be designed on a computer screen. A designer should create consistent visual cues to help a user understand what an icon or symbol represents.

Uden and Beaumont (2006) propose using a constructivist approach while setting goals for the student. Constructivist learning goals should include activities that make the learning the

responsibility of the student (Ackerman, 2008; Biley & Smith, 1998; Boud, Cohen, & Walker, 1993; Driscoll, 2000). Suggestions to insure students learn constructively are complex learning, social interactions, reflexivity, student based lessons, and juxtaposed instructional content (Mezirow, 1991, 1997; Schön, 1983, 2002; Shuell, 1990). This last suggestion relates to the introduction of non-standard instruction, or chaos into the instruction. Having rearranged context provides multiple perspectives on the problem and solution (Driscoll, 2000; Reigeluth, 2008; Uden & Beaumont, 2006). This process also allows a student to have more succinct and varied context of the material they are learning (Brakke & Smith, 2008; Eizenberg, 1990; Heliker, 1994; Novak, Shah, Wilson, & Lawson, 2006).

To help students create their base information, many PBL activities use scaffolding techniques that slowly move the student forward to an ending solution (Greening, 1998). At each level, triggers or motivating steps guide the student to the next level (Newell & Simon, 1972). Real world problems that present information poorly can have a negative effect on students (Anderson, 1993; Scandura, 1970). A student with no initial knowledge can solve a complex problem if their work is broken into segments and arranged into levels of difficulty (Biley & Smith, 1998; Spiro, Coulson, Feltovich, & Anderson, 1988). Once again, each stage depends on the knowledge gained in the lower levels (Beaumont, Sackville, & Chew, 2004; Uden & Beaumont, 2006). These steps seem so logical; however, creating material that steps or moves students from one level to the next requires insight to create the scaffolding (Bransford, Sherwood, Vye, & Reiser, 1986).

Luckner and Nadler (1997) perceive enhancing adult education by creating a safe environment where the student can succeed while being challenged. They create disequilibrium in student activities. To get the most out of their students, Luckner and Nadler create chaotic

events because these events "become a driving force, which create emotional intensity" (p. 23). Making such an unstable situation increases disorder, anxiety, and frustration. "Understanding these conditions and finding ways to create them can increase your ability to promote change" (p. 24). These authors have arrived at six change conditions—hope, effort, trust, constructive level of anxiety, sense of unknown, and perception of risk (p. 24). They highlight that while designing learning activities; educators should incorporate the change conditions to create educational opportunities that reflect a dynamic learning perspective.

Fraser and Greenhalgh (2001) place emphasis on educating healthcare professionals for capability; "In today's complex world, we must educate not merely for competence, but for capability (the ability to adapt to change, generate new knowledge, and continuously improve performance)"(p. 799). They define capability as "extent to which individuals can adapt to change, generate new knowledge, and continue to improve their performance" (p. 799). Further, they state, "Capability ensures that the delivery of health care keeps up with its ever changing context" and "capability is enhanced through feedback on performance, the challenge of unfamiliar contexts, and the use of non-linear methods such as storytelling and small group, problem based learning" (p. 799). The incorporation of RLSPBL provides an avenue to check for competence and capability.

Individuals work in a comfort zone, and by creating a situation where they operate outside of the comfort zone, one opens the potential for growth. Disequilibrium is a major catalyst for change (Eizenberg, 1990; Fraser & Greenhalgh, 2001). The insight moment occurs after the performance, but learning can happen before, during, or after the performance. The creation of disequilibrium helps to establish patterns for self-growth. "The winners of tomorrow

will deal practically with chaos and will look at the chaos per se as the source of market advantage, not as a problem to be gotten around" (Luckner & Nadler, 1997, p. 35).

> Planned change events refer to indirect experiences that the person hasn't actually self-selected, yet which occur because he or she have agreed to participate in the experience or program. Here we are encouraging you to consider this type of intervention more as a means of giving people breakthrough experiences. (p. 51)

Once the student has been through the experience, they will reflect upon the activity and be able to examine their feelings.

The corporate learning environment must provide self-growth mechanisms to its employees to maintain their capabilities and to experience new possibilities critical to the corporation (Marsick & Watkins, 1999). They describe a Learning Organization as a business that requires its employees to grow continuously in their jobs. The use of chaos in education may be best suited for the creation of intellectual capital at a company (p. 210). The nursing profession can utilize this facet of education to better prepare clinical staff for the unfamiliar medical realities that they may face in their daily livelihood.

Hoberman and Mailick (1994) described experiential education as that where "the student is physically engaged in a professional activity with real consequences" (p. 22). These authors defined two separate types of experiential education based upon their origin: Synthetic and Natural. Synthetic occurs by using special learning situations created for providing the learning opportunity. These situations do not allow any real "risk and concern with consequences" (p. 22). The students perform their work on a system that is isolated from a real world usage, such as in a classroom or laboratory.

The second type of experiential education (Natural) places the student in a real world situation. This education "makes use of naturally occurring situations and problems in an actual

work venue, [and the] students are subject to the totality of variables and uncertainties of that venue" (p. 22).

2.4 Transfer of Learning

2.4.1 History

Research on transfer of learning in the workplace to improve performance was conducted by E. Mayo at Western Electric's Hawthorn Works in 1933. He attempted to modify variables in the workplace to increase productivity and morale. Just the effort of paying attention to the workers provided the placebo appearance that the workers were more productive and their morale had improved. After the end of the research, employee productivity and morale decreased; this is known as the Hawthorne effect (Franke & Kaul, 1978).

2.4.2 Researchers and Theories

Research into training by Kirkpatrick (1996) arrived at four major components that effective training modifies: employee feelings and attitudes, employee understanding of the material, employee ability to use knowledge gained back at the job, and the improved productivity. Kirkpatrick points out that for true change to occur, the learners must want to learn, have a supportive environment, and have an opportunity to try out new ideas.

Haskell (1998) discussed transferring knowledge from a classroom back to the workplace:

> It continues to be widely recognized that transfer of training for employees is crucial to performance in business and industry. Transfer of learning – a.k.a. transfer of training – is the use of our past learning in our learning of something new and in our application of that learning to both similar and quite dissimilar situations; transfer of learning is the very foundation of learning, thinking, and problem solving. In short, it's the goal of all training programs. Moreover, the downsizing of our workforce requires increasing

> efficiency and payoff in training functions. The financial significance of transfer of learning is that American companies spend upwards of 70 billion high-gloss dollars on training hardware, materials, seminars, conferences, and consultants. Of all human resource development (HRD) programs, training is one of the most expensive. (p. ix)

He described why transfer has not historically worked:

> The research shows that transfer of learning in formal learning situations doesn't have a good track record. I maintain that is because instructional and training programs have neither systematically made use of the available information nor developed specific frameworks for transfer of learning. (p. ix)

Haskell offers a solution to this dis-functionality of today's corporate educational efforts:

> For the modern organization, a reengineering requires a shift from a training orientation to a learning orientation. The shift requires more than a list of how-to and other simple instructional techniques; it requires considerable understanding of the prescriptions and why they are important to this shift. Again, there are no magic bullets or quick and easy shorts. (p. x)

Singley and Anderson (1989) provided their insight to having success:

> Aside from its relevance to theoretical issues, the problem of transfer is perhaps the fundamental educational question. It is rare that people learn things in school which apply directly to life and work. For education to be effective, curricula must be designed with an eye toward transfer. This concern becomes increasingly important in a world where rapid technological change often penalizes those who are narrowly skilled and inflexible. (p. 1)

Marsick and Watkins (1990) discussed their thoughts on successful learning. "Learning is experienced based, non-routine, non-planned, and often implied" (p. 13). They continued, "We believe that context is more important to learning from experience when the nature of the task is interpersonal or social in nature, and thus subject to a greater number of differences in interpretation" (p. 16). These authors feel that learning occurs under the condition of surprise. Having an experiment with chaos incorporated in it will help individuals learn better. This is a non-routine situation which requires "heightened attention, experimentation, and determination of the nature of the problem" (p. 17). Critical reflection is needed along with experiencing situations where the conditions do not meet expected rules. We learn by experiencing what

people say and do. We infer from their perspectives. "Informal learning is non-routine because it occurs in an indeterminate, uncontrolled context and may be totally unplanned" (p. 23).

> Marsick and Watkins explained what made workplace education successful:
> In a workplace, ambiguity makes solutions hard to find. The information available in a workplace is not limited, it grows as the business situation becomes more complex, there is no one correct answer to many business situations. In the working world, there is not an educational system setup to help employees learn how to solve problems. A lack of experience provides employees with trial and error as the technique used to find solutions. This technique is costly and may not resolve the issue. (p. 55)

Transfer of learning relates to using knowledge and skills gained in a classroom setting. This implies a way of thinking, relating to material, perceiving, reflecting, and using learned information so that it can be utilized (Haskell, 1998; 2001; Singley & Anderson, 1989; Tennant, 1993). Noe (1986) indicates that from the beginning of education sessions the participants form a perception about how the knowledge they are to gain will transfer to their existing jobs. This perception is very important to the instructor and even more critical to the learner who must be able to incorporate the education to develop the skills and knowledge required in their occupation (Broad & Newstrom, 1992; Clarke, 2002; Perez, 2008; Senn, 1999).

Kirkpatrick (1996) reworked his 1959 articles and defined learning as "the extent to which participants change attitudes, improve knowledge, and/or increase skills as a result of attending the program" (p. 20). He presents case studies to confirm his four types of outcomes from training: reactions, learning, behavior, and results.

2.4.3 Near and Far Transfer Learning

The level of transfer refers to the degree to which a learner can use new learning outside of the learning situation (Haskell, 2001). If an individual cannot apply new learning to novel situations that are different from the classroom setting, the learning is near transfer learning.

When a learner applies the education to situations different from the classroom, far transfer learning occurs (Haskell, 2001; Novak, 1998; Senn, 1999). The theoretical basis of near transfer learning and far transfer learning comes from rote and meaningful learning (Ausubel, 1963; 1978; Haskell, 1998). Ausubel, Novak, and Hanesian's (1968) assimilation theory of learning (ATL) says that rote learning occurs when the learner memorizes the new information without connecting it to existing knowledge. This memorized knowledge can be used in settings that are similar to the classroom. Meaningful learning occurs when new knowledge is understood and fits into an existing knowledge structure. Adding new knowledge to existing knowledge, a learner has experience with the knowledge and can modify, enhance, and use with tasks and situations that are different from the classroom setting where the knowledge and skills were initially learned (Billet, 1998; Detterman, 1993; Haskell, 2001). The definition of learning (near or far transfer) that a student realizes is tied to the amount of effort they exerted (Eklund-Myrskog, 1998; Senn, 1999). Another factor is how well the student can incorporate the new learning into their current base of knowledge (Billet, 1998; Novak, 1998).

Daley (2001) conducted qualitative work with multiple professionals (nurses, lawyers, teachers, and social workers). She found that professionals "did not see transfer of learning as an outcome of their educational endeavors; they viewed transfer as an integral part of the meaning making process" (p. 50). The education was not a step to an end, rather it:

> Was essential to the process of meaning making because often, in this process of using information, the professionals again changed what the information meant to them based on the results they observed. In other words, incorporating new knowledge is a recursive, transforming process, rather than a simple, straightforward transfer of information from one context to another. (p. 50)

Ford, Smith, Weissbein, Gully, and Salas (1998) point out that a person's belief in their own abilities will aid transfer. A person's self-efficacy affects the amount of transfer that will

occur. These authors found that individuals with high self-efficacy have a greater degree of knowledge transfer. These authors also have used an approach they call 'guided discovery'. "Guided discovery can lead to greater transfer due to increased trainee motivation to learn since trainees are actively engaged in the learning process. Guided discovery also encourages the use of hypothesis testing and problem solving strategies, which require more conscious attention for their application" (p. 35). Course designers need to incorporate strategies that promote transfer into the course design (Broad & Newstom, 1992; Haskell, 1998; Houle, 1972; Kowalski, 1988).

Billet (2002) also uses guided learning in his models of education. "The use of questioning, problem solving, and scenario building to extend learners' knowledge to novel situations" (p. 34). This strategy uses questioning "to assist individuals to appraise the scope and limits of their knowledge and evaluate the prospects of its transfer to the novel tasks and new circumstances" (p. 34).

Broad and Newstrom (1992) focused their research on the participants' expectations. The Pygmalion Effect happens. "One's expectations about a future event often can affect the likelihood of its occurrence" (p. 112). They also point out that often the opposite occurs; individuals do not learn because they believe that they cannot. These two authors additionally discovered that the absence of reinforcement in the practice setting was the most significant barrier to transfer occurring.

Tennant (1999) indicates that for transfer of knowledge to occur, some of the following characteristics should exist: an authentic activity, multiple situations and examples, highlighted generic parts of the activity, highlighted higher order skills that are made explicit, and learners who possess lifelong learning skills (they communicate and discuss the learning activity). Tennant further defines that 'teaching for transfer' cannot be done by using abstract

decontextualized concepts. The learner must be taught using activities enhanced by taking into account the 'kinds of activities in which we want students to learn to be successful, and develop learning environments in which they can develop their abilities to participate in the general kinds of practices that are important to them' (Greeno 1997: 13). It is therefore possible to arrange learning situations that support more general learning – but the emphasis is on the 'situation' in which the learner participates, not on the knowledge and skill 'acquired' by the learner."

Tennant (1999) brought forth many aspects of transfer:

- The amount of transfer depends on where the attention is directed during the learning or at transfer. Attending to the possibility of transfer increases the likelihood.
- Transfer is enhanced when training involves multiple examples and encourages learners to reflect on the potential for transfer.
- Transfer is improved when there is instruction and training on the cues that signal the relevance of an available skill.
- Different amounts of transfer occur depending on the amount of practice with the target task.
- Transfer between tasks is a function of the degree to which the tasks share cognitive elements.
- Combining abstract instruction with specific concrete examples is better than either one alone in producing transfer. Training which focuses on both the whole task and its component parts is more effective than either one alone.
- Training for skills to be used in complex social environments is best done with a combination of individual training and training in social settings. (p. 167)

Tennant continued:

> Thus 'teaching for transfer' is not enhanced through teaching abstract decontextualized concepts, or of building simple component skills in isolation until the learner is prepared for the complexities and 'wholeness' of practice; it is enhanced by taking into account the 'kinds of activities in which we want students to learn to be successful, and develop learning environments in which they can develop their abilities to participate in the general kinds of practices that are important to them' (Greeno 1997: 13). It is therefore possible to arrange learning situations that support more general learning, but the

> emphasis is on the 'situation' in which the learner participates, not on the knowledge and skill 'acquired' by the learner. (p. 167)

Tennant indicated that for transfer on knowledge to happen, some of the following characteristics should exist:

- An authentic activity-full range of learning resources
- Multiple situations and examples
- Highlight generic parts of activity and generic skills gained
- Higher order skills are highlighted and made explicit
- Supportive climate
- A capacity to 'learn how to learn from experience'—practice analyzing an opportunity and develop strategies for learning
- Community of discourse
- Learners have lifelong learning skills; they communicate and discuss the learning activity (p. 177)

2.5 Summary

The concept that experience creates knowledge is a foundation of much literature (Boud, Cohen, & Walker, 1993; Dewey, 1938a, 1938b; Knowles, 1975, 1990; Kolb, 1984; Malinen, 2000; Miller, 2000). Constructivism (educational philosophy) and Constructionism (educational method) both use the concept that the student creates knowledge through his/her experiences (Ackerman, 2008; Clark, 1995, 1999; Papert, 1980, 1993; Piaget, 1929, 1952, 1973). Providing a student with experiences is not the total package required for student learning. This is very important when educating hospital staff in a corporate environment. Clinicians are not inherently experts with interface design software when they take software design classes (Barrows, 1996; Biley & Smith, 1998; Uden & Beaumont, 2006). The education clinicians

receive must provide them the insights and experiences similar to ones they have in the clinical arena (Boud, Cohen, & Walker, 1993; Daley, 2001; Eizenberg, 1990; Miller, 2000; Shuell, 1990).

Clinical education has a long history of using minimalistic knowledge from a patient to provide a rich learning environment for students who must be able to diagnose unscripted maladies (Biley & Smith, 1998; Boud & Feletti, 1997; Cannon & Schell, 2001; Uden & Beamont, 2006). The use of PBL provides the cognitive development activities needed by clinicians to effectively design and develop their unique clinical systems. The focus is on learning and applying the learning to context relevant situations. Self-assessment, reflection, troubleshooting and exposure to expert techniques all are components of an adult focused educational activity. Using their wealth and depth of knowledge and experiences, adults can incorporate new knowledge through hands on activities along with collaborative discussions.

The knowledge that students gain from experience is as varied as humanity (Brakke & Smith, 2008; Checkland, 1981, 1985, 1991; Connelly & Clandinin, 1990; Elliot, 2005; Houle, 1976; Kolb & Fry, 1975; Malinen, 2000). Creating activities, which allow variations in process and individual goals, is the most beneficial way to establish adult learning environments (Mezirow, 1997; Van Gogh, Ericsson, Rikers, & Paas, 2005; Warren, Sakofs, & Hunt, 1995).

The workplace is not an academic setting that provides appropriate content or processes during an education setting. The employment setting is concerned with context (Benaim, 2002; Daley, 2002; Fenwick, 2000; Kowalski, 1988), and it requires the employee to know what he needs to know to do his job (Funk & McBride, 2002; Novak, 1998). This effort is more training than education and centers on the context of the current task (Krell, 2001). The focus of an employer is not making the individual a lifelong learner; instead, the return on educational

investment is of primary concern (Bernthal et al., 2004; Fenwick, 2000; Harp, 1995; Haskell, 1998; Hawthorns, 1987; Wick & Pollock, 2004).

Many researchers support problem based learning in the workplace (Argyris & Schön, 1974; Barrows & Tamblyn, 1980; Boud, 2001; Carroll, 1990; Cohen, Lawrence, & Morrison, 2000; Daley, 2002; Heliker, 1994; Luckner & Nadler, 1997; Marsick & Watkins 1999, 2001; Uden & Beaumont, 2006; Uden & Dix, 2004). Allowing a learner to work in a 'safe ' (Luckner & Nadler, 1997) environment with a mentor who increases the complexity of tasks (Greening, 1998) appears to be successful. Incorporating disorder in the educational method varies from a structured technique where learners are in their comfort zone has some advantages (Eizenberg, 1990). Barrow & Tamblyn (1980), Biley & Smith (1998), Creedy & Alavi (1997), Hutchings & Wutzdorff (1988) and Moore (1997) highlight the use of such activities in medical education. These authors point out the effectiveness of moving away from the abstractness of textbooks and into a context sensitive problem based environment. This movement of educational focus is more meaningful and prepares the adult learner for the constantly changing medical profession. A particular clinical event becomes the stimulus for recognizing what is necessary in order to comprehend and manage the circumstance, at a level appropriate for the clinician.

"Action research is a form of collective self-reflective inquiry undertaken by participants in a social situation to improve the rationality and justice of their own social practices, as well as their understanding of these practices and the situations in which these practices are carried out" (Kemmis & McTaggert, 1988, p. 5). Action research provides the breadth of educational freedom to pursue using techniques that help empower students and to tell their story after the education is over. Multiple concepts of educational theories—PBL, Experiential Learning, workplace education, and Constructivist adult learning—are all incorporated to provide a

meaningful educational experience (Argyris, 1993; Argyris, Putman, & Smith, 1985; Elliot, 2005; Kolb, Boyatzis & Mainemelis, 2001; Kolb & Fry, 1975; Lewin, 1946, 1975, 1976; Mezirow, 1990, 1991, 1997; Schwalbach, 2003; Whitehead & McNiff, 2006).

Transfer of Learning is a description of the effectiveness of the educational experience. As Daley (2001) indicates, transfer of learning is not an outcome but a fundamental component of education. The success of an educational experience must transcend the classroom and be realized in the workplace. Transfer should be an integral part of any professional education, not just an outcome. Research by Biley & Smith (1998), Dunlap (2005), Fraser & Greenhalgh (2001) and Greening (1998) illustrate the need for transfer of classroom activities by the participant. Construction of knowledge is not transferable between individuals; each person must construct the knowledge as they experience the situation. Biley & Smith (1998) indicate this is critical for clinicians who have critical, unplanned situations. The knowledge they need comes from experiences and the tying together the experiences into a meaningful understanding of the knowledge they contain. These authors have found that clinicians need to have experiences to transfer information. Each student must think about the experience instead of robotically following established procedures; it is deep thought, reflection, and understanding (a patient's problem) that facilitate recall and transfer of knowledge. The information gained in this chapter helps to direct the focus of the research methodology in the next chapter.

CHAPTER 3

METHODOLOGY

3.1 Research Paradigms and Research Methods

This study involves phenomenological research essentially concerned with discovering and understanding social phenomena, which are educational in nature and relate to the use of a real life simulated problem based learning (RLSPBL) activity in a corporate educational setting (Bradford, 2001; Creswell, 1994; Marton, 1981; Marton & Pong, 2005; Orgill, 2009; Richardson, 1999; Webb, 1997). This approach allows investigation of the phenomena being studied and provides an avenue to record the individualistic realities of the participants (Dash, 1993). Investigative questions shall emerge from the differing perceptions, viewpoints, and interpretations of individual participants' realities. As stated by Erlandson, Harris, Skipper, and Allen (1993), the use of a grounded, Naturalist paradigm enables future investigators to understand the research and conceptualize the context of the findings.

This chapter presents the methodology used in this research study. The rationale for using a qualitative research method is explained, as well as the participant selection process, the processes of generating data, collection and data analysis. The reasoning behind a qualitative research paradigm is summarized below from the writings of Creswell (1998), Lincoln and Guba (1985), Merriam (2002), and Patton (1990).

1. Qualitative research starts with a single emphasis and uses the environment as the origin of data. Its design in not predetermined; rather, it emerges as the research occurs.

2. The researcher acts as the means of data collection by observing, evaluating, and assessing information as it is discovered while attempting to maintain an unbiased perspective.

3. The researcher maintains the established process for data collection instead of focusing on outcomes. The qualitative researcher uses purposive sampling to

select key individuals with a wealth and breadth of knowledge to determine and comprehend the insights people have created pertaining to their experiences.

4. The data is constantly examined as it is collected; this facet makes the research ever changing. The result is a well-discussed conclusion created by the participants who experience the phenomena and the researcher.

5. Qualitative research creates stories thick in descriptions that have a breadth of content, and present an experience full of context.

To understand a phenomenon or to expose the meaning of a situation, a qualitative design is most appropriate because it generally interprets phenomena rich with unique detail to provide insight into participants' experiences (Creswell, 1998; Guba, 1978; Merriam, 2002; Patton, 1990). Strauss and Corbin (2008) indicate that qualitative methods are more effective to understand an undefined phenomenon.

3.2 Naturalistic Research

This research resides in the realm of a naturalist paradigm. Using a naturalist approach because this approach gleans insight from the participants, this allows the researcher to develop an empathic content. An experimental approach does not provide sufficient insight of their perception of the RLSPBL. The participants must succeed in their software implementation, and creating a control group would cause harm to those control group participants. This research is an emergent design; using a predetermined insight into participants' feelings, motives, actions, and thoughts do not follow this design (Erlandson, Harris, Skipper & Allen, 1993; Lincoln & Guba, 1985; Pinnegar & Daynes, 2007).

3.3 Data Collection

Merriam (2002) indicate that when investigating a phenomenon that individuals

experience, interviewing the participants will present the most pertinent information. An unstructured interview provides the best mode of information collection when the interviewer does not know what they do not know and is looking for the participant to guide them (Creswell, 1994; Lincoln & Guba, 1985; Merriam, 1988; Wells, Hirshberg, Lipton & Oakes, 2002). Interviewing allows the participant to explore his or her memory of the phenomenon and provides an avenue to explore his or her feelings. This phenomenological inquiry attempts to gain insight into the participants' past; the researcher uses interviews to collect the past recollections and insights of participants (Marton & Pong, 2005; Merriam, 2002; Patton, 1990; Richardson, 1999; Webb, 1997).

This phenomenological study starts without any initial hypothesis and uses semi-structured interviews with participants to determine the interviewee's perception of their experience with the simulated PBL activity (Creswell, 1994; Guba & Lincoln, 1989; Marshall & Rossman, 1999). Lincoln and Guba (1985) describe semi-structured interviews being positioned between structure and unstructured interviews. "A structured interview is used when the interviewer knows what he or she does not know," and an unstructured interview is the "mode of choice when the interviewer does not know what he or she does not know and therefore must rely on the respondents to tell him or her" (p. 269). One individual was selected for an initial interview to discuss their experience. This 'grounding method' allows the discovery of the themes of the research from the participant's responses (Creswell, 1994; Glaser & Strauss, 1967; Onwuegbuzie & Leech, 2007). Once this interview is coded, other participants were interviewed. Coding of the material and comparison with previous interviews helped to clarify the information from the perspective of multiple individuals (Auberbach & Silverstein, 2003; Boyatzis, 1998; Smith, 2000).

3.4 Research Participant Backgrounds

This purposeful sampling maximizes participant characteristics that may facilitate the expansion of the evolving research by including information rich descriptions of their experience (Bogdan & Biklen, 1992). The characteristics sought are; use of critical and non-linear thinking during education, the surprise aspect of the RLSPBL, clinical background, educational background, use of RLSPBL at their workplace, and success in their workplace due to the RLSPBL activity.

3.5 Venue for Research

The research venue was face-to-face interviews and phone interviews. The participants have all been to classes at a business education center in North Texas. Before conducting the interviews, the researcher sent the participants information about the research and all Informed Consent forms required by the University. Once the forms were returned the interviews occurred during times agreed upon by the participants and researcher to maximize the participant's ability to verbalize their experiences.

3.6 Sampling Process

Individuals who participated in the RLSPBL activity between 1/1/2005 and 12/15/2009 (356) and returned to learn the newer version of the software between 1/1/2009 and 8/1/2011 (77) were determined to be viable participants. Their return for the second class could only occur if they were successful after taking the first class. To increase the number of possible participants, individuals who learned the newer version of the software and also participated in the RLSPBL activity (from 1/1/09 to 6/10/10) were included if they took their interface designs

live at their facility. This purposive sampling attempted to provide the widest experience of the clinicians with the most diverse career background while exploring age variations. As Erlandson, Harris, Skipper, and Allen (1993) specify:

> Central to naturalistic research is purposive sampling. Random or representative sampling is not preferred because the researcher's major concern is not to generalize the findings of the study to a broad population or universe but to maximize discovery of the heterogeneous patterns and problems that occur in this particular context under study. Purposive and directed sampling through human instrumentation increases the range of data exposed and maximizes the researcher's ability to identify emerging themes that take adequate account of contextual conditions and cultural norms. (p. 82)

From the respondents, ten participants with diverse educational backgrounds, 2-8 years of experience since taking the initial class, and between 29 to 66 years of age. From this group, one participant selected as the initial interviewee (Creswell, 1994). Coding of the collected material from this initial interview guided the subsequent interviews. Interviews with the remaining participants include information gained from all previous interviews. As new factors appear, follow up interviews with earlier participants occurred. This provided a more in depth look into their experience (Auerbach & Silverstein, 2003; Boyatzis, 1998; Corbin & Strauss, 2008).

3.7 Methods and Procedure for Data Generation, Collection, and Analysis

The method of data analysis was constant comparative (Bogdan & Biklen, 1992; Eisenhardt, 2002; Glaser & Strauss, 1967; Guba, 1978; Pope & Mays, 1995). A recording of the semi-structured interview with the first participant obtains the initial research data. After transcription of the first interview, the participant reviewed for accuracy. Once the participant checked the material, updates were made and the changes were sent to him or her until it accurately reflected his or her experience or point of view. Interviewing the remaining participants with similar analysis and coding upon transcription of the material followed the

completion of the first interview. Email exchanges confirmed the content of each participant's material. After each interview, if any new categories developed, the researcher determined significance and follow up interviews with the previous participants occurred as needed (Auerbach & Silverstein, 2003; Corbin & Strauss, 2008; Creswell, 1998; Pope & Mays, 1995).

During any research, errors can occur. Misunderstanding between the researcher and participant can exist over meanings of statements. Lincoln and Guba (1985) indicate that humans should be the "instrument" of choice for qualitative inquiry, so the correctness of the research depends upon the skill and capability of the researcher. This research included member checks to insure the correctness of the findings. Every participant had the option to end the interview if they were not comfortable being recorded (Auerbach & Silverstein, 2003; Corbin & Strauss, 2008). The interviews lasted between twenty and fifty minutes. Audio recordings were necessary to ensure correct transcription of participant insights. The recordings helped identify patterns of reflection by participants as they discussed their experiences. Notes taken during the interviews of any off subject interjections by the participants supplement the recordings. During the interviews, any comment or point of clarification from a participant which revealed a reflection that explained an insight or provided additional data was noted. The class evaluations provided another source of information to clarify the qualitative information (Clandinin & Connelly, 2000; Ritchie & Spencer, 2002).

After four participants' interviews were transcribed, the researcher coded the interviews. The interviews were sent to a second coder and the work of these two individuals was compared to ensure that common themes described the essence of the interview.

3.8 Member Check - Follow Up

Individuals who indicated that they adopted and used the real life simulated PBL activity, as a teaching method of their own had follow up interviews to further the researcher's investigation. Follow up interviews and email correspondence helped ensure the validity of the stories found in the interviews (Auerbach & Silverstein, 2003). The participants' stories may include failures and misunderstandings and may identify a lack of knowledge due to an inability to transfer principles and concepts (Haskell, 1998, 2001; Hoberman & Mailick, 1994; McFarland & Stansell, 1993). An investigation of any misunderstanding helps to determine the context and a description of the participant's experience.

3.9 Coding of Data from Informant Centered, Semi-structured Interviews

Miles and Huberman (1984) recommend using a coding system that has multiple levels. The first level coding attaches labels to groups of words. The second level coding, also called pattern coding, groups the first level coding into fewer quantities of patterns or underlying themes. The creation of themes may not be possible until all of the research is completed (Auerbach & Silverstein, 2003). Boyatzis (1998) presents five factors that a good theme should have:

1. A definition of what the theme covers
2. An explanation of how the researcher determines when a theme is present in an interview
3. A complete description of items included or excluded in a theme
4. Unique examples of the theme to clarify for other researchers
5. An understandable name that identifies each theme

Glaser and Strauss (1967) and Strauss (1987) define guidelines for creating categories:

1. Define the data into categories, define unique categories, and give them names
2. Connect these categories to the context they define. This may require being specific to a particular context
3. Interlace the categories with each other, and create subcategories if needed
4. Perform category creation based upon specific data; indicate each occurrence with a marking; and record sources, page numbers, and lines
5. Create overriding core categories that relate all categories and subcategories
6. Discard outlier categories that do not relate or tie into the core categories

Using the first and second levels of coding reduces the information for more in-depth analysis. Analyzing the data gained from the interviews helps to determine the themes. Boyatzis (1998) indicates that a researcher needs thematic investigation to understand the hidden explanations that the first and second level coding exposed. The themes rose out of the conversations by utilizing adult education theories and philosophies, such as Constructivism, problem based learning, experiential learning, workplace learning and action learning.

3.10 Thematic Saturation

Once the coding reached a point where no new themes or sub-themes surfaced, the process stopped. Ten participants provided enough diversity in the research area along with enough rich and varied contexts adequately describe the phenomena under examination (Auerbach & Silverstein, 2003; Eisenhardt, 2002; Glaser & Strauss, 1967; Strauss & Corbin, 1990).

3.11 Qualitative Analysis

Qualitative data analysis finds patterns in the data and determines explanations for those patterns (Auerbach & Silverstein, 2003; Corbin & Strauss, 2008; Smith, 2000). Upon completion of interviews, the stories were transcribed. An examination of the material from a thematic standpoint for relationships that connect participants' responses, experiences, and common understanding of the RLSPBL activity occurred.

While there are many techniques for analyzing qualitative data, the narrative inquiry approach provides the researcher with an organized structure to follow (Clandinin & Connelly, 2000; Duffy, 2007; Pinnegar & Daynes, 2007). This narrative inquiry approach guided the interpretation of the data and helps discover meaningful themes (Auerbach & Silverstein, 2003).

In addition to interview data collected from the participants, evaluation by the participants of the instructor and the instruction helped the researcher understand the participants' thoughts. This documentation records the student's perspective of his or her learning classroom activities, and suggestions for future classes.

Field notes describe the interview environments, tone of voice, negative comments about the software or the work setting, and other information (Glaser, 1978). Field notes maintained during the interviews added to the validity and completeness of this research. Glaser outlines the steps necessary to incorporate field notes (or memos) and journal entries (pp. 81-91). He recommends the researcher keep notes and data separate during data gathering, re-examine previous data should any new insights occur, modify any notes as the research develops, keep a succinct list of the coding scheme, and ensure that the codes are distinct.

Studying transfer success experienced by students from many corporate organizations provides the opportunity to eliminate many unique obstacles experienced by participants

(Haskell, 1998, 2001). Common facets of participants' success unfold as the stories of many individual clinicians came together (Duffy, 2007; Singley & Anderson, 1989; Tennant, 1993).

Triangulation of the interviews, the field notes and the student's evaluation of the class ties together differing perspectives of the RLSPBL activity. The years between the evaluation of the instruction/classroom activities as it happened resonates with the animated dialogue in the interviews. These individuals were proud of their learning at the time the class occurred and were even more boastful of their accomplishments on their jobs. The field notes depict individuals who are ready and willing to tell their story. Each seem to be cognizant of the planned surprise of the activity and appreciate how beneficial the RLSPBL activity was to them in their mastery of the software.

3.12 Rigor and Trustworthiness

Research should be credible and have valid application to a field of practice. An individual reading this study expects that the study was conducted with rigor and the outcomes can be trusted (Herr & Anderson, 2005; Merriam, 2002). To present rigor and trustworthiness in a qualitative study, a researcher must persuade the reader that the outcomes of the research are worthy of consideration and acceptance (Creswell, 1998; Lincoln & Guba, 1985; Maxwell, 1992; Merriam, 2002). Jackson (2011) defines rigor "Rigor in the classroom is commonly referred to as rigorous instruction. It is instruction that requires students to construct meaning for themselves, impose structure on information, integrate individual skills into processes, operate within but at the outer edge of their abilities, and apply what they learn in more than one context and to unpredictable situations". His definition matches the stories told by the participants as they describe the RLSPBL.

Trustworthiness accounts for any previous experience or bias that the researcher may have (Argyris, Putnam, & Smith, 1985; Auerbach & Silverstein, 2003). Duffy (2007) indicates that qualitative research must exhibit trustworthiness. She says trustworthiness may be gained by fully involving the participants and providing them the time and opportunity to reflect on their story as it is being told by the researcher. She states that students not only must be active participants but should also be collaborators. They should engage and reflect on their thoughts and develop a partnership with the researcher. Holloway and Wheeler (2002) apply trustworthiness to qualitative research by looking for "truth value" and by relating trustworthiness to methodological soundness and adequacy. These two authors attribute the following characteristics:

1. Credibility – the statements made by the researcher are in line with the data provided by the participants
2. Transferability – the findings are not unique and can be applied in another situation that has a similar context
3. Dependability – the findings between participants are consistent and accurate
4. Confirmability – the findings are drawn from the data and not from the researcher's preconceived ideas or opinions

Lincoln and Guba (1985) also use these four criteria to measure rigor and trustworthiness in qualitative studies. The following section outlines the manner of establishing trustworthiness for this study.

Credibility refers to how truthful particular findings are and depends on the depth and the richness of the information gathered. Accomplishing credibility by:

1. Continued contact with participants over the length of the study
2. Member checking of findings by providing each participant with a copy of the transcript of their interview. In addition, further along in the study, sending the researcher's interpretations to interviewees for review, clarification, correction,

and suggestion helped to ensure that the participants' voices are presented accurately

3. Triangulation use of multiple sources of information: fields notes, analysis of interviews, and class evaluations helped to provide diverse sources for comparison

4. Peer reviews with faculty occurred to discuss the research and verify the integrity of the data and the analysis process. The reviews examined the accuracy of the findings and the interpretations of the researcher (Lincoln and Guba, 1985).

Transferability indicates how generalizable the research is to other situations. Qualitative researchers use 'thick description' of the phenomenon to improve the transferability (Patton, 1990, p. 375). 'Thick description' is described by Lincoln and Guba (1985) as a way of achieving a type of external validity. By describing a phenomenon with ample detail, a researcher can begin to evaluate the extent to which the conclusions drawn are transferable to other times, settings, situations, and people. The practicality of transferring to another circumstance depends on the similarity between the two instances. Lincoln and Guba also explain that a researcher cannot predict if transfer will occur. These authors indicate that the researcher can only provide adequate information, so others can decide if the initial research is transferable.

Dependability refers to the consistency and repeatability of the research. "Replication of a qualitative study will not yield the same results; there can be numerous interpretations of the same data. The important question for qualitative researchers is whether the results are consistent with the data collected" (Merriam, 2002, p. 27). Maintaining a consistent process for the interviews, evaluations, and member check insures dependability (Erlandson, Harris, Skipper & Allen, 1993).

How neutral and unbiased the findings are determines Confirmability. The findings must appropriately reflect the participant's voice and are not the researchers' opinions or biases.

Lincoln and Guba (1985) state that to establish dependability and conformability by using an audit trail, so an auditor can follow the researcher's steps. Accomplishing this if the researcher maintains accurate documentation of the interviews, keeps a journal, and records the interviews and discussions after the interviews. In addition, materials from the interview analysis along with the researcher's field notes must be maintained (Erlandson, Harris, Skipper & Allen, 1993; Huberman & Miles, 2002).

3.13 Authenticity

Guba and Lincoln (1989) indicate that the authenticity of a study is important along with rigor and trustworthiness. A study is authentic when the methods used are appropriate to convey the participant's story. The study also must help the participants and similar non-participants understand their environment and improve it (Merriam, Caffarella & Baumgartner, 1991; Mezirow, 1991; Whitehead & McNiff, 2006). This means there is new insight into the phenomena being researched. Maxwell (1996) points out that the incompleteness of data is the main threat to a valid description of the interview. Tape recording and verbatim transcribing ensure all interviews are truthful, valid, and accurate.

Feedback to the interview participants provide the "member check" proposed by Holloway and Wheeler (2002). Incorporation of the participants' corrections to the transcriptions solicited after the interviewees have reviewed the written interpretations. These authors also include reflexivity by the researcher related to their own involvement in the research. Ongoing critical reflection about the researcher's involvement adds reflexivity to the completed paper. "Unlike traditional inquiry, which believes in a single objective reality, naturalistic inquiry takes its strength from separate realities that have been constructed by different individuals"

(Erlandson, Harris, Skipper, & Allen, 1993, p. 151). “Fairness is the first authenticity criterion” (p. 153). The researcher sought input from all participants on the constructs during development. Open communication with the participants on the material ensures that as new constructs and themes were developed, they become aware of them (Creswell, 1994; Erlandson, Harris, Skipper, & Allen, 1993).

Erlandson, Harris, Skipper, and Allen (1993) indicate that ontological authenticity is the second criteria. The participants improving their experience or their environment discover this. Demonstration of this criterion was present when participants verify that they have improved their understanding of the process and expanded the constructs used on a daily basis—that they learned more by participating and gained insights to pass on to others. This learning ties into the third authenticity of educative authenticity. The involvement in the research has provided them with knowledge that did not previously exist. The fourth authenticity is catalytic, which represents actions considered by the participants because of their interaction in the research. Lastly, tactical authenticity is the actual impactful action because of the information gained from the research activities. This is also called empowerment and can be measured by participants’ testimony of actions and new endeavors undertook. Participant testimony of how well they transferred the education by applying strategies they learned thru RLSPBL to their work environment was included in this research.

3.14 Participant Protection

Each participant was informed of the steps taken to secure their responses (Guba, 1978; McLagan & Suhadolnik, 1989; Smith, 2002). To insure confidentiality, the researcher understands the IRB inventory process and follows these procedures. The benefits of the research

(i.e., more effective adult education) greatly outweigh the peril involved in completing the interview. The participants sent the signed consent forms, which detail participant involvement and the confidentiality measures, before the interviews. All recordings, transcriptions, and documents are in locked filing cabinets or on a password-protected computer. The participants reviewed and edited the transcripts once transcription was complete. Once received from the participants, the interview transcripts were stored in a locked filing cabinet, and all electronic representations are stored on a password protected computer with no connection to the Internet. An alias name provides confidentiality of the participants (Erlandson, Harris, Skipper, & Allen, 1993).

3.15 Bias in Research

The entrance of bias in research is a hazard of which to be aware (Auberbach & Silverstein, 2003; Creswell, 1994; Wilkinson & McNeill, 1996). Strauss and Corbin (1990) indicate that it is very difficult to separate the researcher's background and their study of the literature along with their experiences and maintain research totally absent of bias. They indicate three processes to alleviate bias:

1. Occasionally, pause the research, and examine what is going on
2. Constantly be skeptical
3. Maintain your research procedures.

Research bias in this study was the anticipation of testimony to successful use of RLSPBL. This anticipatory bias may influence what information is selected and interpreted. The analysis of data might miss the research bias; using the three aforementioned processes should embody

research free of bias. As the educator and the researcher, the expectations of the findings are to exhibit the opinions and thoughts of the participants and not those of the researcher.

3.16 Summary

A qualitative research paradigm investigated the process participants implore to gain the knowledge and experiences needed to develop their clinical charting systems. The phenomenological inquiry process allows a more in-depth understanding of the participants' experiences. This process provides participants an opportunity to uniquely, present their thoughts. The researcher is the primary instrument for both interviews and analysis.

Literature indicates that trustworthiness is used to measure validity and reliability in qualitative studies. Prolonged engagement with the participants, peer reviews, triangulation, and member checking insures the findings are bias free and reflect the participants input (Schwalbach, 2003).

Creation of thick descriptions facilitates others' determination regarding the transferability of this study to other situations. An audit trail was be created to provide dependability and confirmability. Aliases were created for each participant. An audit log was kept to allow auditors of the research to follow its origin.

Collection of information occurs through semi-structured interviews. The researcher conducts all of the interviews through phone conversations or face to face. The researcher records and transcribes the interviews. A copy of the transcript of his or her interview was provided to every participant. Data analysis began with the first interview using the constant comparative method, which help identify common themes and patterns emerging from the data.

After the first interview, subsequent interviews reflect on each previous interview with follow up from previous participants.

CHAPTER 4

FINDINGS

This research focused on the lived experiences of individuals who participated in a real-life simulated problem-based learning (RLSPBL) activity. These stories relate their experiences as they learned software and utilized that learning to design and create graphical user interfaces for their clinical environment. Interviews with hospital staff present individuals' frustrations, successes, growth and reflection during an activity that challenged their self-concept, highlighted their learning skills and, as they have related, provided an avenue for fulfillment in the workplace.

From participants' direct quotes, class evaluations and the researcher's field notes, themes have been identified that depict participants' progression from knowing little of the software to being the lead individuals responsible for the graphical user interfaces for their hospital's clinical charting system. Four major themes are evident: PBL, transfer of education to the workplace, sharing the experience with others, and the real-life simulated activity. Intermeshed throughout the participants' stories are unique attitudes and behaviors that helped shape the emerging themes. Furthermore, these themes were critical in successful implementation of the software.

The material presented from the interviews and follow-up conversations relay the participants' experiences while participating in a five-day class that included the RLSPBL activity. Their words depict their initial displeasure, surprise, self-doubt, introspection, and reflection during the class and while applying the material they learned. Interspersed in the conversations are narratives of the participants' indoctrination to utilizing a new technique for their own education.

This research evolved from curiosity of the educational effect that the RLSPBL activity had upon clinical staff in their learning. Further interest related to the participants' successes in the workplace after completing the activity—did this activity help them transfer the classroom experience back to their workplace? Next, interest in why participants were enthusiastic about PBL in an environment where mistakes yield deathly outcomes. Lastly, astonishment in how collaboration between participants could overshadow an intense, unexpected troubleshooting activity. Success in teaching clinicians for over eight years led to the pursuit of this advanced degree and was a focus of academic studies. The classroom provided no measure to determine if the learning was due to the participants' stress or their discomfort during the RLSPBL activity. The financial constraints of corporate education limit opportunities of measuring this and eliminate the possibility of creating a control group to parallel with an experimental group. All participants were required to be successful at their workplace and not using the RLSPBL activity would change their educational experience.

'Why research this subject?' is a question asked by participants who indicated that it was so obvious to them that this technique works. The best answer to this is possibly self-serving. "The possibility of being in a clinical setting creates the hope those clinicians have all of the tools available to them to make the visit the best it can be." Such intentions to improve the American healthcare system are possibly applicable to others and maybe society in general.

To answer this question more academically, some specific observations were made:

- Clinically correct electronic interface systems are very expensive and can critically affect patient care.
- The unique need of each clinical environment is different not only for each hospital organization but also for the area inside a clinical setting (obstetrics has differing needs than geriatrics who differs from pediatrics).

- Clinical businesses have an ongoing need to continue the education of their staff in the clinical realm and in the electronic charting arena.

- Employees must be self-learners who can assimilate the knowledge required to maintain currency in their profession.

- Education must be effective and efficient and provide the participants with clinically correct learning situations that can be transferred back to their work environment.

As an instructor of clinicians with backgrounds totally removed from designing and creating computerized clinical user interfaces, reasoning for researching the RLSPBL activity is the success these participants have experienced. What made the RLSPBL activity the cornerstone to learning, enjoyment of work, and transferring of experience and knowledge from their educational interaction? Once the factors are determined, can they be incorporated in other educational situations? From these introspective questions, the origination of the research discussions with the participants was born.

The following constraints were present in this research:

1. Participants voiced their personal perspectives and experiences; these were beyond the researcher's control. These perspectives and personal experiences may affect the accuracy of the interviews, which may add bias to the results of the study (Merriam, 1988, 2001a, 2001b; Patton, 1990; Wilkinson & McNeil, 1996).

2. The findings of this study were determined through interviews with a limited number of participants. In qualitative research, a small sample is selected specifically because of the desire to get a deep understanding of the phenomenon. The accuracy of responses to the questions depends on the experience and honesty of the participants in this research.

3. Participants were taking software classes in a corporate educational setting. All participants were adults that have employment with a healthcare facility. The healthcare facility has purchased software that requires specific education.

4.1 Constant Comparative

Constant comparative was used to analyze and categorize the information to identify common themes and patterns. One individual was selected for an initial interview to discuss their experience. This 'grounding method' allowed the discovery of the themes of the research from the participant's responses (Creswell, 1994; Glaser & Strauss, 1967; Onwuegbuzie & Leech, 2007). Other participants were interviewed one at a time. Coding of the material and comparison with previous interviews helped to clarify the information from the perspective of multiple individuals (Auberbach & Silverstein, 2003; Boyatzis, 1998; Smith, 2000).

The first interview took place March 18, 2012 and the next was a week later. During these two interviews and the third on April 10, transcription of the recordings provided a venue to discover meaningful items the participants voiced. The researcher reviewed the transcripts. No coding occurred at this time, as the story the clinicians expressed was yet to be determined. Listening to their stories pointed out the passion these individuals had for their learning and what they felt were significant. After the fourth interview (April, 2012) was transcribed, the coding of the interviews began. Using a variety of colored markers and symbols to highlight thoughts expressed in more than one interview. Going over all four interviews, a collection of possible themes and subthemes arose that was further reviewed to create documents to identifying each possible theme.

Follow up with the participants clarified their statements and further defined the story of each. This process occupied two months during which time confirmation was made with three other possible participants. These three interviews were done in June, 2012 and were done with a focus on listening for the identified shared thoughts of the first four participants. No coding was done; the transcripts were highlighted using the already defined possible themes. Analysis

of these three interviews was sent back to the initial four participants to compare with their thoughts. At this point a thematic saturation occurred, but more variation in participant age was needed. Also, a confirmation of developed themes with two individuals who were deep into rebuilding their system with a new software version. Three more interviews were held in July, 2012 to further refine the themes; this information was sent to all previous participants.

4.1.1 Qualitative Analysis

Qualitative data analysis is based on finding patterns in the data and determining explanations for those patterns (Auerbach & Silverstein, 2003; Corbin & Strauss, 2008; Smith, 2000). Once the interviews were completed and the stories transcribed examination of the material from a thematic standpoint for relationships that connect participants' responses, experiences, and common understanding of the RLSPBL activity.

While there are many techniques for analyzing qualitative data, the narrative inquiry approach provides the researcher with an organized structure to follow (Clandinin & Connelly, 2000; Duffy, 2007; Pinnegar & Daynes, 2007). This theory and the work of other researchers will guide the interpretation of the data and help discover meaningful themes (Auerbach & Silverstein, 2003). The long engagement with the participants (October 2009 through August 2012) provide a good measure of trustworthiness, validity and reliability (Lincoln and Guba, 1985). The participants have had enough time to reflect on the class and what has helped them to be effective in their jobs.

4.2 Interview/Contact Schedule

Table 1

Interview/contact Schedule

	Bradley	Andrew	Charlie	Lisa	Elizabeth	Irene	Francis	Betty	Allison	Kathryn
Contacted	3/3/ 2012	3/15/ 2012	3/16/ 2012	3/16/ 2012	3/5/2 012	3/5/2 012	3/5/ 2012	5/25/ 2012	5/25/ 2012	3/5/ 2012
Agree to Interview	3/03/ 2012	3/17/ 2012	3/16/ 2012	3/17/ 2012	3/6/ 2012	3/6/ 2012	3/6/ 2012	5/25/ 2012	5/25/ 2012	3/8/ 2012
Interview date	3/18/ 2012	3/25/ 2012	4/10/ 2012	4/14/ 2012	7/2/ 2012	7/5/ 2012	6/15/ 2012	6/17/ 2012	6/17/ 2012	7/15/ 2012
Follow up	4/23/ 2012	4/15/ 2012	5/12/ 2012	5/12/ 2012	7/22/ 2012	7/22/ 2012	6/30/ 2001	6/30/ 2012	6/30/ 2012	8/1/ 2012
Follow up	5/10/ 2012	5/15/ 2012	8/4/ 2012	8/4/ 2012	8/4/ 2012	8/4/ 2012	8/4/ 2012	8/5/ 2012	8/5/ 2012	8/5/ 2012
Follow up	6/21/ 2012	6/18/ 2012								
Follow up	7/14/ 2012	6/22/ 2012								
Follow up	8/2/ 2012	7/15/ 2012								
Follow up		7/19/ 2002								
Follow up		8/2/ 2002								

4.3 Interviews

The first interview was in March with Bradley, and the next was the following week with Andrew. The third with Charlie and the fourth with Lisa were in April. After the information gleaned during these conversations was coded, collaboration with Bradley and Andrew in late

April. At this point, 20 insights repeated and confirmed by at least three of the four participants became apparent. Further collaboration and clarification with all four participants (May) provided more focus on four central themes with ten sub-themes. This refined set of themes, was used during the next three interviews in June. After recording more interviews, new items were corroborated with the initial four and the last three. Lastly, three interviews in July cemented clarification of previously determined themes. Communication with all of the participants covered all interview material. Three major themes were determined along with one minor theme: Context-based class activities, PBL, and Transference with a minor theme of Shared experience.

Based upon the ten participant interviews, the findings of three major themes and one minor theme became evident from the stories told by the participants. They do not want to be read to; they want hands-on activities that challenge them, require them to think critically contain contextually significant material from their workplaces, help them transfer the experience back to their facility, and promote shared experiences.

4.4 Participant Background

Purposeful sampling maximized participant characteristics and facilitated the expansion of the evolving research by including information-rich descriptions of participants' experiences (Bogdan & Biklen, 1982). The characteristics sought are clinical years of nursing experience, years working with computers, clinical background, educational background, reasons for taking the class, experiences with the RLSPBL activity and work responsibilities.

Participants included clinical staff —eight nurses and two participants with information systems backgrounds—who work in various geographical areas of the United States (West

Texas, Dallas, Michigan, South Carolina, North Carolina, Tennessee, and Maryland). Three participants were males, and seven were females with age ranges between 29 and 66 (one participant in the 20-29 group, one participant in the 30-39 group, four in the 40-49 group, three in the 50-59 group, and one in the 60-69 age group). The years of clinical nursing experience ranged from seven years to 43 years with various backgrounds from bedside care to cardiac surgery. The two IS participants both had no clinical experience. All were assigned the task and responsibility to move their hospital to a robust computerized clinical charting environment. Computer experiences ranged from 11 years to 28 years. The clinicians' previous primary assignment was to enter data until their roles changed within the past two to three years when they became the designers for their systems. The two IS individuals were very experienced with the network and system interfaces with other software. Both had degrees in information systems and regarded themselves as IS individuals rather than clinicians. The clinicians were evaluated at their facilities and found to have a skill for using computers, which was a determining factor in them moving to IS.

All of these participants were familiar with the software and participated in multiple training classes provided by the vendor before coming to the design class. All were functional using computers, alleviating the need for basic computer skills education. The core of this research is to explore their transition from users of clinical software to designers of the clinical user interfaces. Each participant's experiences within this project were recorded here and examined for themes and sub-themes that relay their story in their own words.

4.5 The Participants

Allison. A nurse of 27 years, this 49-year-old clinician works closely with her IS partner,

Betty. With an associate's degree, she is one of the least formally educated participants, but she compensates by being a fervent leader in her clinical realm.

Andrew. A 59-year-old nurse, Andrew has widespread clinical knowledge in his 33 years of nursing. He has a master's degree in Education along with his BS in nursing. He now works as a clinical consultant to hospitals along with being an educator to clinical staff. Andrew had 13 years' experience using computers before coming to the class.

Betty. Working with Allison, Betty, a non-clinician, creates interfaces. Betty has two years of formal education but has been involved with computers at the programmer level for over 10 years. She has the responsibility of ensuring interfaces between computer systems work as well as creating the user interfaces.

Bradley. An emergency room nurse, Bradley has completed his PhD in nursing. He has 32 years of clinical experience along with 20 years of computer usage. He is a consultant to hospitals on their user interfaces and processes. He took a class to learn how to design the interfaces at his facility and left his position to consult for the software vendor. During the selection of the participants, his name was suggested by most of the other participants as a key individual to include.

Charlie. An Information Systems individual, Charlie was one of the youngest participants at 32. His education in Computer Science along with his computer system manager position provided a variation of backgrounds. He has only 12 years of computer work, but these years are at a programmer/system administrator level. Charlie has learned clinical information from the nurses with whom he works and collaborates to create the interfaces. He also was responsible for creating the interfaces and troubleshooting the software.

Elizabeth. A clinician of 37 years, Elizabeth has participated in many educational classes, which have made her a key person at her facility. She has worked in all areas of the hospital, and her position in information systems was to assist in the transition to electronic charting. Four years later, she is the core designer/builder and the manager over the move to electronic charting. Her bachelors in nursing, completed decades ago did not prepare this 57-year-old to work with computers or use them to design clinical interfaces. She has 13 years of end user computer experience but only four years of computer design.

Francis. Francis is a 42-year-old clinician who has a background in ER as well as direct patient care. Her movement to IS was due to her familiarity with computer systems. She has an affinity for delving into software problems as well as directing the design for the end user system. She is verbally very outgoing and has no hesitation voicing her displeasure with the software and the RLSPBL activity. She was very vocal about it but became a fan of it at its conclusion.

Irene. A clinician of 26 years, Irene is 49 years old and has assumed a position as the designer and builder of interfaces at her facility. Her hospital also has tasked her with being part of multiple pilot site implementations for new versions of the software. Her expertise comes with high expectations for someone who has only eight years of computer usage.

Kathyrn. The eldest at 66, Kathryn boasts the most years of clinical background (41) and the least years (5) using a computer for charting. Her background includes every faucet of a hospital, ending as a surgical nurse in the cardiac trauma unit. She recently left the trauma unit (2 months) and moved into IS to be part of the hospital's transition to electronic charting. Kathryn provided some of the most heartfelt stories of her being able to adapt to the computer system rather than being frightened of it.

Lisa. The youngest clinician at 29, Lisa has 16 years of computer experience. Her associates in nursing makes her the least clinically educated, and with only eight years of nursing background, she has the least number of clinical years. She has used clinical computer systems for only five years. Of the clinicians, Lisa was the most technologically savvy with electronic communication devices she used during class (phone and laptop).

4.6 RLSPBL Theme

This chapter presents the experiences of individuals who participated in an RLSPBL activity and returned to their jobs creating electronic graphical clinical charting interfaces. Four main themes were highlighted through these experiences: real-life simulated problem based learning; problem-based learning; transfer of knowledge; and the unshared experience.

Students are asked to step outside their roles to do more than they ever have in the past (Bernthal et al., 2004; Caffarella, 2002; Zielinski, 2001). This requires them to acquire knowledge and expertise in a short amount of time. It is this requirement that created the RLSPBL activity.

4.6.1 Activities with Context-based Material

Houle (1976) explains that learning expanded in the 19th and 20th centuries as professors moved from lecturing to requiring students to perform experiments themselves. "The John Hopkins University medical school in 1876 began its emphasis on practical applications of knowledge. William Osler, its first Professor of Medicine, not only required his students to perform autopsies but took them with him to observe his treatment of patients" (p. 29). The

ability to observe a real-life situation and take notes illustrates the usefulness of using a real-life, problem-based learning activity to educate clinicians.

Boud and Solomon (2001) compared higher education (academia) to the workplace. "Work-based learning as a pedagogical site challenges most of our conventional assumptions about teaching, knowledge and curriculum" (p. 225). Higher education has always been under control of academia, but the needs of the business world require more variations in adult learning. The eldest member of the research, Kathryn, a cardiac surgical nurse, recounted her learning and motivation for knowledge throughout her career. She stated: "My education and learning over the years has evolved greatly. I never had a choice because this way of learning (the RLSPBL lab) was not a way that they taught through my college days." Kathryn's recount confirmed the insights of Boud and Solomon. She continued, "I was in college and post-college in the late 1960s. I continued taking classes in the 70s and 80s, and they did not have that (RLSPBL). I am going to say now what has worked and was effective in learning crucial material was the RLSPBL." Kathryn described that the RLSPBL lab and the realistic representation of her workplace provided an advantage for her to perform on the job:

> I am still learning in an informal way at work because we have huge issues with software at work. Not a week goes by where something doesn't get royally screwed up or it is no longer working and it was working two days ago. And all of that is okay. 'We have a problem and how are we going to solve it?' And what we do is, we <thinks, reformulates her answer>. The way I like to do it is I like to write down what is known. What are the facts that we know? We learned it in class. We learned it just through fooling around with the software. So now we have a whole bunch of known facts, and you then have the known and the unknown. You have to keep trying different things. And you find a solution or at least something that works. And it's fun! It's fun! And that kind of learning is what I retain. So, I learned something that resulted, generated by trying to problem solve. Through real trial and error, I retain that knowledge much more so than if I just, if I got the instruction or if I got an email from the consultant saying 'Here is what you do'. Because that is just recalling the information back, and I tend to forget that. If I had to go through that painful process—trial and error and frustration—then I do retain it. (Kathryn, personal communication, July 15, 2012)

This perspective of learning is aligned with Prochazka (1995) who stated, "Experiential learning needs to be internalized more than memorization or an attitude of interest – the data should be organized and understood" (p. 144). Irene indicated that the class content was the reason she was so successful:

> Well the class is a truly big help. As far as building in the system, it was the class and the experience there and the RLSPBL activity that absolutely helped me troubleshoot when things were not showing up or printing or of that nature. It illustrated to me how do I go about finding out what an issue is. The class content reflected my job. (Irene, personal communication, July 5, 2012)

Bradley confirmed this. From the start of the conversation, he detailed the RLSPBL activity and how it was contextually real-world.

> The use of problem-based and real-life, if you will, simulated scenarios in education, for especially for what I do, becomes really important for implementations of clinical systems in clinical settings within hospitals. The people I am dealing with want real-world expertise; they want real-work applicability. The best way that I know of is to come up with scenarios that not only emulate the type of patients that they will have, the type of scenarios that they will have for using the products they are implementing; but to also make use of scenarios that, I guess for lack of a better way of describing it, go off the beaten path. (Bradley, personal communication, March 25, 2012)

This passion for having clinically corrected material and exercises emanated within the other participants.

Allison and Betty, research participants, both preferred an educational format that includes clinically relevant hands-on activities. Allison indicated:

> For me, the hands on, and the RLSPBL activity was what I needed. I don't get a lot out of reading or someone talking to me over my head. I have to touch more… For me, a lot of it is repetition, doing it in class, hands on. I would say that that was it. Just lecturing to me does not do it, but letting me get in there and play with direction is what I need. (Allison, personal communication, June 17, 2012)

Betty confirmed this and voiced her distaste for lecture:

> I prefer hands on and exploring because I got bored with lectures. I like hands on and repetition. That's how I am going to learn it; that's how I am going back to work and do it. Reading and instructor lecture is not going to help you figure out where it's broken.

(Betty, personal communication, June 17, 2012)

Allison restated her learning preference. "I need the hands on, most definitely. Umm, like I said reading is not, and instructor-led is not my way of learning. I glaze over. I've got to be in it. I must be in it and challenged." The challenge was an aspect of this lab with which some participants agreed, but Andrew felt it was too difficult. Andrew (Andrew, personal communication, March 25, 2012) voiced the feeling that the RLSPBL was overpowering:

> My experience with that was somewhat overwhelming. It was difficult learning the concepts at first with this new class, and the first time I encountered the RLSPBL lab (I have encountered the lab multiple times), it was very overwhelming. At first I thought it was somewhat self-defeating primarily because it was so overwhelming for me. However, looking back on that experience, once I struggled through the exercise, where the build in the system which I had accomplished in the previous days was now tore apart. And this was not what I expected; I had to go back and fix it. And looking back on that experience, it was an experience that taught me problem thinking skills as far as the application. And understanding what I or any other clinical analyst would encounter when he or she went back to their facility after attending class and encountering situations where their build or someone else's build of the system did not work as expected. They would have to go back in and figure out what was wrong and correct the problem. And so, this activity brought me from an experience of rote memorization with learning a new activity to more of a higher level of educational knowledge and a situation that utilized my critical thinking skills in determining the root cause of the problems I was seeing and how I had to go and fix it. (Andrew, personal communication, March 25, 2012)

Barnett (1999) indicated that the usage of electronics has decreased the allowed response time to changes, and we are faced with more changes at a faster rate. Information overload occurred as the Internet made the content of the world available at our desktops. The participants in this research verbalized this in their stories. Allison discussed her preference to get into the activities early in the class:

> I think it's real important to have them real early on and not on Friday <pause> when we are burned out. But I think that they are important because if it's just fluff and it's just reading the book, which I can do at home, <pause> then don't waste my time. But I think that they do need to be challenging to make you think because when you get back, you remember those things that you had. I remember the RLSPBL especially. (Allison,

personal communication, June 17, 2012)

She continued, "<laughter> I came in one day, and all of my work was changed, and I had to figure out where to go to fix it. And so you have to remember this is a legend group or this is in this spot to change it. You had to figure it out where it was. And then you remember it when you go home." Betty confirmed that the RLSPBL activity helped her remember steps after returning to work:

> You do, because it made you think, you need to think. Oh, my goodness because we have done this and something would break, and then you say "Oh gosh, what was it that Mark said" and we'll go back and would think and would say "Oh yeah, that's what he said," and you know you have to do it. There are no shortcuts in clinical design. I mean they are just not there. I can't say how many times we said that, and we learned that from that class. (Betty, personal communication, June 17, 2012)

4.6.2 Using Unannounced Troubleshooting Activities

The RLSPBL activity is a surprise to participants. Kathryn, a cardiac surgical nurse who has handled many critical situations in her life, spoke positively about this aspect.

> I have often thought of the RLSPBL lab as going to a haunted house and not knowing when you are going to be frightened. Would I want to know when a surprise was going to happen? No! I paid my entrance fee, and I just want it to happen. <laughter> (Kathryn, personal communication, July 15, 2012)

Irene described the emotional response she felt:

> At that time, I don't know, it was frustration for all of the crazy things you did to us, but I think we worked through it very good. So at the time, even though it was frustrating and difficult, you did stuff that the system could not do; but we have had such things happen since class. Frustration that day but working through it and reflecting back was very helpful. (Irene, personal communication, July 5, 2012)

Irene, Bradley, Francis, and Allison related the complexity of their work environment; they indicated that every patient is unique, and caring for them is an individual experience. Bradley illustrated the need for complex, context-containing activities as his patients do not follow an established pattern that is duplicated for each:

> These individuals don't follow the typical written scenarios. In other words, patients don't follow a script, so when you are dealing with something that interfaces with patients—and I am sure this is true with people in general—that when you deal with something that has a human interface to it, there is no script that suffices. There is no script that enables you to cover all of your bases, so my thought is why try? What you need to do is to experience problems that would be problems not unlike those you would see every day because nothing ever goes as planned. You start off with a plan, and as soon as you interact with another human being, the plan falls apart, so there needs to be some way of learning that will allow you to adapt to the changes that you find in real life. (Bradley, personal communication, March 25, 2012)

Fraser and Greenhalgh (2001) discussed adult education in a clinical realm:

> Checklist driven approaches to clinical care, such as critical appraisal, clinical guidelines, care pathways, and so on, are important and undoubtedly save lives. But what often goes unnoticed is that such approaches are useful only once the problem has been understood. For the practitioner to be able to make sense of problems in the first place requires intuition and imagination—both attributes in which humans, reassuringly, still have the edge over the computer. Education that makes use of the insights from complex systems helps to build on these distinctly human capabilities. The complex real world is made up of messy, fuzzy, unique, and context embedded problems. Context and social interaction are critical components of adult learning. Adults need to know why they need to learn something, and they learn best when the topic is of immediate value and relevance. This is particularly true in changing contexts where capability involves the individual's ability to solve problems, to appraise the situation as a whole, prioritize issues, and then integrate and make sense of many different sources of data to arrive at a solution. Problem solving in a complex environment therefore involves cognitive processes similar to creative behavior. These observations are directly opposed to current approaches in continuing education for health professionals, where the predominant focus is on planned, formal events with tightly defined, content-oriented learning objectives. (pp. 800-801)

Irene discussed non-linear sequences of learning activities. "Yes, yes, yes. The stuff that was done in the lab, and it was not obvious until you dug down layers into the tool and you had to do much critical thinking to see why it was not printing, why it was saying this when I wanted it to say that" (Irene, personal communication, July 5, 2012). She did not enjoy the lab initially but has reconsidered. "Oh, absolutely yes. I say that it was a great learning activity and looking back now it is funny, but that day it was not funny. I did not know anything."

Charlie has an information systems background and expressed that the RLSPBL was a positive experience.

> It was, I think, a good thing. Challenging…yes. It kind of stimulated and made you think. It's more of a reflection of the real world. When you just come in and something is broken and they just tell you one thing. That's exactly what we are dealing with now. They call in and say "My system does not work." "What doesn't work? "Well this does not come up." And now you have to investigate and get out and go on and I think the RLSPBL activity has been very helpful. Because again it's a reflection of the real world—what's out there and it's like in our environment. Nobody is going to break it down for you. "Okay, this is what happens because of A, B, C, and D." Now, they are just going to tell you it's not printing, or I don't see my page, so the RLSPBL was very helpful. (Charlie, personal communication, April 10, 2012)

He continued, relating the realism of the activity. "As I have mentioned several times, it's a good thing because it's what's out there. It's like that every day. When you get the phone call after support-triage, it's just like that. Something is broken, and you have to figure out, and I think it should be kept and even do more RLSPBL activities <laughter>. I don't know how other people would feel." When asked if the use of the RLSPBL should be increased, Charlie laughed and said, "No, no that's just for me."

4.6.3 Using Activities that Challenge Students

Becoming a designer must be learned by doing. Many aspects of design can be taught in lecture, presentations and reading, but tying them all together is beyond understanding without experience. Schön (1987) addressed the need to tie together all forms of education. "The non-routine situations of practice are at least partly indeterminate and must somehow be made coherent" (p. 157). Kathryn indicated that the RLSPBL activity related knowledge she gained in other classes to her real-life work. When discussion moved to blending new information with current knowledge, she was enthusiastic.

> Absolutely, it did activate my prior knowledge. That whole activity, it forced <pause> bringing back past classes because that's part of your next job, you know? How do you bring it back to your workplace? Really, an activity like that, I think would force students to confront the unstructured problems that mirror what they are going to face in their real life, their workplace situation. So as a group, or even individually, I believe some of us did. I know some people when we all came on board and saw the presentation, were damaged terribly or gone. As a group or even individually, you get that opportunity to generate probable solutions. The one student did a clever presentation on his family. It was so clever; he gave us possible ways to find the material that we needed. My coworker and I will sort out the known from the unknown, and we try things, and eventually we have to bring in some technical people. In the past, we had the hospitals tech people, and we try it on the hospital end to make sure it is not something wrong with our system. Then when we get to the next level we got to bring in more people. Everybody says we know that blah, blah, blah will take us to different, different levels but it's kind of neat how everyone is using a problem to solve what we know and what we don't know. It makes you stronger for that. Your RLSPBL lab is a just a smaller version of what we are going to get back at our office. (Kathryn, personal communication, July 15, 2012)

Andrew, who is now an instructor and teaches parts of the software that at one time overwhelmed him, laughed about how far he came in understanding the software and mastering its nuances.

> <much laughter>My self-confidence is in the gutter ever since. I am still working on it <more laughter>. <pause> Once I struggled through the RLSPBL lab and got through the sense of being overwhelmed, I enlisted the help of other people to reinforce the basics of learning and then began to grasp how pieces fit together and how to correct issues that I did not expect. Then I knew what to do. It is sort of like knowing what to do in case of an emergency back at home. If I have a fire at home, I need to know how to put it out. I need to know what steps to take to remedy the situation or to fix something. So it's the same thing if I encounter a situation back at my facility, and I am prepared and I know what to do, it does not freak me out anymore. It's like I know the steps I need to take. I am not so overwhelmed by it, and I can figure out what is going on. So definitely, my self-confidence factor is now huge. (Andrew, personal communication, March 25, 2012)

Activities that provide opportunities to think using previous experiences also was valued by Andrew.

> The effectiveness of the RLSPBL lab with learning software was <pause>, the RLSPBL lab itself was very effective because rather than going home with a set of scripted instruction on building a system, I left the class with more of a knowledge of going beyond scripted learning and going into troubleshooting. So <pause> having taken the class and the RLSPBL lab, that's really what I walked away from the class with. That

> experience really helped me to get an in-depth knowledge of the application, how it worked, how the pieces fit together, and how to transfer this knowledge to fix similar problems when I got back home. (Andrew, personal communication, March 25, 2012)

Elizabeth incorporated some aspects of the RLSPBL activity into her workplace.

> Sometimes it happens, sometimes it's not on purpose, and sometimes we break things together. When I am working with another analyst, and we think about 'What would happen if we do this?' It is not always with this software. We do this in other programs you can do so very much in a short time and so quickly, and you get almost immediate feedback of what you broke from the helpdesk. So, it's kind of the same kind of thing. I do not always do it on purpose, but it has happened occasionally. Marianna, who does many of our computer classes here for nursing, has students make mistakes on purpose so that they can: 1) Know that they will happen; 2) know how to fix them; and 3) know what to do about them. So I think there is an element of the RLSPBL lab that is used over there with the training that we do for nursing. (Elizabeth, personal communication, July 2, 2012)

Kathryn confirmed that she would use an activity similar to the RLSPBL activity to teach others:

> Would I use it? Absolutely! Because lecture and manuals cover the routine, the way something is supposed to work in the perfect world. We don't live in the perfect world, especially in IT, but with the RLSPBL method, the student is an active participant in the learning process. So the more prepared I am to face the odd and random events, the more successful I would be. I would design a course on developing problem-solving strategies but along with the knowledge based. You know, like the way you did it. I am not saying to just please. Out of the eight times I came to education, I really think that yours was the best. And I say that because I came home and blew through that build. The other classes did not stick with me. I had to look back at notes and manuals and that was not helpful. I have a lot of stuff in the manuals that was not written for the proper version, and I didn't know what to do. This is because we never had hands on. So I would want my students exposed to situations that are going to be similar in context to what they are going to encounter in real life. (Kathryn, personal communication, July 15, 2012)

Allison and Betty, who work together at a facility, indicated that they have not been able to use this technique when educating coworkers. "Have we? No. But would we like to? Yes! But we don't train that often. We don't get to" (Allison, personal communication, June 17, 2012). Betty added:

> But that is one of the things that we complain about to the educators at our facility because basically what they are teaching is key strokes. They are not teaching the back end of say when a nurse calls and says, "When I entered an order, it didn't go. Lab didn't get it; radiology didn't get it." They don't understand how to go back and look. I mean

> they are not taught if it doesn't go, it's because you chose an AM frequency and changed the time. They don't understand, and they need to be taught that. So, the answer is yes. When we originally were teaching classes at the hospital, we did. (Betty, personal communication, June 17, 2012)

And with a smile, Betty included, "It was rewarding for me! Because then you have less user error." Allison completed this thought. "And the users were much more self-sufficient. We didn't get a lot of calls" (Allison, personal communication, June 17, 2012).

Andrew pointed out that the effectiveness of the RLSPBL activity is due partially to the clinical context of the activity:

> If it was completely non-clinical and out of context clinically, I would have been completely overwhelmed. It needed to have at least that context of applying the software to my familiar environment. If I did not have that, I probably would have quit. <laughter> (Andrew, personal communication, March 25, 2012)

Charlie related how beneficial the activity was:

> It was very useful. Like I said, in our business, it's just like that. You get a problem presented to you, and it's not clean cut, and you have to go in there, dig in, and figure it out. That's exactly what the RLSPBL activity does; it was letting you get your bucket of knowledge. It presented you with an issue, and then you solved it. That's what RLSPBL does. To me, I would rather do that. You can go to the documentation, but the RLSPBL stimulates and helps you apply what you have learned. I mean it's a very useful tool. (Charlie, personal communication, April 10, 2012)

Elizabeth described the troubleshooting required in her work:

> I think I use the skills from the RLSPBL lab every day. I have the comfort, the critical thinking that I identify with the RLSPBL activity on a daily basis just dealing with end user situations that I have to resolve. It was in the early days when I was doing screen designs. I would want things to look certain ways, and I would design and create the items, and they would not look the way that I wanted, and it was as if I had created my own problems to solve. It's like "Oh, man I needed that over there, and I want to display a different way." So because I had been successful with the RLSPBL lab, I am able to rework the work that I had done. This all became something that was easier for me and less stressful for me. In fact I thought, "Oh, yeah, if you do this, it's not going to break the world," and you can make it look like this, so it helped me to be comfortable with the experimenting with how the screen may look or how the report looks. Anything that I have done I have been able to kind of use those troubleshooting skills that I used in the RLSPBL lab. To unravel and resolve issues that I may give myself may have been presented to me by an end user. I want it to look like this, and I cannot make it look like

> that and then just do some troubleshooting and problem solving to fix that. (Elizabeth, personal communication, July 2, 2012)

Francis added to this line of thought:

> The skills you must have? Uhm, common sense, problem solving skills, even more specific is having been down a certain road before. If you have that problem before, so a repetition of a problem months later, even like a year later. I just had something happen with another builder who I have working with me now. She has been coming on now for a few months. And something that even happened a year ago, it's like "Oh, wait a minute, this happened, and I know what to do" <participant singing 'Da da da'>. It's like, you know, something that's happened before. <much laughter about the singing> (Francis, personal communication, June 15, 2012)

She continued:

> I think that it is very important. On that same note, it can be very Uhm <pause>, it kind of ticks you off at the time when it's happening. For example, case in point, the RLSPBL activity. Your wheels spin, you get… What I am trying to say is that you might not appreciate the importance of having those classroom activities, but they are extremely important. It just clicks the circle of learning. (Francis, personal communication, June 15, 2012)

When asked about being 'ticked off,' she replied with laughter, "Oh I was. I was not happy that Wednesday morning. I don't know if you remember that, there was a lot of swear words, not just from me <laughter> (Francis, personal communication, June 15, 2012).

Andrew discussed the outcome of individuals who have been through the RLSPBL:

> I think that it not only allowed them to be more productive at work, but it also impacted the overall implementation because the more secure they are and the more capable they are at fixing their own problems the less they have to rely upon implementation consultants and other resources to help them fix the problem; it shortens up the timeline. Because otherwise, if they encounter a situation that they have no concept or no idea how to fix, they have to document what is going on, they have to document the problems, document the steps they took to get where they are, and document the steps to recreate. They have to file the case, and they have to wait for someone to have the time and ability to log into their system and help them. To fix it and all of that delays the implementation and increases their frustration and stops productivity. So the more effective that they are, which I think the RLSPBL lab enables them to be as effective as making sure that they built things correctly the first time or they know how to fix things that are broken. It definitely makes them more productive, and it positively impacts the implementation because they do not have a huge gap of knowledge, and the time frame it takes to fix

everything. They can do it themselves. (Andrew, personal communication, March 25, 2012)

Lisa discussed the effectiveness of the lab as she considered her coworkers:

We actually have some employees that have not had the classes and the hands-on experiences, and they still really do not have a grasp. Of course, they did something a little different from what I did. It is hard for them to understand how to use the tools that we use every day because they have never been to a classroom setting and never had the hands on. Of course, we try to teach them, but it is different. (Lisa, personal communication, April 14, 2012)

Kathryn incorporated what she learned in the RLSPBL activity in her current work processes:

It was very useful because remember I said that talking about the CRV (presentation) how I had to recall the steps to put my CRV back together. I had to remember how to find the components, resolve issues related to what I had built. It taught me, it exposed steps that I could have taken to make my life a lot easier. It was good; it was very good. I have to be very good about recording ID numbers, okay, and I was very sporadic about that. So that was a good little wrap on my knuckles with a ruler. You know, and then, but if I didn't have the numbers written down, how would I find the material anyway? I mean I had to force myself to remember that you could get it by the Result name. But then, how did I name it? I could have a much quicker mnemonic that would have helped to grouped much quicker. So all that stuff I brought home, and when we came back that first Monday, my coworker and I sat down, and we made up some rule of how we could find our result with just a mouse click rather than going to the pre-loaded content. So all of those little skills, they are very useful because it taught me what I didn't do and what I should do for the future. And make me, force me to have all that recorded and put it all back together. It was very useful. (Kathryn, personal communication, July 15, 2012)

Elizabeth promoted her overwhelming positive response to the lab. "I have been successful from the very week that I returned from going to class and have used it ever since, and that was years ago" (Elizabeth, personal communication, July 2, 2012). She further complimented the activity:

It gave me confidence in a whole new area that was so foreign to me—that I had no knowledge of. I mean as a nurse, I would do training with my staff for the computer and stuff, but computers were not something I was comfortable with, and so while I knew exactly what my job was as a nurse and as a nurse manager—I knew what every day was going to bring and the problems I was going to have and patient care and dealing with people and everything—this was something totally different to me and to be successful in

> something that was brand new to me. I think I came to IS in April, and I went to class in June or July so fairly soon after I came to IS. It was something I could do; it was something I could do successfully. I remember when I was chosen to go to IS, my boss did not have much choice in taking me in this position. Well 12 to 18 months is what it takes to feel comfortable in the IS environment. I came to work in April, and the day before Halloween I brought our second facility on documentation on screens that I had built due to taking the class. I thought, "April to October—that is not too shabby!" To be able to have gotten that knowledge and felt comfortable and been as successful as I was with it; I was very proud of myself to have done that. (Elizabeth, personal communication, July 2, 2012)

Kathryn continued the same sentiment:

> Well I think it was definitely interesting and stimulating yes. For me it was like "OH my gosh!" When I first saw it, because it was like "Oh my gosh, it was day four, and I had to build it back up because on day five we had to go up to the front of the class and go through our whole thing step-by-step. I got to put this back." It was initially stressful, but it wasn't an incapacitating thing. It was something that said, "Hey, I can do this. Calm down and think. What do I know?" I know how to do this. That's where the challenge came, the challenge to me. To pull back what I had learned in the last three days before that. When I think now that I applied this to my work, finding that solution and eventually reaching success for a workaround, like how we do now. If something that we were told to do one way and it did not work and we get to that workaround, that's doing what we needed, brings you a real feeling of satisfaction. So yes, I would say it was interesting. Stimulating? Enjoyable? Yes. I would say yes after I had success it was enjoyable. I didn't freak, I did not, I did not lose <pause> it. I think also though, it was because it was at the end of the week, which it almost would have to be. If it happened at the end of day one, I have to ask myself would I have done what I did. I don't know. You might have to try on a class on day one. (Kathryn, personal communication, July 15, 2012)

She continued when the subject of the RLSPBL positively affecting her self-efficacy. "Yes, yes it did, most definitely. I carried that home, and I came home laughing, thinking about it a lot."

Bradley summarized the thoughts of many of the participants when discussing the RLSPBL activity:

> Again, (pause) if I had to pick a word to describe it, it would be "Realistic." And there is an incredible value, I think, that realism brings, especially to adult learners because we want to know things that are immediate, things that are applicable, and not just things that are theoretical. And the problem-based exercises take you out of the realm of theory, but not just into the realm of application because even application can only take you so far. It takes you into the realm of (pause) almost alternate realities. Because it's like an algorithm—if a problem takes place in a ten-step model, at step two the response to it

might be totally different if the problem occurred at step three. So if all I ever do is learn steps one thru ten in that ten-step model and never learn any of the possible alternate outcomes based upon problems at different levels, I do not know if I can respond to anything but to the things that are working properly. In this situation, I don't have any basis for understanding the path of physiology. (Bradley, personal communication, March 25, 2012)

Elizabeth expressed that the lab should be continued:

It should always be used; it was very worthwhile. I think the element of surprise was appropriate, so you should swear everyone to secrecy. I can see it being used in other classes because they have so many similar error-prone areas. Something like that to make them think through and drill down to lower tables, and I can see its use in other applications that nurses must use as a learning tool. I could see elements of it in other areas because you are always going to end up with something that you might not wanted. You will think of how you could have made a difference or can you go back and fix what you did. So I think it is part of other things, but sometimes, you just need to step back and let somebody make a mistake and you know you can then learn from these mistakes. I think that is part of the RLSPBL lab. It is a very useful tool. You need to continue to use it, and I know that it has helped me. It was a very useful part of my education when I came to IS. (Elizabeth, personal communication, July 2, 2012)

Bradley reflected on learning theories he has studied:

Well I think one of the things that is important to remember about it is that when you look at adult learning principles this is very consistent with lots of different writers who talk about the adult learning principles—like Malcolm Knowles and talking about bi-directionality of learning and this is a shared process—and I think that it is really important to keep in mind that the principle of problem-based learning is not just an idea that might be applicable in one place and not applicable elsewhere. It really speaks to the shared experience and the bi-directionality of learning because as an instructor when I present a problem and students respond to that, I inevitably learn something from their responses because they are different form someone else's responses. I can tailor future problems to these new experiences. So it's constantly evolving; it's constantly changing and hopefully improving the process. Because its reality based and because you know in healthcare that there is no script and that it's all in some manner or another flying by the seat of your pants from moment to moment. Because as much as we might say "give this person X milligrams of this drug and expect the following response," what do I do when I don't see that response? That's problem-based learning. I now have a new technique and a new way to look at the clinical picture that will affect my real-life scenarios from here on. So I think that's what is important about this—it's real-life; it's not just learning theory. Theory will only get you so far. It's learning what happens when the theory ends. What happens when you run out of the road that was paved by theory? Now you have to have some type of experiences that you can fall back on, and those experiences are usually best to learn through what we might call 'hard knocks'. That school of hard knocks is those problems—it's that set of problems that presented themselves to us that

> we learned through, that we worked through, and now has become the basis for we might think of later as our gut feelings, our response to future experiences. (Bradley, personal communication, March 25, 2012)

Billett (1999) indicated two types of experiential learning: routine and non-routine. Routine problem-solving activities are when known and established procedures exist. Non-routine problem solving entails new activities and encourages the individual beyond their knowledge. This often will result in new knowledge being created purposely. Francis summarized her thoughts:

> Comparing the skills you gained from the RLSPBL lab to other educational methods, you actually gained skills from that lab. For me to sit there and read something dry: not good. Instructor lecture: always good for me. I do learn very well that way, but actual hands-on problem solving, having to use my own brain—SCARY! But that's the way to do it. It was very good. It was excellent. This job that I have is very complex and reading a book or listening to a lecture does not work. (Francis, personal communication, June 15, 2012)

Her last pearl of wisdom encapsulated what other participants did not so concisely state. "It made me learn, and I use it to teach others <laughter>" (Francis, personal communication, June 15, 2012).

4.7 PBL Theme

4.7.1 Justifications for Using Problem-Based Learning

Cannon and Schell (2001) noticed using PBL in clinical education expands the range of knowledge gained in education. "Dramatic changes in health care have created many new challenges that require the critical thinking skills that are so much part of PBL" (p. 166).

4.7.2 Effectiveness of Using a Real-Life Simulated Problem-Based Learning Activity

Bradley introduced the effectiveness of the RLSPBL. "I think there are two different things that happen. First, there is the learning of functionality, which teaches you perhaps the

'HOW to'" (Bradley, personal communication, March 25, 2012). He also reflected on how the RLSPBL activity was an ideal PBL activity that prepares students for their work. "And for that you probably don't need the problem-based learning, but what it leaves out is probably the more important part of the equation which is when things don't go right." Then he discussed his second point:

> Do you know enough about how, whatever it is that does not work, that you can step back from your scripted response and figure out how to approach the problem in a way that you can solve the problem. That's what I think this kind of exercise does. It's not so much for me about the learning about the mechanics as it is the learning what I would call the 'path of physiology' of whatever it is we are working on. When things don't go right, (pause) what do you do? And when you don't know, I think you are at an incredible deficit because all you have learned is the mechanical response to an artificial situation. Because there is no way that any kind of education can give you all of the realistic scenarios that you might run into in a clinical setting. It just can't happen. So knowing that and knowing that things are going to go amidst, how do you teach that? I think that's the question I often ask myself, and my answer is you teach it with this problem-based type of scenario where you say steps one through three of this ten-step process went okay, and somewhere between three and four the wheels fell off. Now how do we get back on track so that we can do four through ten? (Bradley, personal communication, March 25, 2012)

When prompted to further describe what it was like to have two wheels fall off in a class activity, Bradley continued:

> Well, it's a scary proposition the first time you do it, because if somebody has not told you that this is what is coming, I think we are so (pause) acculturated as adults to learning functionality and the mechanics of how things work. Especially when you are dealing with something, that is as we are, software oriented. In order to say 'to do A, B and C, you need to take steps one through ten.' And I think we get so used to learning those steps that once somebody says 'we are going to stop at three, and we are going to throw a monkey wrench in this, this mechanism and it no longer will function in four through ten.' It's a scary proposition. For me as a nurse, it's sort of like learning those things in nursing 101 about the mechanics of taking vital signs and (pause) doing all of those things that we do as nurses to assess a patient and those are usually based upon norms versus getting a real patient and having those norms thrown out the window, getting results that don't fit what you expect. (Bradley, personal communication, March 25, 2012)

While Andrew found the RLSPBL activity a useful teaching technique, he indicated that he does not incorporate such an activity in his classes and then explained why:

> I do not use <pause> that methodology in class. Students will make their own problems, and they will have things that are unexpected. It is my expectation that if this happens, they need to figure out what happened and/or enlist the help of other students, and in that sense, I use chaotic learning, but it is not instructor induced; it is student-induced chaotic learning <laughter>. So the principle is basically the same—'something is wrong, something happened.' It's just that it was not structured chaotic learning. (Andrew, personal communication, March 25, 2012)

Although he does not use an RLSPBL activity, he extrapolated on its use elsewhere:

> The RLSPBL lab could be used in other classes. It would depend on—I think that rather than automatically inserting it in other classes, you would have to assess the knowledge level of the people attending your class and gauge their comfort level with the concepts that you teach in the first couple days in the class before you would hit them with the RLSPBL lab. So I think that it would need a sense of assessment of the learner before you choose to use the RLSPBL lab. But it could definitely be effective in other classes because it basically enhances your critical thinking skills, which are the key thing. It brings you to a higher level of comprehension, so instead of being trained on software, you are being educated on software. And the education component involves that higher level cognitive thinking skills that you need to understand how it all fits together. (Andrew, personal communication, March 25, 2012)

Charlie agreed with Andrew's conclusion of using the RLSPBL activity in other situations:

> I think so, I think so. Oh gosh, I really do. I think it stimulates you more, you know. As opposed to just Step 1, 2, 3, 4, you know. But I think it is more reflection of the real world. Again I can speak for my area. Gosh, we never had a clear cut 'okay here is the problem because this happened.' You just get, here is your problem, now solve it. I think the RLSPBL activity actually opens your eyes more on that. I really do. I can see because I face this every day at work. Mistakes show up and affect the printers in L & D. Problems are everywhere. I think it can be applied more in our system and in classrooms. Some hardware does not work. (Charlie, personal communication, April 10, 2012)

Charlie, Kathryn, and Lisa indicated that they learned best by having the clinically relevant hands on activities. Charlie re-counted:

> I prefer hands on. <pause> I think you know that first you learn the material and then hands on right after. I am more of a visual type of a person. The more I get my hands on it and look at it, I would prefer that. Of course referencing back to material, it's a good

> thing to look back at. Like now, the class that I attended years ago I can do those activities now. (Charlie, personal communication, April 10, 2012)

Lisa confirmed this in her thoughts about what was important in the class:

> Well, I would guess the hands on, and I loved the RLSPBL activity. It's a little scary at first when you don't know what it is. This activity imitates real life, and that's what you learn from. Yes, the repetition and a little bit of lecture to have an inkling of how to do the hands on, but I like the repetition; it makes it stick. (Lisa, personal communication, April 14, 2012)

Lisa related that the volume of work and need to learn a new thinking paradigm was overwhelming. "All of the hands on, the repetition of hands on that came from the RLSPBL activity puts you under, but that's how work is. It is very stressful." Kathryn elaborated:

> Hands-on is very useful in classes. I think you gave us more hands-on than any other instructor and that was very helpful because you really did learn the routine. The way it should work and even when it didn't go that way we knew why. It's okay because you learned. Hands-on was very good. You gave us a lot of time for hands-on. So in a way, it's repetition there to learn the way it's supposed to be, but actually it was the RLSPBL lab that you take home with you. I would say that in your classroom, the different activities that you gave us were what we took away. You taught us well the basic facts; you did it in the beginning. You went through things, and we did it over and over, and by having every student come up one at a time to your computer. There were ten of us, and I saw it nine times before it was my turn to do it. So there was good repetition. Everybody was doing it, and that was very helpful. So you knew how it was supposed to be. So then, you could draw on that. That was your known fact, and when you ended up with the RLSPBL lab, you could go back and say, 'Okay, I know how to do this.' You had to recall that. That's what we are doing now. My coworker and I—we come up with an issue, the known facts came from that original product that you are learning. (Kathryn, personal communication, July 15, 2012)

Betty found the RLSPBL to be a pleasant experience. When discussion turned to if the lab was enjoyable, she quickly responded:

> I would say enjoyable yes, but it was also stressful <laughter>. I mean, it was fun because it was something outside of the norm that we did not have in any class so far. I mean, and it made you think. When I say I don't like it, it's like maybe I am just one of those people who doesn't like surprises. So, when you have one thing one day that works, and you come in the next day, and 'Oh my gosh! What happened to it?" It's just <pause> it was chaotic! <laughter> It was chaotic, I mean, but it was fun <laughter>. You knew at the end of the day that you would be able to work through it because that's what real life is like. (Betty, personal communication, June 17, 2012)

Allison reiterated that this is how she learns. "It was very useful. I mean, that is how we learned to problem-solve in this software" (Allison, personal communication, June 17, 2012).

Betty agreed:

> Well, it was very useful. The experience helped you go back to think because you would say, 'Gosh, why is this not working? I can't figure it out!' Then, because it was in a classroom setting, we could still ask and say we needed help. You didn't really tell us the answer. You would say, 'Now remember so and so, go here, didn't I say it works here,' so it does help because it makes you think. Because believe it or not we do remember, some of the stuff, you say, but not all because it's a lot packed into one week. <pause> It does help. (Betty, personal communication, June 17, 2012)

Lisa discussed how she was able to learn and be successful:

> Well you have to be able to recollect what you have learned in the classroom. Of course every day you have different problems. You have to deal with all of those. And then it takes you to a place where you can look back and figure out and reflect on the experiences. (Lisa, personal communication, April 14, 2012)

She indicated she has some difficulty keeping focused on classroom material:

> I think that <pause> I am always thinking, I am kind of a dreamer, so I have to be engaged in what's happening in the classroom setting. And of course the more difficult it is, the more intriguing and the more engaging it is, and then the higher level of comprehension, and it just builds each piece off of the other. (Lisa, personal communication, April 14, 2012)

She continued relating her experience:

> It was very interesting <laughter>. When I first did the RLSPBL activity and had no idea of what it was—no inkling at all—and of course everything is messed up and you have to think back 'What did he say, this stuff and this stuff?' You just have to get in there and look at the way things are setup and see what and how it was set up wrong to cause the problem. Once you get off of the high stress anxiety of it, it's very stimulating and makes you use parts of your brain that you really have to dig in <laughter> to see what is going on—like a puzzle. (Lisa, personal communication, April 14, 2012)

Elizabeth commented about having to use your brain. When asked if the RLSPBL made her think, she responded:

> Yes, because you had to think critically to solve the problems. I think that is one thing that I brought into IS from nursing was my critical thinking. To be able to think through consequences, to think through causative factors, and to kind of take all of that into

account and be able to delve deeper and investigate and research and figure out and I think that is critical to what we do as an analyst on a day-to-day basis. That is kind of what I did as a nurse. That is what we had to do in the RLSPBL lab. We had to delve deeper and figure out what happened, figure out how to fix it, figure out how to fix it right without breaking something else. And it was all part of the critical thinking skills brought into IS from nursing that have been fine-tuned a little bit to the IT environment, and I think the RLSPBL helped to do this. (Elizabeth, personal communication, July 2, 2012)

Francis had a different answer to what enabled her to learn:

Personally it's a combination, and it depends upon what part of the software cycle I am at. At the very beginning, it's just like you do in your classes. You start off with an introductory. You kind of ease us in, ease us with lecture. Then, you give us a little bit of hands-on. I don't think you did the RLSPBL activity until Wednesday of that week, which was perfect. And it's actually a combination. Reading for me is an "on my own" kind of a thing. Nah! And with the software as it was for this class, reading is not working for me. And structure, facilitator lecture, with hands on, and then the RLSPBL activity. It kind of got more deep down into 'Hey, what kind of issues can come up out in real life' worked very well for me. (Francis, personal communication, June 15, 2012)

Kathryn indicated that she enjoys doing puzzles because the puzzles require use of the brain:

A major skill would be critical thinking. You need the ability to go back and pull out of your memory and determine what the known facts are. What it should be doing and stuff like that. Experience you would have to solve these difficulties, but each time you come up with a problem, that builds knowledge. So the more exposure that you have to problem-based learning, you know, you would remember the solutions that worked in the past. That type of experience would help you solve the difficulties. (Kathryn, personal communication, July 15, 2012)

Problem-based learning is useful; however, Andrew mentioned another requirement to learn:

As far as successfully teaching students with the software, one of the key components is: Have they had exposure to the software? If they don't, then it is like learning a new language, and they can't even begin to converse in a language until they learn it, so they can't begin to build in the system until they know it. If they have had it, then some of the key things to consider success with using the software are: real-life applications with "real-life" meaning their real life back at their role in their hospital. Also, understanding how the work that they do impacts the work of others and how the work that they are going to do can be more or less effective in impacting the workplace flow of other people. (Andrew, personal communication, March 25, 2012)

Bradley related how systems administrators need to have the opportunity to do PBL activities to prepare them for the work ahead:

> Well I think one of the things they need and one of the things the RLSPBL exercise specifically gives them is the idea that (pause) it is functionally impractical to always think in the linear fashion. You don't always start at step 1. Sometimes you have to start at step 3, go back to step 1, and then fill in the blanks because sometimes there are problems that crop up that force you to do something out of order, and sometimes it is expedient to do things in a different way. So I think that this teaches that what is necessary for success is this non-linear thinking. (Bradley, personal communication, March 25, 2012)

Bradley encouraged the use of PBL learning to get participants away from a scripted approach. "The being open to alternative ways of doing things" (Bradley, personal communication, March 25, 2012).

Charlie's current job requires him work on many projects and applications. He related the importance of having classroom activities that are engaging and difficult and require higher levels of comprehension and skill development. "I think classroom activities should contain all of these aspects. I guess it kind of depends too, you know, if you are doing 'Intro to whatever,' or are involved in something more complex." He continued, pointing out the process he went through while learning the applications:

> Of course you know the population of students you get. They are newbies, and in a way, I was there! I was in Operations 100, those basic prerequisite classes. I was grateful that they were basic, simple, to the point. Okay, now that I have that under my belt, I want something more challenging. Know what I mean? I already know Care Organizer, I already know your Care-Relationships. I already know how to get to the forms to define things like that. Now, I would like to, when I go to another class or another class that I need to attend, please be more engaging, more challenging because, again, of course, I am just thinking for myself. I like to be challenged because it kept you thinking, you know. If it's not so basic 'that, man, is all I need to learn?' It's like when it's more challenging, and you figure it out, you know more about it. I can go ahead and turn around and say this is like my work area. This is my little neck of the woods back at home. Because it's not as simple as 'Okay, it's a printer issue: you know what it is.' You know what I mean. You have to dig down and go to the Lenix side, the operating system side, you know. I think that it's both, if a student is new at it, course they are going have to go to the introduction to whatever class, right? In the introductory class,

> they make it simple like that, using step-by-step instructions. I've got it. Now, I got the basics, show me the intermediate stuff. Show me the more challenging stuff. It's a progression I think. And as a matter of fact, when we went to another class, luckily the rest of the folks there were on the IT side of things, so we just kind of let the instructor know 'Hey, we have got all of that.' The book pretty much is basic, we got it. Now, this is what we would like to learn. Not necessarily the syllabus of it. Kind of like in your class, you know you get a feel for everybody. Sometimes you have to channel down, and sometimes you have to pick it up. (Charlie, personal communication, April 10, 2012)

Allison and Betty believe in doing as much PBL as possible to provide the experiences needed in their jobs. Betty began, "Experience with the software and communication" (Betty, personal communication, June 17, 2012). Allison confirmed: "Experiences would be trial and error and just doing it until you get it right. Until you learn, like what Betty said, to ask the right questions to get to what you need. You got to have a lot of problem-solving skills" (Allison, personal communication, June 17, 2012).

Allison's evaluation of the course and instructor included comments about the creativity of the PBL activity and its innovative nature. She indicated that it was a "clever way" to teach real-life content. "Wonderful innovative creative methods used to teach some very hard to grasp material. The RLSPBL activity was a very clever way to teach/show what happens in the real world." Other comments from student evaluations supporting the use of PBL include the following: " list a few other comments and the name of each interviewee."

4.7.3 The Need for Context in PBL

> Allison described the problems she and Betty see every day:
> They are poorly structured 99% of the time. You get a request. First you have to figure it out; you have to find out what they are really asking. Get to the root of it, and then go forward with that, but they are not, usually, they are not cookie-cutter at all. They don't just come in and say, 'I want this built.' You have to guide them. (Allison, personal communication, June 17, 2012)

Betty pointed out that often the origination of the problem is far removed from the

information presented to her. "And a lot of time we get it second hand. It's not the person that's requesting it. It's not always the one who gets us the information, so we have to say, 'Did they mean this or this' (Betty, personal communication, June 17, 2012). At that point, Betty must take the time to return to the requester for clarification. Betty added, "Typically, it's the same person that's coming at you saying, 'Uhm, Dr. So and So wants this,' so after a while we say, 'Is it this way that they needed or did they want it this way?'" (Betty, personal communication, June 17, 2012)

4.7.4 Gaining Confidence through PBL

Kathryn indicated that she needed as much PBL as possible to learn the complexities of the software:

> Okay, you know that there are problems that we are going to encounter in our workplaces that occur randomly. They are never identical. From day to day, you just never know what this is going to be. So the solutions that would emerge had combined prior knowledge and the new recently gained data. (Kathryn, personal communication, July 15, 2012)

She continued to elaborate on how the PBL activity needed to by complex:

> It must be engaging? Absolutely. Absolutely, yeah you have got to think. You can't just have a list of steps to follow. The steps that you follow just don't work. You have to figure out why something is not working. That's why a manual does not help. Some are so outdated. They are not correct, so unless you are keeping up with your step-by-step, but even step-by-step doesn't always work. (Kathryn, personal communication, July 15, 2012)

Kathryn also stated some of the very same opinions as she evaluated the class:

> Great instructor. Great interactions. Uses multiple different methods to facilitate learning. RLSPBL activity extremely helpful. Excellent overall. I learned a lot more this week than I did last week in another class. Each instructor should use these techniques instead of reading from the manual and letting you demonstrate. He did not use the manual much at all yet I feel like I learned a lot more in his. (Kathryn evaluation of class. 5/09/11)

This statement from Kathryn confirmed the work of Barrows and Tamblyn by indicating that she

avoids the books and relies upon her experience and knowledge. The complexities of the software were learned by doing the PBL activities, and as Irene stated:

> Yes, it was real life, and it helped me to transfer knowledge and experience back to my work. I could not have done any of that off the gun. I could not have got that from a web-based training—without any knowledge of how to design or build. I mean we were slammed with class after class, and we knew nothing. We had hopes that we were able to come back and build the system, which we were able to do because of the classes; however, we did not initially have a system. (Irene, personal communication, July 5, 2012)

Not having a system before class removed the students' abilities to familiarize themselves with the software. When asked if the RLSPBL activity was too much for her to encounter, Irene replied:

> <Much laughter>. No, I was not crushed to that point but I definitely walked away that first class thinking that I possibly had taken a job that I was very worried about it. We came back here and talked about it for a while. Of course we did not have the system, so we could not jump in right the next day. The system was being staged. We went to class early, and it was a month or two before we got our hands onto the system where we could get in there and explore the system. There were a lot of group discussions about how to go about it, the best way to do it, and that kind of thing. (Irene, personal communication, July 5, 2012)

Irene wanted to make sure this PBL activity is experienced by her employees. She laughed about how this lab assumed a different perspective based upon which unit the participant was working in the hospital. She enjoyed thinking how others will handle this lab in the future: <Much laughter> Do it to us again <laughter>. We do not like it, but we want the opportunity to troubleshoot again. I remember the frustration I had with reports, and I had placed a space in the report name, and you allowed me to figure it out. She bragged on the lab, and when asked if it was important to have PBL from the beginning, she was very fervent in her response:

> Absolutely, if I had just been sitting there and only watching, you would have lost me in the first hour. If I couldn't do the work, I would have not gotten anything out of the presentation. I think that was one of the greatest things. Here is how you do it; now let's do it. Here is how you do it and now come up front, and do it in front of everybody. All of that was great. (Irene, personal communication, July 5, 2012)

Irene interview was very close to her thoughts when she first took the class and evaluated it: “The class was all I hoped it to be. I have learned so much with this class in spite of the RLSPBL activity. The instructor is amazing. He taught everything we need to know and the RLSPBL activity cemented the insights and taught troubleshooting. We all were very successful. I was glad to be in his class.” (Irene evaluation of class. 9/21/09)

Charlie’s enthusiasm for PBL was evident when he related what he would include in a class if he were designing one:

> Problem-based learning, you know, I am sure you don’t mean day one PBL. I think you have to cover the material, and in between those, you have hands on. Okay. And I think the way we did it, your class, with hands on, looked at the book, hands on. And then the next day, the RLSPBL activity occurs. That‘s great because you learned that material, and you guys were not expecting us to learn something we haven’t even learned about. Right? So I think the combination of those. I mean I don’t think it’s a just one-way kind of approach. I think the way I’ve gone, especially in your class, is best for me. I referred to the book, learned it, hands on, got in there, did the steps, and the next day, a PBL activity shows up. Kind of like real life; you had to remember what you learned. I think that to me, I retained a lot more information that way. (Charlie, personal communication, April 10, 2012)

Charlie enjoyed the use of PBL while learning. He mentioned that it is his ideal way to learn. He confessed that his confidence rose:

> Yes, it makes you feel a lot more confident. It got scary, and you fix the problems and move forward. At work, the lab enabled you to think back to what you learned in the classroom as far as lecture and out of the book. Then you have to think back to the PBL experience and think, ‘Okay, maybe I had this category on the wrong Result, or I didn’t have this cluster were it needed to be.’ It definitely makes you think back to other experiences. (Charlie, personal communication, April 10, 2012)

Allison agreed:

> Hands on, problem solving, because you cannot take our jobs and say you are going to do this and this and this. Every day you come in, and you have an idea of what you are going to do and try to get accomplished. But I guarantee you it is going to change the minute the phone rings. Your goals and objectives, something broken, and you have to try to figure it out. (Allison, personal communication, June 17, 2012)

Betty confirmed Allison’s thoughts:

> You have to have the problem-solving attitude because you can be right in the middle of something and the phones start ringing or somebody comes to your door and you have to stop what you're doing and think, 'Okay how can I take care of this issue?' Because you have to do it right, so you have to be able to change on a minute's notice, so problem solving is the biggest thing. (Betty, personal communication, June 17, 2012)

Lisa also expressed her improved confidence after she completed the PBL work:

> It was enjoyable when it was over. <laughter> It's not enjoyable when you are first going through it. Later in the class, I did think it was more enjoyable because I knew more about it. As the problem-based activities increased, I found I had more problem-solving skills. So I found every day the PBL activities were enjoyable. It was the experience of succeeding and figuring out the puzzles that made the learning enjoyable. (Lisa, personal communication, April 14, 2012)

Dunlap (2005) discussed the salient factors of using PBL. "In problem-centered learning environments, students have opportunities to practice applying their content knowledge and workplace skills while working on authentic, contextualized problems and projects "(p. 65). Francis related what enabled her to learn. "Hands on and problem solving. Lectures help me at the introduction of a subject and discuss the product, the scenario. Hands on, if that is applicable; problem solving with RLSPBL labs are awesome" (Francis, personal communication, June 15, 2012). She mentioned that in nursing school, she did not have anything like this. Francis then remembered her nursing school:

> If they can apply it and if there was a way, then it is a good method of education. Good method to educate others, it really is. Like on the spot, your life is upside down. This is not how you left things, and it is new to you. We've been over the content; now fix it. I just took masters classes. I finished last year. If there was anything like this, I can't remember. (Francis, personal communication, June 15, 2012)

Elizabeth recounted how the problem-based learning style made her very comfortable:

> <much laughter> I don't think it is that I am that good because I can still make mistakes, but <pause> I am that comfortable with the software, and it doesn't scare me as it did years ago. And I have done a lot of it for many various areas in the hospital. (Elizabeth, personal communication, July 2, 2012)

Argyris, Putman, and Smith (1985) actually determined it good when participants made mistakes:

> Errors are raw material for any learning process. Curiously, this is a proposition that participants understand conceptually and advise others to follow but that virtually all of them discard in action. When participants discover errors, they act as if they believe that they are not only wrong, but wrong for being wrong. (p. 287)

Most people think of mistakes as being wrong and frame it that way. Errors are taboo; they will stop a person in their progression towards completion of their tasks. We react to others' mistakes with anger possibly. Errors should be covered up or punished. Argyris et al. boasted a different approach to errors. "An alternative frame regards mistakes as puzzles to be engaged and solved, thereby making them opportunities for learning" (p. 288).

"A step-by-step outline certainly does not accurately detail my job," Kathryn related. She elaborated on how she learns:

> I kind of wonder could it for anybody's job. Each day brings a challenge which is not really covered in any reference manual, so I don't think any educational technique could cover all of the scenarios that could occur, but the RLSPBL lab type of experiences forces you to use previous learning and really makes you think critically. That really is the number one educational technique that would prepare you. Any time I learned something via a hands-on trial and error where I have to physically do something based upon 'okay let me see if this works' kind of thing, I retain that knowledge rather than saying, 'I vaguely recall the professor saying something about this, let me go look up in the manual.' I may not find it in the manual, and I don't recall it. I retain stuff much better by doing it myself— by working out the problem and arriving at a solution— instead of saying, 'I vaguely remember something that he had said' or seeing it in the manual. So the skills that you get from problem solving on your own stuck with me. (Kathryn, personal communication, July 15, 2012)

Just doing a PBL does not complete the circle of learning for Kathryn. She clarified that PBL is not enough; that there has to be context:

> It does some, but something has got to trigger my experience. Something must trigger what the instructor said related to this or that. Whereas I said, 'I know it worked this way because initially I couldn't do it, and here is what I did.' I did these steps to get to where I wanted to get to. I know it because I did it rather than 'I remember it' out of a book or a note. I hope I am clear. (Kathryn, personal communication, July 15, 2012)

4.8 Transferring Knowledge and Experience Back to Job Theme

4.8.1 Fundamentals of Transferring Education

A hopeful outcome of a corporate educational event is the ability of the employee (the student) to transfer the knowledge gained from the experience of the class to their workplace. During the discussion of the RLSPBL activity, Bradley emphatically expressed knowledge was transferred:

> Absolutely! I think that what is, at least, what's important for me is at the time of doing those kinds of exercises to realize what the purpose is. Then being able to take that purpose and kind of backwards engineer it to apply it to the workplace. To understand that it's not just about saying, 'Well the software normally works this way and here today it didn't.' It's to say, 'Things do not always go the way any of us expect them to' and learning to expect the unexpected. (Bradley, personal communication, March 25, 2012)

4.8.2 Participants Transferring Experiences

Kathryn worked in an environment that is "puzzling," and she must focus on solving those puzzles:

> At work, the software problems are poorly and ill structured! They are messy! We just can't figure it out, and we just know something is not working, and we have to figure it out. "Well, wait a minute. What have we done here? We did it one way yesterday, and it was working, something's not right now!" So it's not very obvious; it is a poorly structured problem. It has a lot of missing information in the detail. The RLSPBL activity provided the process on how to investigate problems like this. That activity enabled me to feel confident in my troubleshooting and that confidence has transferred back to my work. (Kathryn, personal communication, July 15, 2012)

Kathryn continued:

> So you have to sort out what is known, what is definite, and what is unknown. All of that involves thinking, critical thinking. And then part of that—it is not just me and my coworker. It usually starts with just us two; we will start working by ourselves, but then we bring in other people, usually the super-techie guys. And then we sit around, and we start listing all of the facts and stuff. It's kind of neat in a group setting to come up with our solution. A possibility—it's not a solution yet because you have not proved that it works. But to come up with possible ways, it's fun. To see things being tried, to solve this problem, and it's neat to come up with a solution. It's a puzzle, and I am a puzzle person. I don't really look at it as a problem; I look as it's annoying sometimes when you

> have a deadline, but other times it can be a lot of fun. (Kathryn, personal communication, July 15, 2012)

Andrew was not as expressive as Kathryn, but when discussing the transference to work, he spoke enthusiastically about the RLSPBL activity's affect at his work:

> Definitely because when you, <pause> it did help transfer knowledge to the workplace when I went. And it primarily when you are learning in a classroom that has a more structured environment, it's not the same environment that you are going to encounter when you go back to the 'real world' of your hospital situation. In those situations you don't have necessarily the right backup people to ask questions and troubleshooting. It is you. And so when you encounter situations in a safer environment such as the classroom experience, where you encounter situations where things are not working as expected, you have the resources available to you to troubleshoot those problems and help you engage in more analytical thinking as far as what happened and why didn't it work the way I wanted it. So as far as preparing me for going back into a role as a clinical analyst at a hospital and as an implementation consultant, it was extremely valuable. (Andrew, personal communication, March 25, 2012)

Dewey (2007) indicated that students may not want to expend much effort while learning. The bottom line is that we often do not want to delve into deep thinking about a problem. For education to occur, educators must take the students to a level where they must think deeply and go below the surface problems that they see.

Irene highlighted the experience of returning to her facility and discussed if the knowledge transferred back to her workplace:

> Yes, I would say so. Some of the stuff that we saw in the lab was accurate. We have had similar difficult and weird stuff, and we had to go back and troubleshoot all of that. So yeah it did help, and it was realistic to what we see today. Something was there yesterday, and all of a sudden it is not there today, and you investigate and find out why. (Irene, personal communication, July 5, 2012)

Not transferring the experience to her work would have been a problem for Irene. "It had to be based upon what I was expected to come back here to do, or my boss would have been calling your boss saying you did not teach her anything" (Irene, personal communication, July 5, 2012). The use of contextual material also was important. When asked if she could learn the material

using non-clinical examples, Irene was quick to answer. "No, I don't think so. That stuff was okay to play around with and get an idea of it, but no. We had to build real stuff down there to try to wrap our arms around it and get your input while we had your attention."

Lisa also responded in the positive about retaining her experiences after returning to work:

> Yes, everyday it is always a mystery to what has happened. I had a coworker, and she goes in there and does something, and I have to figure out how to fix it. Well it's chaotic, and usually the problems are poorly structured because you have to figure out what the problem is and then you have to think about what steps A and B are that led to the problem, and then you have to back track. But the RLSPBL experience kind of helps you figure out how to think, or think ahead or think fast about what might have caused the problem. (Lisa, personal communication, April 14, 2012)

Elizabeth mentioned how the RLSPBL activity related to her work:

> I think as an adult it's more important for me to learn kind of real things, and I think if it had been not so easily tied back to work I knew my job to be, I don't think I would have paid as much attention to it, would of not thought that this was as important as it was. Would not have worried so much about could I undo what had been done. Wouldn't had taken it as seriously, but I think the fact that it was kind of reality based—it was something that I knew I would be using that made me make the notes, make the effort to make it work. You know I had the expert with me, and if I was ever going to make it work, make it work while I had the expert as a resource and be able to take some of that knowledge back to my job with me so had it not been meaningful it just <thinks> it would not had been meaningful. Had it not meant something to me and something that I deemed to be important, it would had been just another, 'Oh I did this today and yeah that was out of my head' and I would never had thought of it again. (Elizabeth, personal communication, July 2, 2012)

She reflected further on her transferring the experience to work:

> It was us doing the RLSPBL lab and having success at doing it. Because I do not want to be read to, or read it in the book even though I have the book as a reference and can look back to this day. It was the doing it, it was the success with doing. It was the realization that it's not ever as broken as you think it is, and you learned not to do this on Friday afternoon. You learn not to ever screw with something that is going to possibly have downstream effects. It showed the importance to think about downstream effects. That something that we may identify as a problem may not effect anything. On the other hand, even though the change is not seen in one obvious place, it affects other parts of the software. This kind of thing affected having success at work, and it was very confidence building for me because I came into IS with a nursing back ground. I knew nursing, and I

> did not know IS, so to feel successful as complicated and as convoluted as this software is sometimes was a big boost for my morale in IS. And <pause> I still use those same skills today with everyday remedy tickets, helpdesk tickets. That kind of approach in the build I still do today. I am still the only person that is building graphical user interfaces. (Elizabeth, personal communication, July 2, 2012)

When further pressed, Elizabeth indicated:

> I think it was all of it together. Because you had to have the hands on to get your basic knowledge, you needed the problem solving. The RLSPBL lab presented the opportunity to use the other two and to begin to be able to relate it to reality to what I do on a daily basis in my real job. This made it particularly important because I could see the value in effecting the skills and using them going forward, and I have used them immensely. I have used them in work and putting together training programs, and I have used them quite a bit since I have come back. (Elizabeth, personal communication, July 2, 2012)

> Bradley discussed how the RLSPBL activity affected his success at work:

> I think it's made me more successful than a lot of other people, and there is a specific scenario that I think indicates this. The difference between being in a class where these problem-centric exercises are worked through and someone who is new on the job in a hospital whose predecessor or peer teaches them the mechanics of the same system; there is a vast difference between what I know about the system and what those people end up knowing. It's not me specifically; it's not just my experience. It's played out over and over again with people who have gone through the class and have had this type of problem-centric exercise, worked through it, and understood how the system works and how it doesn't in contrast to those people who are simply taught the mechanics by a peer. I see it from the outside working with a lot of those people on a contractual basis. Anecdotally, I do not have any figures to back it up, but my experience is those people who learn from peers do not have anywhere near as good of a handle on the background mechanics as people who have gone to class and participated in the RLSPBL. (Bradley, personal communication, March 25, 2012)

> Francis discussed the lecture, hands-on, and RLSPBL as a reason for her success at

transferring the classroom experience back to her work:

> Yes I was able to transfer what I learned in class back to work. I guess for me a combination of all of those listed. I honestly, particularly <pause> liked the RLSPBL activity! This lab, quite honestly, and I have told you this before, it just kind of made you think outside of the box. Okay? Here is the lecture. Here is the repetition. Here is your hands-on, you know, lecture, discussion amongst us blah, blah, blah. And then on that Wednesday, you made us think. You made us turn on our own auto switch and go, 'Oh crap. What happened?' It's a combination. (Francis, personal communication, June 15, 2012).

Francis also stated in her evaluation of the class, similar thoughts: "I can build and understand the build process now. The RLSPBL lives in my system and now I know how to handle similar problems. This instructor was the best adult educator I have ever had in my 15 years of clinical and nonclinical career.

4.8.3 Using Real Problems in Classroom Activities

Andrew expressed the need for reality in the classroom—that exercises should exemplify the true context of his hospital situation:

> It was realistic in one sense, that there were unexpected developments that showed up in the build. It was a tad unrealistic because someone else did it, and so I did not have ownership of the problems that I encountered as a novice builder; however, looking back as an experienced builder, I have a different perspective. As a novice builder, you are going to make those mistakes that someone made for you in class, so in that sense, it was a real-life experience. Because the mistakes were made by you or someone else or if you are working in tandem with another analyst at your hospital and that person makes mistakes and does not know how to fix those mistakes, you're going to be called upon to help them. So in that case, yes, it was definitely similar to a real-life experience. (Andrew, personal communication, March 25, 2012)

Charlie depicted his ability to take back to his job the needed experiences important to his success:

> Yes, I have been able to transfer what I learned to the workplace. I think you hit it right there; repetition and problem solving is the key. I think I can speak for all my colleagues, if you don't use it you, lose it. And it also helped us because when you got back, you know, we didn't have time to forget it. We went there and applied it, and then I worked all the while, and I use it every day—better. Now what we learned, at least the portion for me, I am sure everybody else and reference those things, the materials, personal notes, things like that, but the key was the repetition. Got into the system right away, able to apply what we learned, what we saw in class. Something like that. To me, that was very helpful. Like I said we didn't have time to forget it, you know, we were in the middle of a build. And even some of the stuff, that I think you remember, that we had created for ourselves you know, kind of like, the project you told us to build it. I built it kind of like I thought we should build here in the hospital where I work, so that too also helped. So I kind of knew what our path was going to take, what kind of stuff, what type of material we were going to build. So that also helped. (Charlie, personal communication, April 10, 2012)

Charlie continued as the discussion moved to the orderliness of the work environment:

> Orderly? No, No sir, far from it <laughter>. They are chaotic, little things, and also, it's not our only system. We have multiple systems that we oversee. I myself have several systems. So, it can be gosh, from one end to another. From charting forms, web-based presentation forms, and clinical printing to network printing; it varies. So yes, it is very non orderly.

He next explained how he has been successful in such a disorderly environment:

> Uhm, man, experience of course you know. I think for me experience is the biggest thing, and I have been in this field for several years. I think experience is the key, and of course training. Another way to help me to be successful was I think, trying to be organized and prioritized things, as we see fit. We don't have that luxury over here where we work, that we have multiple people on one project. We have only a single person; even now I have three projects ongoing. Different projects, so I think, with me the way that I prioritize the major things, besides of course the experience. I know what to expect, of course, the addition of help from other co-workers, managers, and other resources from my group and a lot of combination. But I think mainly for me it's my experience. And I have been in this game for about ten years now. So experience because you already know. Projects come along, and you kind of know your game plan already because you have been down that road, you know what resources you have and don't have. And if you don't have it you can go to your supervisor and say 'Look I need this and this,' and I think that goes back to your experience. I think that if you are green at this, you can be overwhelmed. Even now with my experience the CPOE, that's one of my major projects, I am the technical lead there, and it's very overwhelming, but I kind of already knew what to expect. Now, I think experience is the key. (Charlie, personal communication, April 10, 2012)

> Lisa felt that the RLSPBL activity prepared her for her job:

> Yes, definitely, <laughter>. I didn't know it at the time, but it was definitely a sample of my future work. If I knew that my job was going to be the way it is <laughter>. My job is stimulating, but it is high stress. But at least I am prepared because of the RLSPBL activity and know how to handle it, but it is very stressful. (Lisa, personal communication, April 14, 2012)

Many of the items we learn, we must do by practice, failure, and then retrying. The experience of failure adds to success. While the activity was stressful, Lisa continued with:

> It transferred back to my job. It was wonderful. It's useful in that it does simulate your job. The problems you will have with the RLSPBL lab are the same problems that we have at work. Something doesn't work and is it because that's how it was meant to be or the process failed because this category is in this place or it helps to go back to design

> and enter all of your results and make sure everything is where it should be. It was very, very useful. (Lisa, personal communication, April 14, 2012)

Lisa then described the skills the activity allowed her to gain:

> I think that the RLSPBL gives you skills because you are hands-on and you are faced with something that is not in the book or the instructor just can't lecture you or read from the book about. It takes real-life problems, and of course you have to use what you heard or read to try to figure out what the problem is, which is how work is. (Lisa, personal communication, April 14, 2012)

Betty and Allison spoke about how the RLSPBL activity helped transfer knowledge back to work. Betty started:

> I guess you could refer back to the issues we had with trying to figure out that software security. Because, I mean that was a booger. And just one day the light bulb came on and you know, once it clicks, it clicks. The activity allowed us to learn in context to our future work responsibilities. To experience what our jobs would be like. (Betty, personal communication, June 17, 2012)

Allison added, "YES! It did for me because <pause> in some of the changes that you made in the RLSPBL activity, I may have done the same thing. I then had to go back and remember where to figure out where I messed up" (Allison, personal communication, June 17, 2012). Betty brought up the dynamic workplace. "And nursing is always changing." "Oh my gosh, yes!" Allison agreed. Betty highlighted the continuous need to redesign and rework the interface build. "They are always changing their minds." Allison continued, "They give you a design and want you to build it this way, and then they say, 'Nope, I want it totally changed.' You have to go back and undo, unhook." Betty completed this exchange, "Yes, I agree" (Betty, personal communication, June 17, 2012).

Francis offered similar sentiments about the lab's usefulness and application to her workplace. "Yes, definitely – it activated my prior work knowledge. Definitely was in context to my future work. And the RLSPBL helped to transfer my experience back to my work" (Francis, personal communication, June 15, 2012).

Both Allison and Betty brought up that the experience of the RLSPBL activity transferred back to the workplace. Allison then specified what else she has to do to be successful. "But you have to get in, close the door" (Allison, personal communication, June 17, 2012). When asked to clarify, Allison related that they both needed isolation to redesign for the clinical staff:

> We have to close the door to our office. In our experience, I don't know if you remember, we started down that path and then five months into it we were on a different path. We waited several months before we implemented pharmacy software and had to go back and pick up where we left off.

Betty and Allison then indicated that even after months of not using the software, they were able to get back in it and complete work. When asked to explain, Allison said, "It was deep in our mind" (Allison, personal communication, June 17, 2012).

Osborne, Houston, and Toman (2007) indicated that to design a realistic simulation, real-work problems must be incorporated instead of just creating hands-on activities for students to do busy work (p. 125). Bradley relayed that he uses the RLSPBL activity in the classes that he teaches:

> I use it in other ways. I teach health information technology project management, and I use it, not in the same sense, because we don't have labs where I can actually break things for them, but I do it in the same way by asking problematic questions. In response to discussion postings where students will say 'This is how I would describe how to do X, Y, Z', I'll post questions that would say, 'Okay, what if that does not work? What if you were given a roadblock?' It can be as simple as something that I was doing today; I was grading a paper that had to do with formation of a project charter and plans for collaboration in a project. And it calls for plans for how to collaborate, how to communicate, what to do to mitigate risks and conflict management. And some students would write things about what they would hope happens. They talked a lot about professionalism and respect for each other, and if conflicts come up, the other students should do X, Y, Z. My response to that is 'tell me what you will do when that does not happen? This is all well and good to talk about professionalism and respect for each other, but what are you going to do specifically if you have someone on your team who does not respect the rest of the team? Who does not get their work done on time? And you can't reach them? How long specifically are you going to go along certain lines before you adopt another plan? What is that plan? And what are the mechanics that you are going to put into place to make sure the work gets done?' I think that this is another offshoot, a different kind of example of exactly the same type of thing. It's placing

> problems, roadblocks, in the way of asking what do you do when things don't work out the way you think they are supposed to. (Bradley, personal communication, March 25, 2012)

Irene has sent others to the class as a manager of the project. Her experience with them after they went through the lab is that "they were more productive beyond the skill level they had before the class. Some of the pieces were a little bit different between what I taught and what they learned in class, so we discussed this. We shared the experiences and our knowledge" (Irene, personal communication, July 5, 2012). Kathryn confirmed what raised her skills back at her workplace:

> The RLSPBL exercise! The lecture and discussion had value to it, but you did not spend much time starting at page one in the manual and going through it. We didn't refer to that at least I don't recall. I just remember taking minimal notes in my book. It was just a lot of opportunity to do it ourselves. I am going to tell you that some of the classes in Dallas, I forget what class it was, when the instructor takes control of our computers; I did not learn anything. (Kathryn, personal communication, July 15, 2012)

Kathryn discussed what did not work for her:

> I am going to tell you there were a couple of classes where 95 percent of it we were watching the computer with the teacher/instructor doing it. Then you just got turned over to do a pre-printed exercise that was handed to you, and we went through that. It was designed to work, and it did work because all of the possible land minds and pitfalls were removed for you, okay? So you did go through that exercise. Bravo you got the result you needed to get, but it did not help when we came home, and it didn't work that way. We needed to have little RLSPBL to blow up on us. (Kathryn, personal communication, July 15, 2012)

Francis discussed that her work often has no order to it:

> Not orderly. They are poorly organized; they are haphazard; you don't know what is going to come along. When a problem comes up and it's usually a customer, a clinician complaint, 'This is not working, something's not right, they can't see something.' Or we are QA-ing something that we built and uhm <pause>. Yes! No, it's never orderly, otherwise it would be like open up the book and follow 123, and here is your answer. It is never like that. (Francis, personal communication, June 15, 2012)

She related that taking classes with problems she was expected to solve has helped her transfer the skills and knowledge back home. She completed this thought with singing and laughter and

continued:

> I was going to say I have used a similar technique in real nursing as an RN. Before I let a trainee go on their own, we had them stand on the side and discuss the case. 'What if this happens, what if that happens?' 'What if the patient had an air bubble in their tube?' I would not ever place an air bubble in their tubing to make them discover before something bad happened, but there would be times where I would see them do something wrong and have the wrong gauge needle, and I would stop them and discuss if they saw anything wrong. Not the same, but it kind of is that. (Francis, personal communication, June 15, 2012)

4.9 Shared Experience Theme

4.9.1 Sharing an Experience to Enhance Learning

Fraser and Greenhalgh (2001) outlined capabilities workers should possess. Traditional education and training largely focus on enhancing competence (knowledge, skills, and attitudes). In today's complex world, we must educate not merely for competence but for capability (the ability to adapt to change, generate new knowledge, and continuously improve performance). Capability is enhanced through feedback on performance, the challenge of unfamiliar contexts, and the use of non-linear methods, such as storytelling and small group problem-based learning. Education for capability must focus on process (supporting learners to construct their own learning goals, receive feedback, reflect, and consolidate) and avoid goals with rigid and prescriptive content.

One item that arose from multiple participants was the shared experience they had in class and different experiences from others who were not in the class. Andrew called this the 'Unshared-shared experience.' When questioned about talking to others, he responded:

> Yes I have discussed the RLSPBL lab with other individuals. It's sort of a standing joke among people who have attended the class because it's sort of like 'misery likes company' because everyone who has been through it knows exactly what you mean when you talk about the RLSPBL lab. And very few individuals say that it was not a worthwhile exercise because it went beyond a class that taught you how to do something to work with a class of 'how do you fix something' that is not working the way you

> expected it. So, yes I have talked about it with other people, and they all agree that that type of problem-based learning or chaotic learning was fundamental to their leaning experience and comprehending the software. (Andrew, personal communication, March 25, 2012)

Andrew continued:

> When the RLSPBL lab occurred, the following morning when we discovered that the system was not displaying items in the manner that we left them or in the way we expected, it was very individual at first. Everyone was focused on their particular build, their particular system, what was wrong because the problems that were wrong were not the same for every individual. So, everyone at that point was focused on what was wrong with my system; they kind of had their blinders on. From that perspective it was very individual. After you fixed the problem, identified what was wrong and fixed the problem, or at that point if you were unable to fix it, you could ask other people to assist you, and then we also had an activity at the end of fixing the RLSPBL lab where we all shared what our problems were and what we had to do to fix the situation. So it was both individual and group based. (Andrew, personal communication, March 25, 2012)

Boud, Cohen, and Walker (1993) stated that education can be enhanced by interaction with others. "Learning requires interaction, either directly or symbolically, with elements outside the learner. It is only by counterpoising experience with something which is external to the learner that meaning can be created" (p. 2). Oakeshott (1933) also related that education is a shared experience. "Nothing, in short, can maintain its claim to be an experience which presents itself in utter isolation, alone, without world, generation of relevance. Experience is always and everywhere significant" (p. 14). In an educational setting, events happen, students talk, instructors lecture, labs are done. Experience is not just an activity that happens; it is an activity that has meaning. Dewey (1925) said it very concisely. "Events are present and operate anyway; what concerns us is their meaning" (p. 244).

Elizabeth recounted the friends she made in the class due to the shared lab experience:

> I think the fact that everybody in class had been affected early in the week, we kind of bonded over that. For the most part, we were from different facilities and were very comfortable with the class for the rest of the time we were together and shared this experience and had come through it. Maybe not with flying colors, but at least we had come through it and survived it, and so we were able to talk and kind of use each other as

> sounding boards for the rest of the week. Nobody felt afraid to ask anything especially not afraid to ask the instructor because he just said, 'Go on, try it, sure, okay, if you think it will work try it, that will be fine.' So there was never a wrong idea. Sometimes they proved not to be workable, but it was our work that figured it out. There was never 'NO, you can't try that. No you should not do that.' So I think it being something that we were going to be using and that made it real to us and important to us. And I think that was one of the big aspects that helped to stick in our heads because we could imagine it happening back home and having success again back at home as we had in class. It was a good exercise that was a confidence builder. It was a good team building even though we worked on our own because of everybody going through it, and it was very important in the whole week of the class I think, kind of set the stage for it. (Elizabeth, personal communication, July 2, 2012)

When asked if she felt the experienced was a shared experience, Elizabeth responded in the affirmative:

> True, but I think because we could, we all experienced it, and we all had different settings. Because we were building something that would be meaningful to us at the various facilities represented in class. Everyone had built something a little different, and everyone got broken a little bit different. I think the sharing came from the realization that we all had been affected, and then we used each other. Even though we worked independently to get it resolved, we felt very comfortable and open talking with each other because everybody was trying to fix theirs at the same time. So even though I was trying to fix mine and the person next to me was trying to fix theirs, there was the shared commiseration. 'Oh man, can you believe we did this?!' And that kind of thing, so I think just having that feeling with the group, and then I think that it kind of permeated the rest of the week that we could feel very comfortable saying anything. We never had a stupid question; there never was someone that threw you off saying, 'You don't know what you are talking about.' I think everybody realized that everyone had something to contribute, and that was good for the rest of the week. It made it a very safe place to be and made learning that much easier. (Elizabeth, personal communication, July 2, 2012)

Because Andrew encounters so many individuals who have been through the activity (in separate classes), discussion continued related to if he felt a shared experience with this diverse group:

> Oh, correct, I see what you are saying. I definitely think the experience that even though it is modified and different for each person who has gone through it, we all walked away with the same type of learning experience. It was shared in that sense. We all had the same type of situations where something was wrong, and we all had to troubleshoot and fix it, and in that sense, it was a shared experience. It is sort of a shared experience that everyone who has been through it knows exactly what you are talking about when you mention the RLSPBL lab, and in that sense, it was a shared/unshared experience even

though people were not in the same classes. (Andrew, personal communication, March 25, 2012)

Bradley also has conversations with many individuals who experienced the RLSPBL activity:

> I have talked with people who have taken the class and have gone through the RLSPBL activity and people who have learned from others and have not had that kind of experience. The people who have not had the RLSPBL experience seem somewhat puzzled by it because again they seem acculturated to a type of learning that is simply about the mechanics of things, the functionality of the software, the learning A + B = C. I think what the exercise teaches us is that A + B may equal C today and might equal D tomorrow and heaven only knows what it will be the next day. When I talk to people who have gone through the RLSPBL experience, the common theme that I hear is 'We hated it while we were doing it, and once we got to where we were responsible for the system ourselves, we were really glad we had to do it because we know a lot more about how things work than we would have if it had simply been steps 1, 2, 3,4, 5—go through these, now we are done, thank you very much.' It's an unshared, shared experience. (Bradley, personal communication, March 25, 2012)

Barton (1976) described that many individuals learn from another student's experience. "This informal training is really nothing but experience in the job, making mistakes, learning—somehow—from another worker who knows the task" (p. 120).

Irene shared partial information about the lab with her coworker who was coming to class:

> Yes, yeah I did. I guess the ones who were there were me, Karen, and Kay. We worked together to do it at the time, and then Jennifer from our place who came later, and I let her know about it. I didn't tell her everything but to expect that this day would be hard and that an experimental activity would happen. (Irene, personal communication, July 5, 2012)

Bradley noticed the situations where his students have taken the RLSPBL activity:

> Yes it is—it's (pause) it's an interesting situation. I can tell very quickly without asking when I work with different people that at different facilities whether or not they have been through this experience. It is evident on two levels. It is evident in the way they talk about how the system works. Even without talking about the class, you can pick up the shared experience simply through the dialogue you have because we share terminology, we share (pause), we share descriptions that are very similar, and those things seem to come from that unshared-shared experience. When I talk to someone who

> is not privy to that kind of information, who has not been through that class, has not been through that kind of problem-centric learning, I have a lot harder time with the dialogue. Because when I use descriptors that we have used in class to describe how the system works or how certain functionality played out and how to approach it or how to troubleshoot particularly, there is no shared dialogue. It requires me often to have to teach them the dialogue before we ever have a conversation about what we think is going on with the system. So, if I am asked to troubleshoot something, often I have to not only do the troubleshooting but then turn around and do some ad-hoc teaching to say this is what I found. I have found that if I simply describe it, there is little basis for understanding some of what I am talking about. And I think that basis for that shared dialogue comes from that experience of having gone through it and saying, 'Oh yes, I remember when we did this RLSPBL activity, here's what happened and here is what we took out of it.' I think the other thing that is important about the lab itself is that it is—you called it a shared experience that was not shared—I would call it kind of a shared/unshared experience in that there are those of us who were not in the same classes who went through the same experiences but asynchronously. So we have an unshared experience in that regard, but the overall experience is shared. Plus those people who are in class share an experience that no one else shares because in that specific class, the things that happened and the responses to the problems are always different from the next class. Even though the problems may be the same, the personalities and the past experiences of those people make the solutions different, and the interactions are different. (Bradley, personal communication, March 25, 2012)

Luckner and Nadler (1997) talked on the need for interaction to learn. "Learning requires interaction, either directly or symbolically, with elements outside the learner. It is only by counterposing experience with something which is external to the learner that meaning can be created" (p. 2).

Bradley, who completed his PhD after taking the class with the RLSPBL activity, discussed his research:

> Well in my own dissertation research, which was about the conversion of clinical documentation from paper to electronic media, one of the things that I highlighted, one of the themes that I talked about was the education process. And one of the things that came out of the lived experiences that nurses had was that there is a necessity for not only real-time but real-life type of scenarios. They want to see something that is similar to what they will be doing. And they want to see not only how to use it, but what to do when things don't go quite the way they planned. Because from both sides (users and administrators), nobody likes the outcome when you don't have something beyond a functional grasp of the subject. My subject specifically was clinical documentation. From the nurse's side, the end user, they don't like not knowing what to do because they do not want to be in the middle of documenting an assessment, have something happen or

> even just not be able to find something and not know what to do. They want something beyond the ABCs of the mechanics. On the flip side, the people who are the administrators of the system don't want their users to only have the mechanics because they do not want to get all of the phone calls from people saying 'I can't find this and I don't know what to do with this and the system acted this way and I don't know what to do.' They want their users to be as proficient as possible, going beyond just the norms. The way that it's consistently identified that this is possible is by teaching something that goes beyond the norm, which is 'what do you do when problems strike.' (Bradley, personal communication, March 25, 2012)

Marsick and Watkins (1990) offered specific characteristics of informal and incidental learning in the workplace. "We believe that context is more important to learning from experience when the nature of the task is interpersonal or social in nature, and thus subject to a greater number of differences in interpretation" (p. 16). This social aspect of learning also must have some internal factors. "Critical reflection is needed along with experiencing situations where the conditions do not meet expected rules. We learn by experiencing what people say and do; we infer from their perspectives" (p. 16). The creation of this emotional response ties the learner to the event. The authors believe this is how to improve retention among learners. "We believe the cutting edge of professional practice for adult educators and human resource developers is the successful integration of the affective with the cognitive in adult learning" (p. 235).

Lisa had a different experience since taking the class. She has no one to discuss the activity with. Now that she is interviewing individuals, she realized that she cannot discuss the reality of the position that they are interviewing for:

> No <laughter>! In fact we have been interviewing individuals to work with us at my employer, and we cannot even begin to tell them in an interview their job. We can give them an overview, but there is no way to relay it until they are actually in the middle of it. (Lisa, personal communication, April 14, 2012)

Francis discussed the education that she imparts to coworkers:

> I know that I can say, but it may get hit upon it in future questions, uhm, with the person recently that I have taken under my wing. I had to do training with her even before she came to your class. Taught her basics and how I would think. Going through the whole process and part of what I did to her was problem solve. I didn't put it to her quite as you do in the RLSPBL. One day she came into work, and I kind of emulated you and went through some of the practice. I questioned her on where would you go if your codes are missing from the code group. Where would you go, tell me what you will do? Now you're coming in and looking at the screens, what would you do? So I mean, I like verbally went through and <pause> actually not just one occasion, but a few different occasions. I needed to get her more up to speed, quicker than, because she couldn't get to your class quick enough. I needed her!! I needed her to be functioning back here! So she did very well. She even said, even though I had gone to problem solving verbally with her that the RLSPBL activity was even more valuable now. So there you have it. (Francis, personal communication, June 15, 2012)

When discussing why she used this technique back at home, Francis was quick to say:

> Because it was efficient and effective! I needed someone up to speed now, and not three months from now! She was able to think and problem solve. I was not always going to be there telling her the keystrokes or how to check for spelling. It definitely helped me teaching somebody. The RLSPBL activity was very useful to me and my employees. (Francis, personal communication, June 15, 2012)

> Elizabeth continued with a similar positive perspective:

> I don't think I personally knew that it was coming. There was some in the class that had been warned that the RLSPBL activity would occur. I don't think I knew that. And we were going about our hands on building, doing what we were supposed to be doing, and then it was mentioned that the RLSPBL activity would occur. I did not know what that meant. And went to lunch on the second day and came back from lunch, and we had been building all morning, and when we came back from lunch and everything was broken—And all of us—everything was broken. So the RLSPBL had indeed occurred and was not selective in who it modified. It seemed to have shared the wealth with all of us who were present. And I remember thinking how easy it was for RLSPBL to have done so much damage. It did not take a whole lot of time to play with our work, but it had thoroughly broken it, and after we all said, 'OH, my GOD, Oh my GOD, What are we going to do?' type of realization, we were able to sit down, think about what we had done, think about what we had been shown in the two previous days of class and were able to apply that to what the RLSPBL had done. We then realized first of all that it was within our power to fix, which kind of amazed us because we did not know we were that good yet, but we were. And we were able to go in and fix what was broken, which gave us a boost, gave me a boost of confidence. (Elizabeth, personal communication, July 2, 2012)

4.10 Other Items from Interviews

Items were revealed in the interviews that did not speak to any one theme. Andrew gave suggestions on how he would manage the use of the RLSPBL activity:

> I just think it was a very worthwhile experience and gauge whether or not your students are ready for the experience because they could be easily overwhelmed if they are not. Keep the pulse on the class, how are they doing with the comprehension and maybe even doing mini- RLSPBL labs could be helpful—over lunch change one or two items on their build. When they come back, say that something was modified and ask if they understand where they would go to fix the problem. Then increase the complexity of following changes. It could be gradual instead of one fell swoop. (Andrew, personal communication, March 25, 2012)

Bradley discussed how he did not have a singular insightful moment, but how it was a positive experience:

> I don't know if it was an 'A-HA' moment at that time. Once you get over the initial fear of thinking, 'Oh my, everyone else in class will be able to do this, and I won't' and learn that failure is okay because we don't know the answers to all of the problems all of the time. And secondly, everybody comes up with different approaches, and ten of those approaches may work equally well, and when you complete it, although it may not be an 'A-HA' moment right then, but it is a feeling of accomplishment. And that is a positive thing for your ego because I think, especially for people who are uncertain about their roles in administering the system and who are just learning the mechanics and the underpinnings of how things work, it gives them a (pause) scaffold. It's the scaffolding effect that learning one thing that allows you to reach higher for the next thing. This process makes it more likely that you will be able to learn that which will, in turn, allow you to have a new basis for reaching even higher. I think the 'A-HA' moment comes later when you're now responsible for actually doing the things that you learned in class, and you run into something that is either exactly the same problem or similar enough that you say, 'A-ha. I actually know what to do with this. This is familiar to me, and I feel confident. I don't feel lost.' So maybe it's a delayed 'A-HA' moment. (Bradley, personal communication, March 25, 2012)

While some students have mentioned the RLSPBL activity affected their self-efficacy, Bradley did not appear to think that way:

> I don't think it had any real affect initially. In the sense, at least for me, I realize that in the classroom setting there is value to either learning or questioning or not being able to learn something. And that does not really affect my sense of self-efficacy. Again it's later when you are presented with the real-life problems that the classroom scenarios tried to illuminate when self-efficacy really comes into play, where you say, 'I am confident

> with this. I know what to do with this.' You can speak to it not only with an internal dialogue but an external dialogue to your peers and say, 'This is what I know to be true about how this works. And it's based not just on mechanical knowledge but it is based upon mechanical knowledge, the theoretical knowledge, the application knowledge and the experiential knowledge.' All those things rolled into one and being strong enough to know that when you are presented with an alternative or something is not working, you can work through that and find a realistic and workable outcome. That is what really built up my sense of self-efficacy. (Bradley, personal communication, March 25, 2012)

Charlie's background in IS and troubleshooting prepared him for the RLSPBL activity even though he could not remember ever having an activity like this. "I don't believe so, I do not remember. It was a lot of math, a lot of coding, programming. It was never 'Here's your system, someone broke it, now go fix it.' It was more of book learning and code writing" (Charlie, personal communication, April 10, 2012). He indicated that he found the lab to be a productive use of time because it included problem solving and hands-on. He also liked the real-life scenarios which helped to cement the learning, and he suggested using this technique in other classes because reading textbooks is not for him.

Lisa found that the RLSPBL activity was a positive educational experience, which represented her workplace environment, and it was a beneficial and effective method of teaching. She has found that others, who did not go through the activity, are unable to grasp the concepts. Lisa further indicated:

> The RLSPBL activity is wonderful. In fact, I do teach classes. I teach orientation to new employees, and we kind of use a little RLSPBL activity. We cause a little problem to happen, and they have to figure out what happened. And they have to think about what they learned from their short class, and try to address it. This tries to imitate their 'On the job' function. I really like the classes in Texas—a lot of hands-on—and these were great. I did have one person who read the whole time from the manual, but it was boring. Everybody thought it was boring. We did some hands-on for the activities at the end of the chapters, but it was nothing like being in your classes, nothing like the RLSPBL lab. This activity is great; it is a legacy where I work. I mean there was nothing that prepared me more for what I do than the classes I had with you and the RLSPBL lab, and I appreciate it. So do my bosses. I did things I had no idea and things that others did not know. I was able to map stuff. I was able to be very functional. I have become a hot

> commodity in my area, and I owe it all to the RLSPBL activity. (Lisa, personal communication, April 14, 2012)

Irene discussed her job:

> Every day is different; every nurse has a varying set of activities. I no longer do bedside anymore, and we get calls weekly and sometimes daily to change some of the interface screens for charting and change some settings, and we just have to roll with the changes. (Irene, personal communication, July 5, 2012)

When asked if she would be able to perform her job without experiencing the RLSPBL activity, she responded:

> <Pondering and thinking> That's a difficult question. I would hope that by today, after a couple years, I would be able to figure it out on my own, but I do know that I could have done anything straight off the gun like building and designing the system. We had three people who were designing, and each had their own way, and one person had a lot of trouble, and so a lot of days, I had a RLSPBL lab to figure out what had gone wrong with her designs. So I would say that hopefully in the long run it did help me, but again, we saw things in the lab that we have not seen since. You went really above and beyond the call with creativity to show us every possibility of error that could occur. (Irene, personal communication, July 5, 2012)

Irene discussed using the RLSPBL in other classes and why it worked for her. When she was asked if this activity should be used in other education, she replied:

> Well, yes, I would say so, especially in this type of thing where you are actually designing and building in the system, but you know what made me successful and continues to make me successful was my instructor. You are awesome. I tell everyone that you are the best teacher down there that I had for anything. You continue to be a resource. Give me input, so I still feel like I am learning, but it just made me chuckle, and I thank you for that. (Irene, personal communication, July 5, 2012)

Andrew, who has moved into a software instructor position, related the ease of instructing students who have been through the RLSPBL activity:

> As far as easier to instruct whether or not if they have been through the RLSPBL lab, it depends upon which subject I am currently teaching. If the subject is related to the application where the RLSPBL lab was implemented, then definitely; they understand the application better. If the application for the RLSPBL lab also is used in the application for a class that I teach, they have a better understanding of that particular application, which makes them better students in the class that I am teaching. (Andrew, personal communication, March 25, 2012)

Not getting the chance to do the RLSPBL in other classes frustrated Charlie:

> The lady who taught another class just read out of the book. That was painful, painful. I did a comment to my supervisor that I could have done that in my office. Read all the book, limited hands on, no RLSPBL lab. It was a waste of time. Honestly! Hands on, I think I speak for a lot of people, is the way to do it, you're cranking on things, getting menus. I mean you are in the application; it's a lot easier for me. I am more visual, and you drawing on the board and another instructor who did HEC that tried some orders. He also was visual and putting it on the board and explaining how was a much easier way to understand because sometimes you reference back to the book. It's like okay, what was that again, seeing it again, visual, look at the board, go to the lab. It's the way to go. I mean a person who would prefer reading out of the book, I am sure they exist, but augh! That class was very painful. Let's not do that. (Charlie, personal communication, April 10, 2012)

Francis delved into discussing emotions during the activity:

> That's like a two-part thought. At the time it was occurring, was it enjoyable? Not really. Interesting and stimulating? Yes. After the fact, after you realize and you start to problem solve and start to get it, then it did. You can look back and say it was enjoyable or realize that it was good for you. Yeah, I would find it hard to say it was enjoyable going through it, but it was interesting and definitely stimulating. (Francis, personal communication, June 15, 2012)

She then related that it helped her self-efficacy once she was done but not while she was doing it.

Francis then discussed the lab being nurturing to a new person:

> In that respect that it built my self-confidence—yes it did, but not in a motherly nurturing like a warm fuzzy feeling <laughter>. It's more of a 'You're being tortured, it's uncomfortable, but it is good for you' because all of a sudden, you don't know something. You have to dive deeper into your knowledge yet attained. Knowledge you have but have not put it to this level yet. It was good. (Francis, personal communication, June 15, 2012)

Andrew mentioned that this activity was somewhat self-defeating:

> <Laughter> As far the activity being self-defeating, the reason I mentioned that, <pause> is because, and there are some students who have <laughter> who have mentioned that they left the class almost crying because they couldn't understand, they are barely hanging on to the basics and the concepts of learning the software. They don't have the fundamentals down yet, and it is almost as if the RLSPBL activity was introduced to these individuals too early into their learning environment. They were overwhelmed by the changes. They didn't understand the concepts of building, so when they are confronted with situations that they had no control over and they really didn't understand where those anomalies came from, <pause> they are ready to throw in the towel and call

it quits. Because they didn't understand, they didn't have the basic concepts down yet. So, in that manner, I remember the first time I encountered the RLSPBL activity I was kind of in the same situation. I was not familiar enough with software terminology. I was not familiar enough with the concepts of building and how all of the pieces fit together to even know where to go to troubleshoot some of the things. So, in that manner, you walked into that, and you are completely overwhelmed and in that case I guess that is what I meant by self- defeating. It was overwhelming. (Andrew, personal communication, March 25, 2012)

CHAPTER 5

DISCUSSION AND CONCLUSONS

5.1 Discussion

The use of a real-life simulated problem-based learning (RLSPBL) activity with an element of surprise was supported initially by 80% while the remaining 20% did not like the surprise element but were supportive of its usage for future classes. All who were asked indicated the activity should be used on future participants. Some concern arose about the conceptual skill of future students; do not apply it to them if they are having difficulties with the material. As Bradley stated: "I just think it was a very worthwhile experience and gauge whether or not your students are ready for the experience because they could be easily overwhelmed if they are not. Keep the pulse on the class, how are they doing with the comprehension" (Andrew, personal communication, March 25, 2012). A subset of the participants (20%) expressed that if prerequisite knowledge was not known, the RLSPBL should not be used. After further discussion 100% agreed it was best not to know that the activity was coming. Kathryn compared the experience to being at a haunted house; she did not want to know when the surprises are coming.

Participants indicated that the RLSPBL activity tied back to their work experiences. Upon returning to their workplace, they all found the RLSPBL activity a critical element of their training.

The participants agreed that hands-on was not the only tool that contributed to their mastery. Doing a hands-on activity that merely followed a script or step-by-step instructions in a manual did not provide them the experience needed. The participants related this to rote memorization, and because their workplace responsibilities are diverse and unpredictable, the

structured hands-on activities were not beneficial. Each day is a new experience, and the total recall of their experiences is needed to satisfy their responsibilities.

Problem-based learning is very valuable to this class, but if the content does not directly relate to their job responsibilities, PBL is a fruitless exercise. The creation of graphical interfaces that do not relate the clinical information required in a hospital setting provides the participant with wasted classroom time that does not advance their knowledge for their job. Previous instructors' initial education of clinicians was done using examples related to food purchases, which provided problems to the participants but did not provide them with a meaningful educational experience.

When the intent of going to a classroom is to learn software, the need to transfer of information and knowledge back to the workplace is significant. Transferring appropriate examples and valid mental processes is a goal that corporate education should satisfy. The movement of software expertise from the classroom to the workplace enables the participant to manipulate their system to the specifications decided by their hospital. The need of the clinician who is interacting with the patients varies depending on the clinical characteristics of the patient. The vital sign information on men would be different from the vital signs for a woman who is in labor or for the newborn at the moment of birth. A geriatric patient has characteristics vastly different from a pediatric patient; verbal communication, past medical history, and the current medical situation are examples of differing data. The realization of how to create a variety of interfaces and allow the clinical information system to reflect all patients uniformly is one challenge that the interface designer must comprehend and consider during development.

5.1.1 RLSPBL Theme

All of the survey participants completed the RLSPBL activity. Participating in a lab that included material and activities similar to their workplace was critical to their learning. As Haskell (1998) determined:

> In teaching countless strategies, one must be cautious and extremely skeptical. First, there are so many possible strategies to teach. Second, we do not know which ones work at all or work the best. Third, a strategy approach may all too easily lead to a cookbook approach, and cookbook approaches to learning are all too easily misinterpreted by learning. In training and in classroom situations, problems are generally well defined, and the knowledge to solve them is typically present. It's important to understand that unlike in training or classroom instruction, most thinking, reasoning, and problem-solving situations in everyday life are messy or ill-defined. This creates extremely problematic conditions for the transfer of learning. Again, an extensive knowledge base is what is required for coping with ill-structured problems. Accordingly, a broad knowledge base is requirement for the shift to the learning organization; it is also what is required for broad transfer of learning and reasoning. (p. 119)

Haskell's (1998) thoughts describe the RLSPBL activity as verbalized by the participants. All of the participants indicated that the RLSPBL activity was the reason behind their success at their facilities. Allison and Betty both preferred an educational format that includes clinically relevant hands-on activities that make them think and reflect on their own experiences. Andrew stressed that the activity made fellow students more productive at work and also decreased the amount of time needed to implement the software. He posited that the activity makes designers more effective and efficient in their time sensitive work and that it was the clinical context of the activity that made it very useful. This same sentiment was shared by Charlie, Francis, and Bradley, who all praised the clinical context that reflected the situations experienced on their jobs.

Critical thinking is mentioned as a key component by Fraser and Greenhalgh (2001), Luckner and Nadler (1997), Marsick and Watkins (1990), and Mezirow (1991). During this study, critical thinking is present in Andrew's, Kathryn's, Irene's, and Elizabeth's stories. They

each discussed that the activity required them to draw upon past experiences and tie together concepts that previously seemed unrelated and provided meaning to the education they had received.

Classroom content must be meaningful to the participants (Chapman, McPhee, and Proudman, 1995; Luckner & Nadler, 1997; Novak, 1998). Simply understanding material is not enough for these clinical individuals; the content has to be meaningful to them in class and most importantly back at their job.

Hands-on activities are critical to the adoption of the information gained in the classroom activities. Simply thinking critically does not allow contextually valid information to inherently flow through to the participant. Multi-dimensional hands-on activities that provide the opportunity to design, develop, make errors, reflect, and redesign material make available troubleshooting opportunities beyond the realm of one-dimensional hands-on activities. The dynamic work environments the participants face require education that is dynamic and presents chaotic situations (Marsick & Watkins, 1990). A non-linear educational experience is often fuzzy and ambiguous (Fraser & Greenhalgh, 2001); however, a checklist-driven education could not prepare students for their work responsibilities.

Utilizing a technique that incorporates problems and purposeful learning activities to repair the problems is paramount to the success of the students. Allison, Betty, Kathyrn, Elizabeth, and Francis all related that they have incorporated parts of a RLSPBL activity at their facility to train coworkers. They also related that this helps them troubleshoot and develop new interfaces that were not delivered with the software installation.

Allison related her pleasure with the class and the RLSPBL activity: "Wonderful, innovative and creative methods used to teach some very hard to grasp material. The RLSPBL activity was a very clever way to teach/show what happens in the real world.
You need more instructors who teach using this method. One of the best courses I have taken at this vendor. Thank you" (Allison class evaluation, 11/02/09).

5.1.2 Transfer Theme

Haskell (1998) stressed that the use of step-by-step instructions does not assist in transferring troubleshooting skills and knowledge back to a participant's job. To achieve a significant higher-order transfer, the student must step outside of the routine classroom activity and utilize a more meaningful technique. Kathryn was very annoyed by other classes where the instructor took control of the students PCs and performed step-by-step activities. She indicated that she retained very little from these classes and was not impressed by this presentation technique. She wanted a lab that "blows up" on her. It was that investigative style of work that enabled her to transfer the knowledge she gained back to her facility. Charlie agreed, indicating he would like to have more of these activities because they mirrored his real-life occupation.

Haskell (1998) re-iterated that the importance of transfer for corporate training could not be over-emphasized. He determined that companies desire to have a good return on investment for employee education. "Insufficient knowledge base, or expertise, is one of the most important factors in lack of transfer. Seen in this light, the transfer of training model, which has served a specific purpose, is now often inappropriate in the same way that the methods used to instruct children are inappropriate when instructing adults" (p. 35).

Bradley was very emphatic when he described how well the classroom activities transferred back to his job and served as a resource for him in later employment. Andrew also expressed how overwhelmed he was initially, but then as he worked through the material, he found it related to his work as an individual who was tasked with helping facilities implement the software. Irene learned that while some of the situations in the classroom were beyond what she experienced at her facility, she saw other uniquely difficult and perplexing situations. She felt that her hospital's investment in her education and expectation of transfer was so important that if she had failed to be capable upon returning, her bosses would have asked for a refund.

Lisa transferred her knowledge back to her facility and discovered that her co-worker, who has not been to the class, creates problems for her. As Lisa states: "It is hard for them to understand how to use the tools that we use every day because they have never been to a classroom setting and never had the hands on". (Lisa, personal communication, April 14, 2012) Marsick and Watkins (1990) indicated that when trying to learn informally in the workplace, situations are full of unknown outcomes that may surprise the worker. The results of an action may not be visible easily or in a timely manner; some work processes take days to complete (p. 76). Lisa stated that the RLSPBL activity prepared her for her work and provided pathways to mastering the software. Elizabeth saw how the RLSPBL activity tied directly back to her workplace. The experience was real to her and provided her the opportunity to practice designing her system. Francis' work requires her to "think outside of the box," and the RLSPBL activity prepared her for the reality of her job. As a clinician, Francis encounters many unexpected clinical situations with patients, so her movement to IS and the design of her system were improved through the use of the RLSPBL activity. Charlie confirmed that he transferred knowledge back to his job mainly due to the RLSPBL activity, but he also attributed his success

to the repetition he had while in the classroom. Betty and Allison elaborated on problems they face at work and said they could solve the problems by recalling what they had done in the classroom. Allison experienced a 'eureka moment', and the thought process started clicking for her. It had become second nature to her because the classroom activity transferred back to her work.

Eight of the ten participants of this study were clinically educated, so they needed re-education to prepare them for a computerized healthcare environment. The RLSPBL activity helped them transfer the education back to their workplace to enable them to perform their duties successfully. The two IS individuals also complimented the RLSPBL activity because of its clinical slant, which prepared them for the reality they face each day working with clinicians.

Betty related how her expectations were exceeded: "I really enjoyed this class, I learned so much. I can actually go home and be a productive builder now. I need to practice more myself to see how to use this for my hospital, but I truly have a much better understanding of how to use the software to do this. The instructor did a great job teaching this class! "(Betty class evaluation, 11/02/09)

5.1.3 PBL Theme

Cannon and Schell stated in Duch, Groh, and Allen (2001), "The use of real-life problems is essential for preparing students for practice—making a strong case for the use of problem-based learning throughout the curriculum" (p. 165). Allison completely agreed with this statement. "For me, the hands on and the RLSPBL activity—I don't get a lot out of reading or someone talking to me over my head. I have to touch more."

Duch, Groh, Allen (2001) summarized the work of multiple authors:

> To strengthen the case for implementing PBL in nursing curricula, it must be remembered that those in nursing practice have long criticized those in nursing education for distancing students from the real world of healthcare. Traditional teaching strategies do not produce the desired outcomes of critical thinking, independent decision making, and autonomy that are needed by today's graduates. (p. 167)

Bradley reveled in the PBL portion of the RLSPBL activity because he believed all clinicians must understand what they should do when "the wheels fall off." He described how there is no normal clinical case in a hospital and that the clinician must respond at that moment. Bradley indicated that this immediacy also flows through to the designer of the charting system; each day brings new needs that were unanticipated the day before. Charlie, Kathryn, and Lisa confirmed Bradley's thoughts and added that the PBL work must be clinically relevant and tied closely to their daily work. Simply doing PBL to get hands on is not enough; the work must be appropriate.

Elizabeth suggested that the PBL was good because it required critical thinking. Kathryn agreed with Elizabeth about the need for higher level thinking. She saw this facet of the RLSPBL as a puzzle that she needed to solve. Having to solve problems and think critically was mentioned by Allison, Andrew, Betty, Bradley, Elizabeth, and Kathryn as they explained how they perceived the RLSPBL activity and how it brought them to a new level of learning. Irene not only found the activity to be awakening but also expressed her desire that her employees be taken through the RLSPBL activity also.

While Charlie did not mention critical thinking, he was very enthusiastic in saying the PBL made him skilled and that he actually desired more of this style of classroom activity for himself. Lisa actually indicated that she gained self-confidence by doing the PBL; the repetition and hands-on enabled her to understand the multiple variables that affected her designs.

Betty and Lisa found the PBL portion of the class stressful, but they enjoyed it once they were through the activity. Lisa pointed out that the more difficult the PBL is the more intriguing and the more engaging it is—the higher level of comprehension gained. Scaffolding to the next level occurred as she built each piece off others she learned previously. Charlie and Kathryn seconded this and asked for more PBL activities that they could complete to further expand their knowledge.

Bradley excels when doing Problem Base Learning (PBL). He expressed his style of learning which was well suited in this class:

> I really like the watch a demonstration, now do it on your own approach. It allowed me to really get my hands on it and problem solve for myself during the RLSPBL activity. I again, really like how knowledgeable he was about everything, and if he didn't know, he was able to find it for us. I liked how much hands-on practice we got, and the visual diagrams that he used because I need to see a conceptual visual of how everything ties together. I also loved the review, so we always went back and tied it all together. Will probably use my own personal notes more than the manual, but the manual is very good to have to answer questions that are more detailed. It was a great learning environment, I really feel like I learned a ton this week and the RLSPBL activity gave me the much-needed mental tools that I need to succeed. (Bradley class evaluation, 11/9/09)

Irene also enjoyed her classroom experience and expresses her reason for understatning the software:

> The class was all I hoped it to be. I have learned so much with this class in spite of the RLSPBL activity. Mark is amazing. He taught everything we need to know and the RLSPBL activity cemented the insights and taught troubleshooting. We all were very successful. I was glad to be in his class. (Irene class evaluation, 9/21/09)

5.1.4 Shared Experience Theme

Bradley created the phrase “a shared unshared experience” to represent the comrade-like relationship that he found he had with others who also went through the RLSPBL activity during a different class. Finding fellow clinicians who shared personal experiences like his opened an avenue for him to discuss, compare, and relive the activity with others. Andrew talked about

how in class during the RLSPBL activity, everyone initially worked individually, but as they started to ask the instructor questions, the class discovered they all had similar problems, and that by working together, they could solve the errors. Individually solving errors led to discussion, reflection, and attempting solutions and reworking if the initial solution failed.

As Andrew mentioned in his interview, once success begins for one participant, it spreads to others. The success did not come from lecture, pre-printed steps, or an outline; it came from the thinking, sharing, and collaboration of the participants. Elizabeth described the participants as new-found friends who were in this together. Elizabeth further stated that the RLSPBL activity actually made her feel safe in the classroom because everyone bonded together; no one was left out as this group of strangers shared an emotionally bonding activity. Lastly, Francis utilized a less intense RLSPBL activity to better work with a new employee, who needed to be trained as fast as possible.

Boud, Cohen, and Walker (1993) wrote that we must remember how we learn. When teaching students, we have to define our perspective from their viewpoint. Brookfield (1995) was very strong on this point; he stated:

> In particular, I argue that regularly experiencing what it feels like to learn something unfamiliar and difficult is the best way to help teachers empathize with the emotions and feelings of their own learners as they begin to traverse new intellectual terrains. (p. 21)
> One of the most cherished tenets of adult educational practice is that discussion is an educational method that exemplifies the participatory, democratic spirit central to the field. (p. 25)

This presumes that one has something to say. Staying silent could be seen as a lack of desire to participate or being unprepared. Contributing to the conversation often is thought to represent knowledge or wanting to engage. The author mentioned that they talk to jockey for position in the social standing of the conversation. Talking just to talk and to indicate awareness is not a measure of a good experience; it indicates nothing.

Having something to say or being driven to say something appears to be a method to start a discussion in class. The participants in this research did not know other participants in their classes (except Allison and Betty), and as they learned the material, they also became very social through discussions and lab activities. During the RLSPBL activity, the participants indicated they were upset, challenged, or overwhelmed. This discomfort was shared in the class. Andrew, Bradley, Elizabeth, Francis, Irene, and Kathryn all related how they bonded with others in this class and in future work situations over the RLSPBL activity. All of the participants indicated they talked with others at their workplaces about the activity, and some incorporated the technique when educating new employees (Allison, Betty, Irene, Francis, and Kathryn). Andrew and Bradley teach software and indicated that they could identify the individuals who have been through the RLSPBL activity. The students understand better and seem to be able to share insights that are not evident without having been through the activity. They understand the software and are less fearful of making an error; in fact, they use any errors that occur as learning situations.

Francis does not like the web based training classes:

> With the WBT, the customers do not get a chance to interact & network with other companies who might've already implemented a certain system. You can't establish this type of camaraderie during Webinar's either. Think about your customers and how they can benefit. WBT are convenient, but in a nutshell - they suck. (Francis class evaluation, 3/22/10)

5.1.5 Student Class Evaluation

Upon completion of the class, the participants document their thoughts of the education they have received. 2/7/11 Andrew expresses his thoughts on the class:

> I left this class knowing much more than I thought that I would. The examples were very effective. The RLSPBL activity lab was the most effective tool for learning! Our instructor was really tops!! I would take any course he teaches. His teaching style is very

> engaging and fun, but most importantly very effective! I have taken a ton of Web Based Training that was fairly beneficial. I have taken Virtual Instructor Led Training classes that are helpful. But nothing measures to the quality and effectiveness of classroom learning. This was my first classroom experience in over 90 days as an employee. I finally feel like I have truly learned something!!! (Andrew class evaluation, 2/7/11)

Charlie felt this class meshed well with his learning style:

> The process and layout, that the instructor has created and follows for this course, is very effective. I learned a lot of this tool in a short amount of time. The instructor is very fun and makes the class very interesting during this class. He knows the tool and has the process down to an art that makes it easy to follow and learn. I think his class is very beneficial. The material that Mark provided has been useful. Still having him run and step through the program was priceless compared to the binder documentation. I have been able to make my own notes from his instructions that are very helpful. (Charlie class evaluation, 4/12/10)

The humor experienced in the class also added to Elizabeth exceeding her expectations:

> The instructor provided clear examples, covered a great deal of material effectively and afforded us ample time to learn and build as we learned. His knowledge with the software was a great addition. The instructor was able to respond quickly to all questions in the classroom, which improved clarity on many of the difficult lessons. Also, his sense of humor and encouragements throughout this week made this very tough class more fun and engaging. The instructor was very helpful which resulted in me becoming more confident in my own abilities. My expectations were exceeded. (Elizabeth class evaluation, 2/7/11)

Francis, Lisa and Kathryn expressed their enjoyment of having a classroom setting as opposed to having a Virtual learning environment:

> Unbelievable!!! Mark was the best instructor and was clear and made difficult material very understandable. I can build and understand the build process now. The RLSPBL activity lives in my system and now I know how to handle him. Mark was the best adult educator I have ever had in my 15 years of clinical and nonclinical career. KEEP educators for courses like these. In learning how many classes may be converted to Web Based Training - you guys should note: THIS CLASS DOES NOT NEED TO BE A WBT COURSE. There is far too much pertinent material that would not be covered in a WBT course. Also, I feel other users would get more from this class if the class were longer and could cover more detail. Mark is an excellent instructor, but with the complexity of this tool and all it encompasses, there's only so much information that he can cover in a 5 day period. (Francis class evaluation, 3/22/10)

Kathryn is straight and to the point in complementing her classroom experiences:

> Great instructor. Great interactions. Uses multiple different methods to facilitate learning. The RLSPBL activity was extremely helpful. Excellent I learned a lot more this week than I did last week in another class. I think each teacher should use Mark's format to teach. Each instructor should use Mark's techniques instead of reading from the manual and letting you demonstrate. He did not use the manual much at all yet I feel like I learned a lot more in his class. I do hate the class is only for 1 week. It is a lot of information to cover in one week. Thank goodness this is not virtual. All instructors should follow Marks teaching format. It makes a lot more sense and you leave feeling you have learned something instead of feeling lost. (Kathryn class evaluation, 5/9/11)

Lastly Lisa was even shorter in her evaluation of the class: Mark Rocks, instructor is fabulous, I love the RLSPBL activity. The classroom experience is great; webinars are the worst thing ever. You need to bring back all classroom classes; they facilitate learning much better and thoroughly. For my overall experience, sticks with classroom instruction--webinars are the worse things ever! (Lisa class evaluation, 6/15/11)

5.2 Conclusions and Implications

5.2.1 Conclusion

The use of a real-life simulated problem-based learning activity in a corporate educational environment had a positive effect upon the ten participants. Regardless of gender, age, educational background, or years of computerized charting interface design, all participants stated that the activity was a worthwhile effort that helped them understand and utilize clinically oriented design software. Many used similar activities when educating other workers and all felt that the activity should be used in the future. Kathryn and Charlie wanted more of this activity because of their own style of learning; Kathryn liked puzzles, and Charlie desired to be prepared for his future work.

All of the participants indicated that the activity was realistic of their work environment, and they felt that the activity must be clinically based to be effective. All of the participants felt it was this activity that enabled them to transfer the knowledge and education back to their environment. The use of problem-based learning was a critical factor in the participants receiving the needed hands-on time working with the software and creating designs appropriate for their facility.

All of the participants in the research agreed that hands-on, context rich, PBL, scenario-based education is preferable for learning electronic documentation design. Numerous participants complained that other classes they attended were absent of troubleshooting opportunities needed for the information presented. In some cases, such as those related by Allison, Betty, Irene, Emily, and Kathryn, this resulted in a classroom experience that was primarily presentation-based; instructors spent the majority of class time showing step-by-step, linear examples. All described similar classroom experiences and longed for the inclusion of more "real-life" clinical-based scenarios that greatly enhanced their ability to transfer knowledge back to their jobs. Andrew, Bradley, Elizabeth, Francis, Irene, and Kathryn spoke of numerous realistic clinical-based activities that moved the education from an instructor presentation to a realistic and appropriate application in the classroom. Allison, Betty, and Charlie also spoke of good PBL experiences that were situational based and that adequately prepared them to troubleshoot the problems they might encounter during software implementation. Bradley also pointed out the value of having non-scripted activities that made you think beyond "just doing A then B and then C every time." Sometimes, "the wheels fall off," and the PBL enabled him to gain a more complete understanding of the product and not just the "mechanics" of how the software worked.

If participants attend education opportunities where they perceive they cannot learn, the learning opportunity may be negatively impacted, and understanding the material may be impaired. Andrew indicated that initially he was overwhelmed with the material and the activities, but as he worked through the labs, he was able to comprehend. Allison, Bradley, Francis, and Irene all agreed with Mezirow (1991) that the material needs to reflect the complexity of the workplace. These participants agreed with Francis, who indicated that the RLSPBL made her learn, and she needed that experience to be successful at her job.

One area of research was to identify any differences in the experiences of the younger and older participants. Lisa and Kathryn, who had a 38-year age difference in age, related the same story; the RLSPBL activity was the key to their understanding the material and transferring it back to their workplace. Any pre-conceived notion that older participants would be the most challenged and the younger participants would better grasp the material was not found to be true. No participant, regardless of age, indicated that they felt their maturity was a factor in the learning. My own observation was that the more experienced nurses were better at reasoning, and with time and hands-on activities, they would master all activities.

The participants expressed some individual and some shared experiences during their software education and the design of electronic nursing interfaces for their facilities. Below are conclusions mentioned during the research:

1. Education must be timed to coincide with the implementation of their system. The knowledge and experiences in class were best utilized if participants had a system.

2. Realistic context based activities with PBL hands-on education was favored to lecture/demonstration.

3. Hospitals expected them to be fully capable of designing their system upon returning to work.

4. Nurses retained more knowledge when they were allowed to troubleshoot and reflect upon their knowledge base when designing.

5. The inclusion of the RLSPBL activity was a critical aspect of their learning. This activity provided them the experience to manipulate and control the software.

6. The participants indicated that they were responsible for their electronic charting systems, and they often had to educate coworkers if they needed assistance.

7. Participants felt an ownership of the system for which they were responsible, and working with their clinical staff believed it appropriately fulfilled the needs of the clinicians who are delivering patient care.

8. Additional clinical staff was needed during the design process to include the complex realities of a hospital environment.

9. Participants believed the implementation of the computer-based charting system enhanced patient safety.

10. As well as being an element of support, communication was also a key component in the environment of care and patient safety.

5.2.2 Implications

The findings and resultant conclusions drawn from this study imply that the clinical education process can be improved in the following ways:

1. Schedule clinician education to occur in an orderly fashion: prerequisite classes occurring before advanced classes. Poor performance may occur because the participants lack the skills to perform the required work (Boud & Garrick, 1993; Hodges, 2001; Perelman, 1984).

2. Clinicians should be central in the purpose of the software and its legal/medical use in the clinical setting. Inexperienced clinicians may rely on trial and error as the primary technique for finding solutions to problems they encounter. This process can be time consuming, costly, may not resolve the issue and may introduce errors into a patient's medical history (Harp, 1995; Hawthorns, 1987).

3. Education should contain realistic, scenario-based, hands-on labs with an unexpected troubleshooting activity. This education should focus on the realistic use of the software and the problem-based activities that reflect a clinical environment. Using realistic, scenario-based labs engages the student as an active participant in the learning process. "It brings you to a higher level of

comprehension, so instead of being trained on software, you are being educated on software" (Andrew, personal communication, March 25, 2012).

4. The education should cover the functionality found in the software and demonstrate how to incorporate the output of participants' designs with other clinical systems. Clinicians found it difficult to plan their interfaces to collect data if the entire use of the data was not realized during design.

5. Future employees who will participate in future designs need to be taught using an activity similar to the RLSPBL. These individuals should be prepared for the steep learning curve encountered when learning a complex software product that attempts to replicate their paper charting system with an electronic system.

6. All individuals (clinical and non-clinical) involved in the design, building, and implementation of these electronic user interfaces must remember that their design must provide for patient safety and efficiency of clinical documentation because the clinical charting system interfaces to healthcare decisions critical to the patients' lives.

7. The researcher, who is part of the classroom experience, conducted the interviews. Leading the interviews by a research team or another individual may increase credibility.

The conclusions and implications were deducted from the thoughts and feelings of the participants in this narrative research and are limited by the sample size and the qualitative nature of the study. The opinions and stories expressed by these participants provided a guide to successful education of clinical staff during software implementation. Their insights regarding the use of an RLSPBL activity, the consistent opinions, and mutual themes identified here connect all participants in the design of a computerized clinical system. Constantly seeking out education that utilizes context-filled material that incorporates PBL with hands-on activities, that helps the participants transfer knowledge back to their jobs, and that provides opportunities to share experiences and knowledge with others.

To improve this activity, more information is needed relative to each participants occupation at their facility and the future tasks they are assigned. Their clinical background is

also important when endeavoring to design activities; so a survey to describe their clinical knowledge would be helpful. Additional time would also allow the participants to experience more hands on activities once they have gained insight to their critical thinking abilities. This activity has been improved through the constant contact with participants and their feedback about the class and their workplace experience. To further improve this activity, past students are solicited through instructor emails pertaining to suggestions for further classroom activities.

Limitations found in this research were the lack of measures against which to gauge the improvement in the participant's skills. The importance of their success in learning the material does not allow a group of individuals to be used as a control group and then compared; all participants must be successful is the corporate mandate. Students indicated that they learned better in this class than in other classes because of the use of the RLSPBL, no comparison can be made related to content and efforts. While Elizabeth indicated that she was able to do an estimated 12 to 18 months work in six months; there is no direct quantitative yardstick that allows comparison to her build timeline without the education. No true percentage of improvement can be gleaned from the interviews. What has been born from these conversations is the overriding belief that they are more effective, efficient and competent at their jobs and preferred to be educated using a RLSPBL activity.

To address these limitations, the inclusion of a test of knowledge before class and a follow up test after. Another possibility to address the limitations would be communication with corporate staff at the facility who is engaged with the software implementation. This communication can inform the instructor of the timeline the student has before they take the class and its change once they complete the class. The measure could be similar to Elizabeth's experience of decrease time to her ownership of the clinical system. Conversations with the

student about their class expectation, clinical background, educational goals and their job responsibilities all provide a path to effective education for each student.

5.3 Future Research

Allison, Betty, Bradley, Charlie, Kathryn and Lisa have all successfully incorporated a RLSPBL activity into the teaching of employees at their facilities. Andrew, Charlie, Elizabeth and Irene indicate that they see a widespread use of the RLSPBL to unravel and resolve issues they experience on a daily basis. Future research could be done with these individuals to analyze how effective this educational technique has been at their facilities. Further research could focus on the use of this educational technique by individuals who are not educators versus those with an educational background. Other instructors at the researcher's workplace have incorporated using a RLSPBL activity in their classes; the instructors could be interviewed to determine their stages of concern regarding the use of an innovation like the RLSPBL. The use of Hall and Hord's (1996) concerns-based adoption model (CBAM) could help determine the effect of the RLSPBL innovation and access its level of use by instructors.

The use of a surprise PBL activity could be researched in other areas outside of interface design and the clinical realm. Troubleshooting has been determined an effective teaching method along with scaffolding and guiding students to critical thinking. Using real-life, scenario-based activities that involves problem-based learning and requires troubleshooting worked well for these participants. They all indicated that the knowledge and experiences that they needed to be successful at their jobs were transferred back to their work because of the RLSPBL activity. Incorporating such an activity in other learning situations where success is critical may be possible using training or non-live environments.

Educational situations that require critical thinking could be enhance using the RLSPBL. Andrew indicates that the use of the RLSPBL activity brings you to a higher level of comprehension, so instead of being trained on software, you are being educated on software. And the education component involves that higher level cognitive thinking skills that you need to understand how it all fits together. Critical thinking was the facet of this activity mentioned by Allison, Betty, Bradley, Charlie, Elizabeth, Kathryn and Lisa as they explain their success and desire of seeing this educational technique used elsewhere in their corporate careers.

The use of a RLSPBL activity in other educational environments is very conceivable. An educational situation, with motivated adult learners who are focused on a specific educational end goal could benefit from this technique. The realm of clinical education already has been explored by other authors. Design classes that utilize test or train environments to explore possibilities of design could utilize such a technique to develop new possibilities, test assumptions and endeavor to improve the learners understanding of their environment. The use of the RLSPBL is not new to the design of instruction; rather it is a purposeful implementation of educational techniques (PBL, hands-on) in a corporate educational environment.

APPENDIX

SUPPLEMENTAL INFORMATION

Example of a Real Life Simulated Problem Based Learning (RLSPBL) Activity

Below is a graphical presentation of a chart of a patient's vitals. The items a clinician would chart in this example are: patient pulse, patient respirations, patient temp and the patient weight. Each of these data entry fields is numeric. These items are presented together in a screen that is called Patient Vitals which is show in Figure A1 in the upper left. This is what a class participant would initially create.

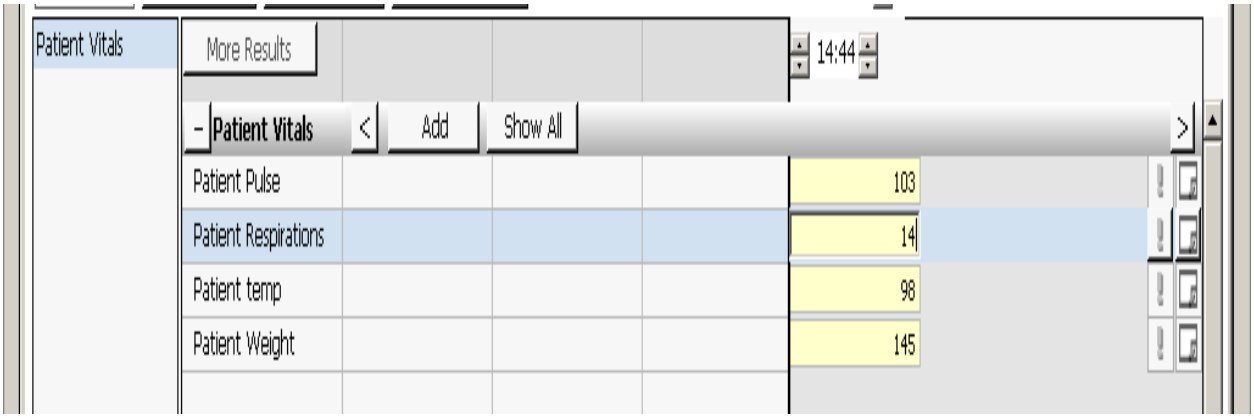

Figure A1. Vitals charting screen example created by class participant.

In Figure A2 (which follows), the name of the upper left has been changed to 'The name is incorrect – please fix.' Nine items are present in the charting area. The first charting item has been changed to 'Number of heartbeats.' The next three items were not present before and have been added. The fifth item is patient respirations which was present, but now allows a value of over 800 which is not clinically appropriate (humans cannot breath that fast). The next two items are new and are not valid for this charting. The next item 'every breath you take' accepts text values such as 'few' which is not clinically valid. And the last item 'wait of a person in tons' has a misspelling of 'weight' and humans do not weigh in tons and also text can be entered when only a number should be accepted.

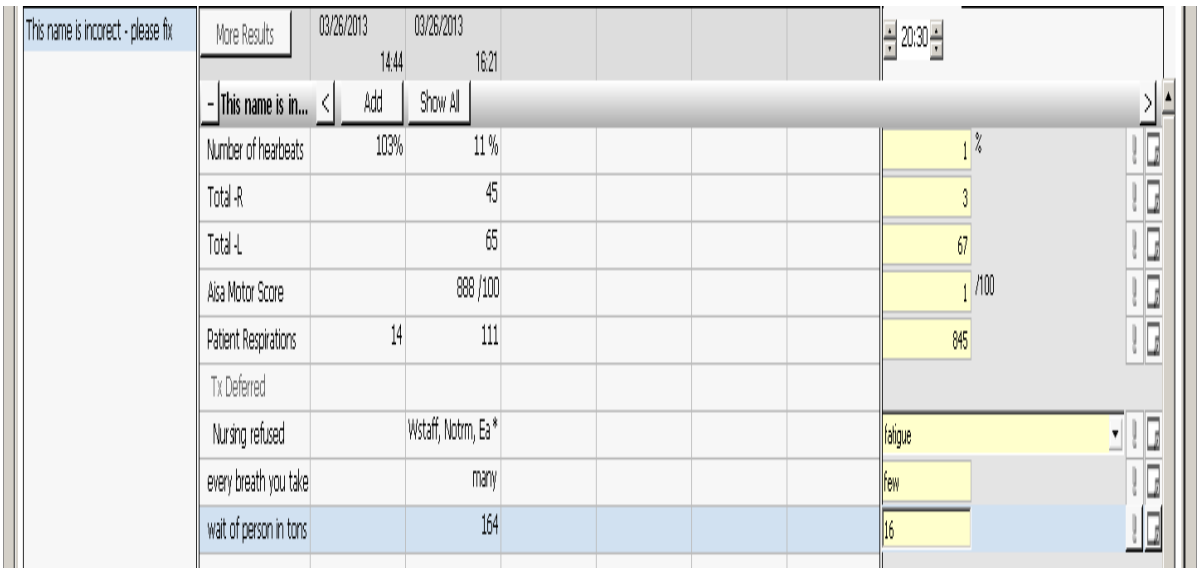

Figure A2. Vitals charting screen after being modified in the RLSPBL activity.

These are the errors that the RLSPBL activity presents to students. Their task in class is to return the charting presentation back to the presentation illustrated in Figure A1. These editing and design tasks represent their job responsibilities at their facility.

Field Notes

Allison and Betty – Face to Face in classroom – These two were pursuing education in other software and were very happy to be involved in discussing their experiences with the RLSPBL and their emotions/thoughts. They were comfortable and outgoing in their stories. Having them together prompted each other to add additional information. They both appeared relaxed and open to talk about their experiences (6/17/12).

The realization that the RLSPBL activity was planned for their education made them upset initially in class but the understanding that it was a learning activity prompted them to explore, learn and have confidence in their skills. This in class understanding endeared them to the RLSPBL activity and they utilize it to teach new employees.

In later emails from them (8/15/12), they indicate they used a RLSPBL on a new employee.

Andrew – This interview was done in his classroom after what appeared to be a hard day of instruction. He was very comfortable with a desire to expound on some of the frustrations of teaching that day. His focus on unprepared students distracted the initial interview focus but added flavor to the interview. Did not record his initial ranting on the frustrations that he was having on that particular day (3/25/12).

Once he was focused and on subject Andrew was an encyclopedia of experiences and information. His Bachelor's in Education and Masters in Nursing lead him to speak on what was needed for success in educating clinicians on software. He gave examples of how a classroom must reflect the day to day life of a clinician. He was laughing as he remembered the shock of the RLSPBL and how it affected his mindset, forcing him to critically think on what he was doing. No interruptions occurred and Andrew was smiling and enjoying telling his story. He indicated that he would use a RLSPBL activity if it would help his students but often times the

students will do it to themselves (this was his frustrations for the class he taught – the participants made so many errors that the class became an all-day troubleshooting activity) (3/25/12). During follow up conversations, (5/15/12, 8/2/12) he added that students who were taking his class after going through the RLSPBL activity were quick to understand his material.

Bradley – Met at his residence and talked over the kitchen table. Knew about the interview and prepared his thoughts related to the subject. He was friendly with animation in his words, as he expounded on the RLSPBL activity. He was selected as the best first person to interview because of his years of nursing, breadth of experiences and his Ph.D in nursing. He indicated that the RLSPBL activity was important in his learning. He laughed when mentioning how it shocked him but smiled when he indicated that such an activity was needed (3/18/12).

During follow up conversations, he was quick to evaluate new perspectives and blend them into his. He agreed with thoughts provided by Andrew and Kathryn and updated his words to be more focused on nursing education and teaching nurses (4/23/12, 6/21/12, 8/2/12).

Charlie – Interview over the phone – Charlie was very receptive to the interview process, we had arranged a specific time to meet and discuss his thoughts on the RLSPBL (4/10/12). He spoke how his life was a continuous RLSPBL activity. His desire was to have more such activities in other classes because of so many possible errors that arise from the implementation of computer systems and interfacing them to other systems. He was at ease in his speech and appeared to be confident in his answers. During the last discussion (8/4/12) he indicated that new software training that he was receiving with another vendor did not have a RLSPBL activity and it took him longer to understand and master it.

Elizabeth – Phone interview – Elizabeth was very positive and outgoing in her thoughts about her success. She spoke about her ability to decrease the expected time for the project and

how she felt so empowered by the class. Then she indicated her further accomplishments with the software and how years ago she could not have imagined she would be doing this work (7/2/12).

As a nurse she felt so out of her element when she was moved to IS and the overwhelming tasks assigned to her. The RLSPBL activity shocked her but her alignment with others in class (shared experience) guided her to a new awakening of her skills. Working with the unknown she has done in diagnosing patients, now she saw the software as another sick patient who was in her care (8/4/12).

Francis – Interview over the phone – Francis was more businesslike as we started the interview but her humorous side came out as she expressed her anger and enlightenment of the RLSPBL. She was very open to express her surprise, feelings and thoughts of that day and then to tie that to her success back at her facility (6/15/12).

She was quick to speak poorly of the software and why it frustrated her so much at work and also in class. She also was quick to complement the RLSPBL activity as a needed activity that frustrated her but forced her to think and become a better designer. In the last discussion (8/4/12) she suggests continuous use of it.

Irene – Phone Interview – Irene was very forward detailing her frustrations with the software and the overall software installation/upgrade process. She did not speak positively about other instructors or presenters. She also dislikes the process she must endure to move to new versions of software. Her deep understanding of the software (which she attributes to the RLSPBL activity) has opened new doors in her career (7/5/12).

Her hospital has become a BETA site of testing new versions of software and it is her mastery of troubleshooting that has enabled her to take charge and direct testing and suggestions

back to the software vendor. She is part of the design team that is determining some of the future facets of the software (8/2/12).

Kathryn – Phone Interview – Kathryn was very motivated to tell her story of how she overcame her fear of the software and has been able to make her job enjoyable. Every roadblock is a puzzle to her. She was open about her thoughts and seemed very comfortable in telling her experiences and story (7/15/12). Her background as a senior Cardiac surgical nurse did not prepare her for the movement into IS to design charting interfaces.

After the RLSPBL activity she was able to take her clinical background and utilize it to develop clinically correct charting interfaces for her hospital. For this she was very appreciative and very outgoing with how she succeeded (8/1/12).

Lisa – Interview over the phone – Lisa was very receptive and as is her nature, laughing often and upbeat. She was initially hard to get to focus on the interview but once I was recording it was all pertaining to the RLSPBL. I kept my focus on pulling information from her and having her talk about her experiences in class and how much went back with her to her work (4/14/12).

She was enthusiastic in telling of her success and how the RLSPBL prepared her to do her job. She provided many comments on the realism of the RLSPBL activity and her work. She seemed comfortable and her discussion was from her thoughts and experiences (5/12/12).

Class Evaluations of Participants

Allison and Betty work together. Both are very skilled in building, designing and using the software. They both recovered from the RLSPBL activity and did a very effective presentation. Both should be able to use the software to build their system. They added much to

the class as they discussed problems they were having getting an understanding of certain aspects of the software. The further we went in the class the more confident these two became – they overshadowed other individuals who were not used to two, pushy southern women (11/02/09).

Andrew is an RN who has a background in education and has been directing clients for over 7 years. He came to the class so that he could better understand new aspects of the software that he has not learned. He did great, recovered from the RLSPBL activity and made a very capable presentation. He added greatly to the class and helped as many clinicians understand and come to be at peace with the software (2/07/11).

Bradley is an RN who has been a builder at one facility and has become a very skilled Implementation individual. He is taking the class to be able to go onsite to teach. He added greatly to the class discussion, helped the clients and displayed great insight to our products. He directed others to help them fully understand that the output is how you design input. He did great, recovered from the RLSPBL activity and made a very clinically viable presentation. He also pointed out that you cannot see the output until you build the input so making errors in the creation of your initial design should be expected (1/09/09).

Charlie is an IS person who is going through the classes trying to learn as much as possible. He worked hard, did all of the activities and his presentation illustrated he knew how to build and design. Charlie fully recovered from the RLSPBL lab and added to the class continuously as he helped students who were not up to his speed (4/10/10).

Elizabeth is a RN with many years of patient care experience. She was a very hard working individual who was able to do all of the activities presented. She recovered from the RLSPBL activity and was able to make a viable presentation that illustrated her understanding of

the material. She added to the classroom discussion and was able to inform others of possibilities related to building (2/07/11).

Francis is an RN who comes with many issues. She was not able to understand the software on her own and had to come to class. She continuously curse at the software but did it in such a happy way. Other nurses joined in with her to express the distaste. She worked very hard, did the activities and spearheaded the creation of documentation for the class to illustrate what to do back at their facilities. She recovered from the RLSPBL activity, did all of the work and had a very informative presentation (3/22/10).

Irene is an RN who also comes with many issues, her hospital is always signing up to be BETA test sites for the software. She continuously spoke out in class but did so in a cheerful manner. She worked very hard, did the activities and then did more to experiment for her facility. She recovered from the RLSPBL activity, did all of the work and had a very informative presentation (9/21/09).

Kathryn - In this class, the clients have to actually work and think in the classroom, this overwhelmed Kathryn. Eliminating the pre-requisite class has sent students to me that are not versed in using our software or its functionality. This hampers their ability to learn. Kathryn is a 65 year old RN who is new to the computer world. A mentioning of her age because on the last day she indicated her age and all in the class were amazed how successful, skilled and adept she was. She worked hard, recovered from the RLSPBL activity and added greatly to the class. She still was overwhelmed, but her work experience as a Cardiac-surgery nurse enabled her to pull through. She was a pleasure to have in class. She should be capable back at home if she has the time and Barbara (her experienced coworker) to work with (5/09/11).

Lisa is an RN who did not have any prerequisite knowledge and was behind often. Her coworkers have been taught but they have left the facility. Lisa worked very hard and listened to the presentations and to other students. She worked well with them and added a fresh perspective to the class on how the software works. She recovered from the RLSPBL activity by waiting for some of the hard parts to be done by others; however she did understand the work being done. She made a viable presentation and should be able to update her system as changes come through (6/15/11).

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