THE EFFECT OF A CHANGE FACILITATOR ON PROJECT-BASED LEARNING CURRICULUM DESIGN

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This study sought to understand concerns and levels of use of a group of teachers in the process of developing a project-based learning (PBL) program, and the effect of a change facilitator on these processes. The research was guided by the following research questions: One, what are the concerns of teachers regarding the planning of a PBL curriculum? Two, what are the levels of use of teachers in the process of planning the PBL curriculum? Three, how does a change facilitator affect the process of change in the planning of a PBL curriculum? The population of this study consisted of seven subject area high school teachers and one district level administrative staff member. This study used the concerns-based adoption model (CBAM) to study the PBL innovation. CBAM is a conceptual framework that describes, explains, and predicts teachers' concerns and behaviors throughout the change process in education. In this study, the teachers progressed through the levels of use on a timeline at a rate that was much more rapid that what is typical for implementation of an innovation in an educational setting. This rapid progression was the function of the teacher population studied and the change facilitator that led the PBL curriculum design process. With the leadership of the change facilitator, the goals of the PBL curriculum innovation were realized, and the team created a PBL curriculum with multidisciplinary PBL products that could be implemented after the development phase.

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CHAPTER 1

INTRODUCTION

Background

Schools and educators are facing the challenges of meeting the learning needs of students in a 21st century world. In an effort to conceptualize 21st century learning, Allison Zmuda (2009) states that it is the fundamental shift from a teacher-centered learning environment to one that is student-centered. Prominent 21st century skills include critical thinking, problem solving, collaboration, effective communication, and global literacy. These skills require students to actively construct meaning, distinguish what is relevant, be deliberate in communication, share responsibility in learning, and engage in a curriculum that connects to their real world. In essence, 21st century learning focuses on what students can do with knowledge, rather than measuring what units of knowledge they possess. Project-Based Learning (PBL) is one such 21st century model in which students collaboratively research real-world problems and generate multiple solutions. The Buck Institute (2014) defines Problem-Based Learning as "a broad category which, as long as there is an extended 'project' at the heart of it, could take several forms or be a combination of: designing and/or creating a tangible product, performance, or event; solving a real-world problem (may be simulated or fully authentic), and; investigating a topic or issue to develop an answer to an open-ended question."

The setting for this study was a public Project-Based Learning high school of choice in a large suburban school district. The PBL campus implements a multi-disciplinary PBL curriculum to meet the needs of learners in the 21st century. The PBL campus website states, "We are an

innovative, project-based learning community committed to fostering a professional environment, inspiring creativity, and empowering students to collaborate and compete in a rapidly changing world" ("PBL School", n.d.). This study sought to study the PBL curriculum process at the PBL campus.

Statement of the Problem

Change is necessary in any organization that desires to be responsive to the exponentially changing world of the 21st century (Vinger, 2008). While the organizational change demands of the 21st century are unique to today's increasingly technical and globalized world, there are some basic tenets of change that span the decades. Change is challenging, uncomfortable, requires resources, and involves people in both leader and follower roles. Moving from a traditional model of learning to a PBL model requires significant organizational change and paradigm shifts on the part of individuals involved in the change process. While there is a significant amount of research on PBL, little exists on the processes of change inherent in moving from a traditional educational model to a PBL model, particularly on the role of a change facilitator in the change process.

Purpose of the Study

Facilitating the design of a PBL program is a large task and one that requires paradigm shifts, training, and growth among the participants. This study sought to understand concerns and levels of use of a group of teachers in the process of developing a PBL program, and the effect of a change facilitator on these processes.

Research Questions

The research was guided by the following research questions:

1. What are the concerns of teachers regarding the planning of a PBL curriculum?
2. What are the levels of use of teachers in the processes of planning the PBL curriculum?
3. How does a change facilitator affect the process of change in the planning of a PBL curriculum?

Assumptions

Hall and Hord (2006) refer to those who act in leadership roles as change facilitators (CF). A CF can be district administrators and building principals, but that role is not limited to these leadership positions. A CF is anyone in a position to manage change. It is assumed that any innovation will be more successful when there is effective leadership managing the change. Therefore, it was assumed that each teacher in the zero year, the PBL curriculum planning year, at the PBL school would grow as a collaborative team member who can integrate their content area into a PBL curriculum with the assistance and guidance of a CF.

Theoretical Position

An understanding of change process theory is integral in implementing organizational change. Frances Fuller's model of teacher development viewed change through an analysis of teacher concerns (Fuller, 1969). Fuller developed a model in which intern teachers progressed through three stages of concern- concerns about self; concerns about tasks/ situations, and;

concerns about impact on students. Fuller's model is a seminal work on change within the field of education, and was a basis for the concerns-based adoption model (CBAM).

CBAM is a conceptual framework that describes, explains, and predicts teachers' concerns and behaviors throughout the educational change process (Hall & Hord, 2006). This study used instruments in the CBAM model to examine the innovation of the PBL design process. The Stages of Concern measured concerns participants had about the innovation, the Levels of Use determined how participants were using the innovation, the Innovation Configuration map informed facilitators regarding progression through innovation goals, and the Change facilitator Style Questionnaire instrument provided data on the participants' perceptions of the CF's leadership style as she facilitated the process of designing integrated PBL curriculum.

CBAM's Principles of Change

CBAM operates on twelve defining principles of change; all have implication in the implementation of a PBL innovation (Hall & Hord, 2006).

Principle 1. Change is a process, not an event. Most lasting change in education takes three to five years.

Principle 2. There are significant differences between the development and implementation of an innovation. Often, much effort is given to the development and little to the implementation. Both must be given equal time and resources, for any idea that has been developed is doomed to fail without proper implementation.

Principle 3. An organization will not change unless the individuals within the organization change. Individuals will progress through change at different rates and in varying degrees.

Principle 4. Innovations come in different sizes. Most innovations occur in a bundle in which several seemingly small innovations are part of a much larger picture.

Principle 5. Interventions must continually guide the change process. Interventions help implementers of change keep a pulse on the organization and individuals, and allow adjustments to be made accordingly.

Principle 6. There will be no change in outcomes until new practices are implemented. Hall and Hord use an implementation bridge as a metaphor for change. The goal of implementation is to provide individuals whatever tools, skills, and support necessary to move over the bridge and toward the proposed change.

Principle 7. Leadership and administration plays a vital role in change. In this instance, the role of administrators is to support change from the bottom up, rather than to dictate a top-down change. Lasting innovation is more successful in a bottom up model where the stakeholders at the “bottom” are integral agents of the change process, and they are supported and guided by administrators through the process.

Principle 8. Mandates can work. When a mandate is made with a plan and expectation that involves continual communication, professional development, collegial coaching, and necessary time for individuals to cross over the implementation bridge, then a mandate can be very successful.

Principle 9. The school is the primary unit of change, for it is at the school level that most innovations are implemented.

Principle 10. Innovations are more successful when principals and teachers at the campus-level are involved in the implementation process.

Principle 11. Resistance is certain. Leaders of an innovation must continually take the pulse of individuals involved, determine why there may be resistance, and provide coaching, resources, training, or other interventions to guide individuals over the implementation bridge.

Principle 12. The context of the school influences the change process. The culture and school environment must be considered when implementing a change process. School cultures with a climate of professional learning communities in place will most likely have a staff that is more accepting of change and new innovations.

Elements of CBAM

Stages of Concern

Understanding feelings and perceptions about change. Organizational change will not be successful unless people within the organization change. Research suggests that most organizational change fail because employers do not take into account employees' attitudes towards change. Attitudes play a significant role in successful processes to attain changing organizational goals and improving individual and organizational performance (Baglibel, Samancioglu, Ozmantar, & Hall, 2014). Innovation developers must remember that organizations do not change until the individuals within it change. The goal of change is to bring these individuals across the implementation bridge (Hall & Hord, 2006). Before this leap can be

made, the individuals' feelings and perceptions regarding change must be considered through the stages of concern (SOC). The term "stages" implies that there will be different phases of change involved in an innovation, and each individual must walk through each phase or "stage." There are four basic stages of concern (Hall, 2010): *impact* focuses on how an innovation is affecting students and what can be done to positively increase outcomes; *task* refers to a focus on the time, logistics, and schedules of an innovation; *self* is primarily concerned about teacher efficacy, their confidence in success, and whether administrators will support their efforts, and; those who are *unconcerned* feel the innovation is not as important as other concerns.

SOC tools seek to meet individuals where they are at different junctures of the change process so that their needs and concerns are being considered. Astute administrators of innovation evaluate progress and communicate with stakeholders in every stage through a variety of means (Hall & Hord, 2006). One simple strategy is the "one-legged interview", which is a brief and informal conversation between the change facilitator and implementer about aspects of an innovation. In an educational setting, the administrator and teacher are sharing information about the impact of a change process. More importantly, regular and direct communication creates a positive culture in which administrators and teachers build trust and mutual respect. Another strategy is an open-ended statement in which teachers are asked to write their concerns regarding an innovation. The most rigorous strategy for assessing concern is the Stages of Concern Questionnaire (SoCQ), which is a 35-item questionnaire designed to apply to educational innovations. Data from the SoCQ can be used to develop a collective concerns profile within the organization (see Appendix A for a SoCQ as it relates to a PBL innovation).

Levels of Use

Exploring the use of innovations. While the SoCQ examines the effective aspects of change, the Levels of Use (LoU) focuses on the behaviors and actions of the individuals in a change innovation (Hall & Hord, 2006). There are several methods designed to determine LoU. One method is the branching interview in which a series of questions are asked regarding an innovation. The flow of the interview is determined by the answers to questions as they branch. For example, a question answered "yes" opens one branch of subsequent questions, and a questions answered "no" follows another branch. The second method of LoU assessment is the focused interview in which questions are focused under specific categories related to the change innovation (see Appendix B for a rubric to determine the LoU in a PBL innovation).

Innovation Configuration: Clarifying the Change

Often in the implementation of an innovation, teachers may not be clear about the nature of the innovation, what they are being asked to do, and why they are being asked to do it. From the beginning of the change process there is a disconnect between the innovation designers and implementers (Hall & Hord, 2006). Consequently, what designers assume is happening in the classroom in regard to the innovation may be something very different than what is actually being implemented. The purpose of the innovation configuration (IC) map is to "address both the idealized images of a change developer as well as the various operational forms of the change that can be observed in the classroom (p. 112)." This is accomplished through IC mapping in which words, pictures, and connections are created to help visualize the

concept, much like a road map helps a traveler visualize their journey from origin to destination (see Appendix C for an IC map of a PBL change innovation).

The purpose of the IC map is to present descriptions of different ways of implementing the innovation. It also allows leaders to measure degrees in which innovations may be occurring. IC maps can be developed for various stakeholders in the change process. For example, there may be an IC map for teachers, students, and building administrators as they progress through an innovation. Ideally, the individuals involved in the innovation will participate in developing the IC maps and create a sense of shared ownership in the process. As a result, the process is time-consuming, but perhaps the most important benefit of developing IC maps is the consensus-building that it encourages. The final product is one that proactively explains all elements of the innovation, determines a potential time-line, and prevents potential potholes in the journey.

Definition of Terms

For the purpose of this study, the following terms are defined.

- Project-based learning (PBL). Project-Based Learning (PBL) is a learner-centered inquiry model in which instruction is designed around complex authentic projects with multiple solutions that enhance students' analytical, synthesis, and evaluation skills.
- Concerns-based adoption model (CBAM). CBAM is a conceptual framework that describes, explains, and predicts probable teacher concerns and behaviors throughout the educational change process.

- Change facilitator. In the CBAM model a Change facilitator is any individual leading the change process.
- Zero year. The zero year at the PBL school is a year of PBL curriculum design in which a multi-disciplinary grade level team creates the PBL units.
- The war room. The ideation room and home office area of the 11th grade team.
- On the floor. The PBL campus' 9th and 10th grade teacher teams who were teaching students were said to be "on the floor", as opposed to the 11th grade team of this study who were creating curriculum in the war room of their zero year.

Limitations

This study sought to explore the processes of designing a PBL curriculum for a grade level, while integrating all content areas into meaningful projects. Of particular interest were the processes that moved teachers from a novice understanding of PBL to one in which they are comfortable enough to design a year of integrated projects for a specific grade level. The population in this study was a group of teachers who applied to the PBL campus; hence one limitation of the study was that the participants were interested in this model and willing to work in it. Data gathered from an already accepting group of teachers may not directly apply to teachers on traditional campuses where learning structured around PBL is not the norm. The context of this case study limits the generalizability of the findings. The case study format of this research allowed the researcher to provide a rich description of the phenomena encountered in the process of research. This description may afford readers the opportunity to

make independent decisions about whether or not the themes that emerged from the research bare transferrable to other PBL development teams.

Summary

Moving from a traditional model of learning to a PBL model requires significant organizational change and paradigm shifts on the part of individuals involved in the change process. While there is a great deal of research on PBL, little exists on the processes of change inherent in designing a PBL program. This study examined the processes of the 11th grade team, undergoing a change from traditional to PBL curriculum designers, using the instrumentation from the concerns-based adoption model (CBAM). This study examined the role of leadership in the design of the PBL curriculum. This study sought to provide change facilitators (school administrative personnel) with a model to aid in the understanding of the change process. The assumption was that administrators might be able to use the tools to guide teacher growth and aid in the implementation of the PBL program in the future. One extended goal of the study was to provide district administrative personnel, the building principal, and any other leader/ facilitators with change management data to address the concerns of teachers as they planned for the implementation of the PBL initiative.

CHAPTER 2

RELATED LITERATURE

Historical Models of Change Management

Change is necessary in any organization that desires to be responsive to the exponentially changing global world of the 21st century. "Organizational change refers to any alteration in activities and tasks. It is a modification or transformation of the organization's structure, processes, and goals" (Vinger, 2008, p. 196). While the organizational change demands of the 21st century are unique to today's increasingly technical and globalized world, there are some basic tenets of change that span the decades. Change is challenging, uncomfortable, requires resources, and involves people in both leader and follower roles.

Some of the earliest work on change theory was developed by social psychologist, Kurt Lewin. Lewin's model is predicated on a field theory he developed in which human behavior is influenced by internal and external forces acting on the individual (Lewin, 1947). Internal forces are those cognitive and motivational elements that we categorize in individuality. What was more of interest to Lewin were the social forces that acted up on the individual. He argued that social norms, standards, and institutions become "vested interests" in humans, and that individuals become highly protective of these forces. The individual is imbedded in social groups, and social groups are embedded in social systems or structures. Comfort in the group is what makes individuals resistant to change. In this view, we value the group in which we belong, and therefore changing our attitudes threatens the comfort of being in the group and all that we value. Because this social value makes individuals resistant to change, attitudes tend to be "frozen" in to place. The only way to create real change is to temporarily "unfreeze" the

individual's attitudes. Ideally, the attitudes of the social group should be unfrozen at the same time for the most effective change. Once unfrozen, the groups' attitudes, including the individuals in the group, will support each other to "freeze" the new attitudes. Lewin's theory was tested in World War II when the US government sought his assistance in changing eating behavior in a time of food shortages and rationing (Jost, 2015). He found that compliance to the government plan was successful when local communities and neighborhoods were involved in the discussion of nutritional facts, sharing of the rationale behind the government plan, and local decision-making and implementation of the plan.

The earliest organizational change models were apparent post-World War II, and Kurt Lewin's change model was applied to organizational change models. (Medley & Akan, 2008). In the unfreezing stage, leaders propose new ways of thinking to unfreeze old behaviors within the organization. Leaders devised ways of removing barriers to change and garnering supportive attitudes of employees. In the moving stage, employees are provided with new information, new behaviors, and alternate ways of operating that will help them learn new concepts. Change starts to stabilize in the refreezing stage in which employees integrate new attitudes and behaviors into their daily practice.

The action research model for business surfaced in the late 1970s and spanned through the 1980s. This model views business change as a cyclical process (Vinger, 2008). The organization is first researched which provides information to guide the next actions steps. The action steps are assessed to provide further information to guide further action. This process involves collaboration among members of the organization. The model provides interplay between action and research, and has a twofold aim: One, it helps organizations develop

planned changes. Two, it develops more generalized knowledge that can be applied to other settings. The steps in the process are as follows:

1. Identify the problem.
2. Consult with a behavior science specialist for data gathering and analysis.
3. Gather data for preliminary analysis.
4. Provide feedback to a key client or group.
5. Diagnosis the problem with the key client or group.
6. Create an action plan.
7. Implement action plan.
8. Gather data after action to guide further action.

The key characteristic of the action research model is that research guides action, and action guides research.

Recent research by Werkman and Boonstra (2014) presented a case study in which barriers to organizational change were studied and discussed with all organization members involved in the change process. They investigated the factors underlying the problems experienced by a Dutch institution for socio-cultural work for the implementation of self-directed teams. Each team was addressing problems and solutions in a lower-economic section of a medium sized Dutch city. Prior direction for problem-solving had been administered through a consulting firm that administered guidelines for the action groups to follow as they worked on their project in the neighborhood. When results from this directive approach did not meet management expectations, researchers from the University of Amsterdam proposed using the action research model, which is the work of this case study. A questionnaire was used

to map the approach and management of the change process and give insight into the experiences organization members had with the change process. This questionnaire was distributed among all organization members concerned. Feedback on the issues raised in the interviews and the questionnaire was provided to all team members. The team members then engaged in interactive sessions to understand the factors underlying their difficulties in working together in self-directed teams. Each team chose the problems that were most important for that team as a starting point for improvement. The team members thoroughly studied these problems and all teams suggested a range of possible solutions. These solutions were then discussed and actions were chosen. In interview and observational data, management and workers reported that they felt a greater amount of trust through the small group discussion approach. Action group meetings were problem-focused and not gripe sessions. Workers appreciated inclusion in the problem-solving process and the ability to inform management which neighborhood issues were of most importance. All reported that they believed their goals for working in the neighborhood were better accomplished through action research, though no empirical study has tracked the outcomes.

While some models view change through the lens of organizational structure and the processes within, other models focus primarily on the individuals in the change process. The theory of reasoned action and planned behavior predicts that the rate of change acceptance and adoption is related to the involvement and/ or perceptions of involvement of the individuals impacted by the change process (Ajzen, 2011). The central factor in the theory of planned behavior is the individual's *intention* to perform a given behavior. Generally speaking, the stronger the intention is of an individual to engage in a behavior, the stronger the

performance of that behavior. When changing a behavior, it is possible individual intent may not be strong for change. Change of intent is more successful when individuals possess perceived behavioral control. If a change is desired, then individual need to feel that they have an element of control in the process. In other words, they need to feel that they have ownership in the change, and ultimately their own "fate".

Ajzen's and Madden were the first researchers to test the theory of planned behavior (Madden, Ellen, and Ajzen, 1992). Their first experiment studied students' class attendance. The results indicated that perceived behavioral control was a significant predictor of intention after controlling for attitudes and subjective norms. However, perceived behavioral control did not contribute to the prediction of the target behavior after controlling for intentions. The researchers argued that the degree of actual control over attending class was relatively high and, therefore, the addition of perceived control would be expected to have little predictive validity with respect to the target behavior. Their second experiment assessed students' attitudes, subjective norms, perceived control, and intention towards getting an A in a particular course. The data were collected at the beginning of the semester and at the end of the semester. The responses from the first data collection mirrored data from the student attendance experiment in that perceived control enhanced the prediction of intentions, but did not contribute to the prediction of behavior. However, when the semester end data were used, perceived control did contribute to the prediction of behavior after controlling for intentions. In sum, the theory of planned behavior predicts two possible effects of perceived behavioral control behavior (Madden, et al. 1992). In the first case, perceived behavioral control reflects motivational factors that have an indirect effect on behavior through intentions, whereas in the

second case, perceived behavioral control reflects actual control and has a direct link to behavior not influenced by intentions.

Concerns-Based Adoption Model of Change Management

The concerns-based adoption model (CBAM) is grounded in the empirical research of Frances Fuller's model of teacher development. Fuller viewed change through an analysis of teacher concerns (Fuller, 1969). Fuller's study examined intern teacher development during a two-semester internship program by focusing on the patterns of the interns' evolving concerns and aspirations. Over the years of studying teacher development concerns, Fuller developed a model in which intern teachers progressed through three stages of concern: concerns about self; concerns about tasks/ situations, and; concerns about impact on students. Concerns about self are most prevalent among student teachers or when a teacher is new to the profession. Their teaching concerns have an egocentric frame of reference. Their thoughts center around things such as: how the teaching experience will affect them; understanding the school professional culture, from teacher dress code to forming collegial relationships, and; wondering if their student will like them. Concerns about tasks begin soon after the initial self concerns. Teachers quickly must think about the logistics of teaching such as needed resources, grading papers, how to group students, and classroom procedures. Impact concerns are the ultimate goal for educators. Once the self and task concerns are resolved, focus needs to be on the students and how what the teacher is doing has a direct relationship on student learning.

Conway and Clark (2003) speculate that Fuller's research portrays the outward path of teacher development with elegance and clarity. This model has come to encompass the process

of novice teacher development, however, it has implications for experienced teacher development. The introduction of change innovations is a challenge to the most seasoned teacher, and even the experienced teacher will have déjà vu moments of being a novice teacher when they are negotiating a novel innovation. The learning curve is steep. The hours of planning and preparation and the experiences of successes and failures are reminiscent of the first year of teaching.

Planned organizational change continues to be a neglected area in practice, training, and research in schools (Zins & Illback, 1995). Change in education is more often reactive than proactive, and often executed piecemeal instead of systematic planned change. While few models address the change processes in an educational setting, the Concern-Based Adoption Model was developed specifically for implementing change in education.

"The concerns-based adoption model, better known as CBAM, is arguably the most robust and empirically grounded theoretical model for the implementation of educational innovations to come out of educational change research in the 1970s and 1980s" (Anderson, 1997, p. 321). CBAM was developed at the University of Texas Research and Development Center for Teacher Education. Development began in the early 1970s and continued until the mid-1980s. In the mid-1970s the National Institute for Education funded research to develop a diagnostic process for guiding change (Hall, George, & Rutherford, 1978). The focus of that work was on the individual teacher in the change process and what administrators or change agents can do to make the change less difficult and more effective. These are the underlying tenets of CBAM, which was being developed during that same era. CBAM developed during the heyday of what Fullan (1985) has termed the "innovation-focused" approach to educational

change, when the dominant strategy for school improvement hinged on facilitating the implementation of discrete innovations in curriculum and instruction, innovations that were intended to result in improved teaching and student learning in affected curriculum areas and classrooms. Throughout the 1980s and 1990s efforts to improve teaching and learning processes and outcomes shifted away from an emphasis on discrete innovations in curriculum and instruction to a variety of organizationally focused initiatives bearing such titles as "effective schools," "restructuring," "site-based management," "teacher empowerment," "teacher collegiality," "parental choice," "teacher accountability," and "outcomes-based education."

CBAM and Research

Recent research studies used CBAM to implement, facilitate, or measure change initiatives. Christou, Eliophotou-Menon, and Philippou (2004) effectively applied CBAM in the national school system of Cyprus by studying teacher concern in the adoption of a new mathematics curriculum. They used the SoCQ to assess teachers concerns as they implemented a new math curriculum based on the concepts inherent in PBL such as problem-solving, communication and discourse around math problems, manipulatives, collaboration, new content, and changing views of the roles of teachers and students. Their study concluded that generally teachers focus on the day-to-day task stage, much like the focus novice teachers experience in their first year of teaching. There was a correlation between experience and how quickly teachers moved from the task stage to more student-centered stages.

In a study of a mathematics innovation in 4th grade classrooms to adopt a new model of algebraic thinking in elementary schools, Tunks and Weller (2009) used CBAM to guide the change and examine the process of change. The researchers focused on teachers' concerns about the levels of use of the innovation, and how those concerns evolved. They measured changes in perceptions and practices as the teachers progressed through the innovation. Tunks and Weller found that personal and frequent contact with supportive staff members, orchestrated teacher support systems, and observation of student success were factors that had the greatest impact on the change process.

Project Learning is one of the four key tasks in the "Learning to Learn" curriculum reform introduced by the Hong Kong Curriculum Development Council (Leung, 2008). This study discussed how teachers viewed Project Learning using the SoCQ. Through the use of the SoCQ, Project Learning facilitators learned that teachers have major concerns regarding the impact of implementing Project Learning in their schools. Facilitators were able to pinpoint those concerns and address them in professional development and conversations with teachers. Facilitators also tailored teacher development based on the stages teachers were at in the implementation of the innovations. Professional development was designed differently for teachers who were at a self-concerns level and teachers who were at the student impact level.

CBAM was also used in the implementation of a new social studies curriculum in an Australian elementary school (Marsh, 1987). The results indicate that over the nine-month period of the study, teachers had high personal concerns, possibly because of the lack of explicit teacher guidelines provided by upper level administrators. There was some movement from mechanical level of use (LoU III) to routine and refinement levels (LoU IVA and IVB). It was

evident that only a partial use of the innovation was achieved by teachers, and the elements of CBAM were used to assess teachers' concerns and needs to guide further staff development.

CBAM has been used in similar studies that focus on the specific innovation of implementing elements of technology in the classroom. Newhouse (2001) used CBAM as a research model to study the implementation of portable computers in a secondary school setting. The researcher concluded that CBAM provided a well-developed framework within which to conduct research. CBAM was found to be very useful in developing an initial understanding of the innovation and its effects on teachers. The CBAM structure provided the researcher with a framework within which to develop a model more tailored to the particular characteristics of the innovation.

Slough and Chamblee (2007) studied the efficiency of the CBAM model through investigating three reviews of technology integration in mathematics and science effectiveness. Three themes emerged from two of the reviews: one, very few research studies actually use the entire CBAM model to study the integration of technology. The majority of studies only used the SoCQ; two, almost all studies were short in duration—less than one year—so few studies reported follow-up surveys after the implementation phase was completed; three, lower-level concerns were identified at a much higher rate as higher-level concerns and modifications were implemented to address most of these concerns. The research concludes that the use of CBAM as a research tool has merit, particularly because of its demonstrated flexibility. They recommend further studies to substantiate the CBAM model as a research tool.

Goodnough and Cashion (2006) worked with a high school science teacher to implement a PBL model in her classroom. The researchers used elements of CBAM to study PBL

implementation. Outcomes related to student perceptions of PBL indicated that the majority liked learning through PBL because it promoted active learning, made science relevant, provided a variety in learning, and supported group work. The authors further discussed implications and recommendations for the adoption of PBL in K-12 settings: one, the CBAM model can provide a useful tool for practitioners to reflect on their own concerns as the adopt an innovation; two, the CBAM model can be a useful tool to guide professional development; three, PBL is a complex instructional model, so teachers should work in professional learning communities that engage in shared learning of this new innovation; four, PBL requires a new role for students, thus teachers need to give careful consideration to student abilities and skills that need to be engaged before and during PBL implementation; five, the adoption of a PBL in K-12 education needs to be contextualized to meet the learning needs of diverse student groups. It is not a one-size-fits-all approach.

CBAM is a preferable research and implementation model for several reasons: One, CBAM focuses on the process of change that is dynamic and nonlinear; two, the primary focus of CBAM is on all stakeholders in the change process. The CBAM model aims to bring all stakeholders across the implementation bridge; three, Hall and Hord offer a research-based model with practical tools such as the IC, LoU, and SoCQ that allow for proactive contingencies associated in a change process. These tools allow facilitators to be proactive in anticipating issues associated with an innovation, not just responsive to issues as they present themselves; four, the CBAM model and the use of the tools has been successfully implemented in various school-based research studies as previously cited; five, the continual evaluation of the process and input of the participants throughout the process provide ownership of the change and

innovation for all stakeholders; lastly, CBAM is a change model developed for the unique milieu of education. CBAM provides tools to guide staff development and other important facets of change such as planning vs. implementation, resources, leadership, and the school environment.

In the current climate of education where initiatives such as No Child Left Behind and state standard assessments guide local policy and procedures, it is becoming imperative for districts and teachers to embrace the necessity of implementing scientifically validated practices in the classroom (Roach, Kratochwill, & Frank, 2009). The term "scientifically-based research" is referenced over 100 times in No Child Left Behind. To support the use of research-based practices, the U.S. Department of Education created the "What Works Clearinghouse" whose stated purpose is "to promote informed education decision-making through a set of easily accessible databases and user-friendly reports that provide education consumers with ongoing, high-quality reviews of the effectiveness of replicable educational innovations" (p. 302). Roach et al. argue CBAM is the vehicle for school-based facilities who wish to impact change and introduce research-based practices, programs, and innovations in classrooms and schools.

Change Facilitator

The impact of a leader can be judged through the extent to which planned organizational change improved organizational behavior. A study by Song (2009) examined the extent to which planned organizational change intervention (team-building system) affects organizational behavior by comparing change-oriented leadership. This research surveyed team

and division leaders and team members and division members in Korean four central ministries. The results showed high level of change-oriented leadership and leader–member exchange in both the team building and division systems. Successful planned organizational change occurs when organizations rethink the role of the leader. Often the role of leader is perceived as one of improved productivity, maintaining goals and/ or deadlines, better quality, and reduced conflict. Effective leadership and a positive relationship between leaders and participants can be best attained within flexible organizational structures, primarily in rethinking views of hierarchical structures in which leaders are the designers of the change and participant are subordinates who may or may not have a role in the change process. Leaders who take on a supportive role and focus on consensus building, interpersonal interaction/ team building, and mutual trust in decision making better facilitate planned organizational change than the traditional goal-oriented top-down leadership.

While all stakeholders are important in the implementation of an innovation, perhaps the most important element is that of leadership. Effective leadership throughout the process can provide measures of success, while ineffective leadership can doom an innovation to failure. Hall and Hord (2006) reference a 1958 work from Lippit, Watson, & Westley that focused on the role of the leader as a change agent. They believed the key to transformational change was the identification of change champions who encouraged others to be involved in the change design and planning process. These change champions maintained the change through open communication, feedback, group work, and frequent goal celebrations.

The change facilitator (CF) is a change agent who sets the tone for campus level innovations. Hall and Hord (2006) identify three change facilitator styles in their concerns-based adoption model (CBAM):

- Initiator change facilitators. Initiator change facilitators have clear, decisive long-range goals and policies for the entire organization, not just the current innovations. They tend to have strong convictions about what constitutes good schools and effective teaching, and have high expectations for students, teachers, and administrative leadership. Decisions are always made through the filter of what is best for students, and such decisions are framed with current research and data on classroom practice. They are also master communicators throughout the process. Initiator principals make it happen.

- Manager change facilitators. Manager change facilitators focus on resources and organization of activities. They are responsive to situations and the needs of people. They tend to have good rapport with those involved in the innovation at all levels, and they serve as a bridge between the various levels. They keep teachers informed about expectations from district administrators and support changes that have been initiated. However, they are not typically the initiators of such change and do not move far beyond the basics of a proposed innovation. Manager principals help it happen.

- Responder change facilitators. Responder change facilitators place emphasis on teachers and others having the opportunity to take the lead. They view their role as keeping the day to day function of the school running smoothly. They believe that teachers are professionals and give them latitude to perform their job with minimal guidance. They solicit input and take into account feelings of others when decisions are being made. They tend to

make decisions based on what is immediately in front of them rather than goals and a vision for the future. Responder principals let it happen.

Each CF style has its merits and areas for growth, but studies have shown initiator principals are the most successful in implementing innovations and leading change. It should be noted that effective change cannot be guided by only one individual. Hall and Hord (2006) refer to those who act in leadership roles as " change facilitators", and they take a broad perspective of facilitators beyond district administrators and building principals. Everyone who is engaged in change may potentially have a responsibility to assist in facilitating the process. Facilitators may be teacher leaders, policy makers, or IT specialists. Whatever their title, facilitators provide the interventions that can increase the potential for the success of change.

Research on CF style is sparse and tends to focus on school principals. A research study was conducted at 32 primary schools and 18 secondary schools located in Gaziantep, a southeastern city of Turkey, in the 2011-2012 academic year (Baglibel,et al., 2014). The researchers administered the questionnaires to 700 teachers. In the data collection phase, the Change facilitator Style Questionnaire (CFSQ) was used to measure school principals' change facilitator leadership styles based on teachers' perceptions. The CFSQ includes 30 items and comprises six dimensions: social informal, formal meaningful, trust in others, administrative efficiency, day-to-day, and vision and planning. Research results suggest that teachers perceived their principals as responders, managers or initiators. The highest occurrence was of the responder CF style, followed by manager and then initiator. The change-related attitudes of the teachers who perceived their principals as initiators were significantly more positive than those of the other two groups. The attitudes of those who perceived their principals as

managers were significantly more positive than those of teachers who perceived their principals as responders. Lastly, the change-related attitudes of the teachers who perceived their principals as responders were significantly more negative than the attitudes of the other two groups.

Change facilitators are focused on interventions that facilitate change. An intervention is anything that is needed to assist in the change process such as resources, training, a conversation, coaching, or even a party (Hall & Hord, 2006). The six functions of interventions are: developing, articulating, and communicating a shared vision of the intended change; planning and providing resources; investing in professional learning; checking on progress; providing continuous assistance, and; creating a context supportive of change. Interventions are both planned events that are part of an initial timeline and unplanned events that address needs as they arise. There must be a continual evaluation of the process as a whole, of the organization as a whole, and of individuals involved. Interventions facilitate the process based on continual evaluation, and facilitators will do well to remember that whatever the innovation, it is a learning process for all. If leaders view their role as facilitators of the learning process in which they provide tools and remove roadblocks, then their guidance of the process will be successful.

The Principal/ Teacher Interaction Study documented the interventions of nine elementary school principals for a year (Hord & Huling-Austin, 1986). Their staff meeting, staff interactions, memos, and time in classrooms were documented and described. Implementation was assessed measures teachers' SoC, LoU and IC. Statistically significant differences were found in the quantity and quality of the principals' interventions. Interventions most related to

innovation implementation took place in the initiator schools, whereas the fewest occurred in the schools with responder principals. Later studies examined the relationship between principal CF style and teacher success in implementation. Teachers who moved to higher LoU, with higher fidelity of the IC, and with reduction of self and task concerns and arousal of impact concerns would be considered to have had greater implementation success. The general finding was that teachers with initiator principals had the highest levels of implementation success. These findings suggest that initiator CFs make it happen. They have the vision, passion, and push to move things toward a common goal. Teachers with manager principals were successful too, but not to the same extent in initiator schools. Manager CFs help it happen. They are well organized and efficient when implementation becomes an objective. However, unlike initiators, they tend to accept minimal implementations and do not push to do more. Teachers with responder principals were rated a distant third in terms of implementation success. These leaders let it happen. Statistically, they are significantly less active in terms of the number of change-related interventions (see Figure 1).

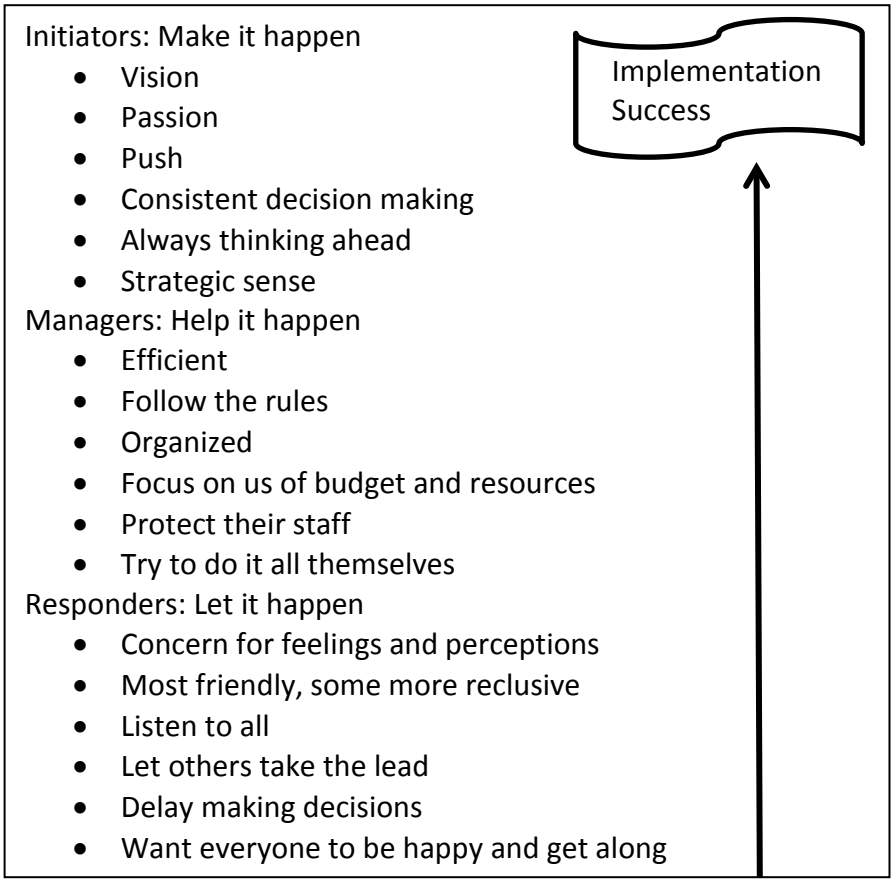

Figure 1. Change facilitator style implementation success. Adapted from Hall & S. Hord (2006, p. 148).

Project-Based Learning

Critical attributes of 21st century education include integrated and interdisciplinary curriculum planning, technologies and multimedia, global classrooms, project and problem-based research, student-centered learning, and relevant and rigorous instruction (Shaw, 2009). The concept of school, teacher, and learner must change to meet the needs of 21st century learning. School must transform from buildings with small boxes to nerve centers where walls have a "transparency" that foster a community of learners. Teachers will move from dispensers of knowledge to orchestrators of learning and, in turn, help students transform information

into knowledge, and knowledge into wisdom. Learners are participants in their own learning process and set goals for their own learning, collaborate with students and teachers, and reflect in all processes. Learners are also the new generation of "digital natives" who process much of their world through technological devices, but this does not mean that students are media literate. A 21st century curriculum includes elements of media literacy, along with an interdisciplinary thematic and research-based approach to content and skills filtered through inquiry and problem-based learning (PBL). A PBL model is centered in students collaboratively researching real-world problems and generating multiple solutions (Prensky, 2010).

PBL was first developed in 1969 at the medical school of McMaster University in Ontario, Canada (Ramsay & Sorrell, 2007). Medical school professors noticed a disturbing reality in the educational process of the medical students. It was possible for students to memorize medical content extensively without any change in their ability to use the information to diagnose diseases. Instructors were also disturbed by the lack of transference of information. Body systems were studied as an entity, but not in context with other body systems. Since doctors must understand how disease impacts the body's multiple systems, this linear approach to a systemic discipline was missing the mark. As a result, the PBL curriculum delivery model was developed to actively engage medical students in the subject matter and to help develop effective critical-thinking, communication, and social skills.

PBL is a mainstay of the 21st century learning movement in education. In an effort to conceptualize 21st century learning, Allison Zmuda (2009) states that it is the fundamental shift from a teacher-centered learning environment to a student-centered one. Most prominent 21st century skills include critical thinking, problem solving, collaboration, effective communication,

and global literacy. These skills require students to actively construct meaning, to distinguish what is relevant, to be deliberate in communication, to share responsibility in learning, and to be connected to a curriculum that connects to their real world. In essence, 21st century learning focuses on what students can do with knowledge, rather than measuring what units of knowledge they possess. PBL provides a model that encapsulates all of the 21st century learning skills. Just as the role of the learner shifts, so must the role of the teacher (Ferreira & Trudel, 2012). No longer is the teacher the content expert and imparter of knowledge through lecture. Instead, teachers become facilitators or coaches guiding students through the PBL process. The primary role of facilitators is to help learners develop questions, locate resources, and create proposed solutions. PBL has the following benefits (Ramsay & Sorrell, 2007): It merges thinking and knowledge by helping students master both content and process; it emphasizes real-world skills; it integrates disciplines; it capitalizes on concerns valued in the community, and; it meets the needs of learners with a range of learning styles and needs. Most PBL models are implemented in an interdisciplinary framework in which teams of teachers from different core disciplines plan units that are both true to their content knowledge yet connect through themes, inquiry, and PBL. Such a shift to 21st century learning based in PBL requires significant organizational change in education.

In our changing world of education, PBL takes on a greater importance because it allows students to extend their strengths and explore their interests. There are seven major attributes of PBL (Harada, Kirio, & Yamamoto, 2008). One, issues, themes, and problems form the core of PBL and require in-depth exploration. There are no quick and easy answers or definite solutions. Two, students develop ownership in their education by selecting topics, setting their

own goals, and taking charge of their own learning. Three, instructors take on the roles of facilitators and coaches. Four, students use essential tools including technology, for accessing, retrieving, and producing information. Five, students collaborate with peers and adults. Six, students reflect continuously as they work through projects. Lastly, PBL culminates in a product that presents possible solutions to a problem, analyzes a dilemma from multiple perspectives, or develops an idea in original and thoughtful ways.

PBL is a learner-centered instructional method designed around complex real-world problems with multiple solutions, which enhance students' analytical, synthesis, and evaluation skills. The primary educational goal is to develop learners who are effective problem-solvers. Ideally, PBL is a process in which learners acquire the knowledge and skills needed to prepare them for professions in which critical-thinking, problem-solving, and independent and collaborative work is essential for success (Ramsay & Sorrell, 2007). In PBL, learners collaborate to examine issues related to a problem and pose viable solutions. In the process, the learner is reflective on the knowledge they do and do not possess. This reflection helps chart a course of what needs to be learned. It has become a teaching/ learning method and a pedagogical philosophy that "facilitates student achievement by supporting a structured process of using what one knows, systematically obtaining new knowledge and skills once gaps have been identified, collectively applying new and old knowledge and skills, and finally reflection"(Ramsay & Sorrell, 2007, p. 42) . The emphasis of PBL on collaboration and problem-solving offers students opportunities to learn language and communication skills, make their current knowledge visible, identify knowledge gaps, collaboratively address gaps, and clarify

and consolidate what they have learned in a collaborative process (Chernobilsky, DaCosta, & Hmelo-Silver, 2004).

The 21st century learning movement has evolved from the theories of 20th century progressives, constructivist epistemology, and the demands of a 21st century global society influenced by exponentially changing technology (Dillon, 2006). The Partnership for 21st Century Skills was one of the first organizations to emerge that promotes 21st century learning. Now many similar organizations are emerging as alliances between the education community and the private sector. The underlying purpose for 21st Century learning proponents is to keep the United States viable in an increasingly global marketplace with unprecedented competition. We must develop a workforce that is also competitive in a market driven by technology and global interdependence. We can no longer educate today's students living in the 21st century with yesterday's educational models. The 21st century classroom combines old content with new skills to create more rigor and relevance for students (Matusevich, O'Connor, & Hargett, 2009). Learning in the 21st century classroom emphasizes critical thinking, problem-solving, digital literacy, and interpersonal communication skills. Learners are encouraged to take creative risks in this environment while teachers are provided with more opportunity to foster creativity in their instruction. Students look at core knowledge through real-world examples, and prepare to compete globally by developing thinking and interpersonal communication skills while learning content.

PBL is a viable educational model to meet 21st needs. Researchers have found that well implemented PBL models positively impact student outcomes (Ferreira & Trudel, 2012). PBL can lead to greater conceptual understanding, problem-solving skills, and analytical and reasoning

skills. Students learn how to learn as they structure real-world problems and develop solutions. In addition, since PBL is collaborative in nature, students strengthen their interpersonal skills. Students report that PBL helps them become independent learners while increasing their interest in the subject matter and enjoyment of learning.

CHAPTER 3

METHODOLOGY

Research Purpose

Facilitating the design of a PBL program is a large task and one that requires paradigm shifts, training, and growth among the participants. This study sought to understand concerns and levels of use of a group of teachers in the process of developing a PBL program, and the effect of a change facilitator (CF) on these processes and on the development of the teachers as designers of PBL curriculum.

Research Questions

The research was guided by the following research questions:

1. What are the concerns of teachers regarding the planning and implementation of a PBL model?
2. What are the levels of use of teachers in the processes of planning the PBL curriculum?
3. How does a change facilitator affect the process of change in the implementation of a PBL model?

Method

Design

This study was a qualitative case study of the PBL school's curriculum design process which used mixed methods for collecting data. The case study design was used because case studies explore the space between theory and the experience of practice. "It is one thing to have an idea and another thing to make that idea concrete and real. (Breslin & Buchanan, 2008.

p. 36).” The charge of this team and the CF was to create a PBL curriculum with PBL products that began first with an orchestrated understanding of PBL, the six content areas, and ideating a construct to create a multidisciplinary PBL curriculum that brought all the content areas together in a PBL product. Next the team and CF had to move from this ideation phase to creating an actual curriculum with PBL products that could be implemented with students the following academic school year. The concerns-based adoption model (CBAM) was used as the model for this study because it addresses the multifaceted process of change in education. The SoCQ addressed the affective process of individuals in a change process. This instrument provided data on the personal feelings of participants as they worked through the PBL innovation. The first research question for this study, the concerns of teachers about the PBL initiative, was answered with the numeric data of the SoCQ. The concerns of the participants were represented as a numeric percentile in the areas of self, task, and impact concerns. The second research question regarding the participants’ level of use of the PBL innovation was addressed with the LoU matrix, which showed the performance of participants in the change process. Each participant was placed on the LoU matrix by analyzing data from the IC map observation data and the NVivo coded interview data. The third research question explored the affect of a change facilitator in the process of change, and was answered with both quantitative and qualitative data. The CFSQ charted the CF numerically in the six leadership domains, which elicited a specific leadership style. This CF leadership style was further corroborated though CBAM leadership style characteristics and NVivo interview data from the participants in this study.

Setting

Learning Environment

The PBL school in this study is one of three public schools of choice academies opened in 2013 in a large suburban school district. The PBL school is a STEAM academy that is grounded in science, technology, engineering, art, and math. The facility is a former office call center space, with a corporate feel to the space rather than that of a traditional school setting. The building has three floors, each of which has no interior walls. Observers can see from one end of the each floor to the other. Along the sides are ideation and seminar rooms where teachers, called "facilitators" on this campus, and students, called "learners", are writing on walls, windows, and tables as they learn and design projects. Small conference/ meeting rooms resemble boardrooms in which students, like corporate executives, meet with team members to plan and evaluate projects. Collaborative worktables and casual sitting areas are spread throughout, and all furniture is moveable and rarely in the same configuration from day to day. The space itself encourages freedom of movement and freedom of thought. Student groups can be observed writing on walls, sitting with open laptops on couches, or walking with 2 x 4 boards from the fabrication lab to the maker space. There is a buzz of activity and learning. Facilitators might be guiding a small group in a seminar room, walking from group to group in the large space engaging in questioning or formative assessment of learning, or listening to a presentation of a final product, called deliverables.

One unique aspect of the PBL school is that it is 100% funded through corporate partnerships with companies such as Southwest Airlines, Texas Instruments, Toyota, USAA, Hillwood Homes, and Fossil, just to name a few. Partners support with money, knowledge, and

time, and there is evidence of this investment throughout the building. The fabrication lab, sponsored by Southwest Airlines, is a fundamental learning space where small tools, table saws, drill presses, and plasma cutters are available to students who are building deliverables from catapults to solar cars. A Southwest airplane panel is a focal piece of the cafeteria, which resembles a corporate or university cafeteria rather than a traditional school cafeteria. Students use technology funded by Texas Instruments, and present projects to Toyota executives. Both Toyota and Southwest Airlines are working with students to solve actual real-world problems that exist in their companies. This close connection with businesses enhances the non-traditional corporate feel of the learning space.

Curriculum Development Environment: The War Room

The focal point of this study was the 11th grade team that was in the planning stages during the zero year, a year without students in which teachers, under the guidance of a change facilitator from the district, plan the curriculum and instruction for a grade level. The 9th and 10th grade zero years occurred simultaneously in one year before this study. They were in the inaugural year with students on the lower levels of the building, known as being "on the floor," while the 11th grade team was meeting on the 3rd floor in a think tank that is known as the "war room". The war room moniker was used because it was the place where teachers planned learning experiences for students and solved the problems inherent in a PBL curriculum in the same way governments might solve problems of national security.

The room was designed around individual workspaces arranged in a circle. One wall was covered by posters of subject area Texas Essential Knowledge and Skills (TEKS) from Grades 9-

12. Another wall had large sticky notes with past project ideas, and small sticky notes that further annotated and communicated ideas within the large project. Evidence of team building experiences was also displayed on the walls. Principles of backwards design that guided every project were written on the window as a reminder of the process and goals. The front of the room had moveable whiteboards that captured the ideas of the current PBL that was in the planning stages. In the back of the room were two areas. One area housed many books, which included titles on team building, pedagogy, current trends in business, project design, and many more. Multiple copies of novels that were being considered for required reading or book circles were part of the collection, as well. The other area had both board games and video games. This served a two-fold purpose of taking needed mental breaks and also reminding facilitators the steps in problem solving and "leveling up" needed in unlocking thinking.

Perhaps what was most unique about the facility was that, beyond creating an openness and freedom of thinking and learning, it fostered a feeling of community and family. The main administrative offices were by the cafeteria and front door and in an open space. Everyone was part of the team of learning, visible and integral to all. This teaming extended beyond the war room to the floor where the ninth and tenth grade facilitators were supporting students' projects.

Population

The population of this study consisted of seven subject area facilitators (teachers) and one district level administrative staff member. The district level staff is referred to as the change facilitator (CF), using the terminology of Hall and Hord (2006). The teachers were given

pseudonyms to protect their anonymity. The teachers' population is described below, followed by a description of the CF.

Allison is a white female, age 54. She was the career and technology member of the team. She worked 12 years in education, all in the fields of English, technology, and business on a senior high school campus. She did not indicate any prior curriculum development experience.

Amber is a white female, age 31. She was the U.S. history and economics member of the team. She worked 4 years in education teaching AP U.S. history, American studies, and economics. She had developed a special education economics curriculum at the district level.

Jessica is a white female, age 52. She was the art member of the team, and had taught art for 15 years. She was the art member of the 9th and 10th grade zero year team, hence she had experience in the PBL school philosophy and zero year processes.

Jill is a white female, age 25. She was one of two science teachers, and taught chemistry and environmental systems. She was a first year teacher who had to design PBL learning as part of her university teacher education program.

Kate is the second science teacher who taught biology and environmental systems. She is a white female, age 58. She had 15 years of teaching experience. She had experience in designing biology curriculum at the district level.

Robert is a white male, age 32. He was the English language arts teacher on the team. He had 8 years of teacher experience in another state where he was involved in some PBL experiences and curriculum writing.

Sara is a white female, age 37. She is the math member of the team. She had 4 years of teaching experience in community college, and business experience prior to teaching. She had no experience designing integrated curriculum.

The CF was a district-level curriculum specialist. She had 12 years' experience teaching science at the middle school level. While teaching science, she also worked on a district curriculum writing team for five years to create an integrated middle school curriculum. That experience created a role in which she supported district curriculum coordinators in training and implementation of district integrated curriculum. As the district moved to the schools of choice academy model, she became the facilitator of curriculum development at the PBL school.

Data Sources

A variety of sources served as data for the study. Several instruments from the concerns-based adoption model (CBAM) model used were: Stages of Concern Questionnaire, innovation configuration map, Levels of Use interview protocol, and Change Facilitator Style Questionnaire. In addition, a demographic survey was administered and field note observations were used to note the actions of the team that were more generalized.

Survey of Concerns Questionnaire

The Stages of Concern Questionnaire (SoCQ) is a CBAM instrument designed to assess the concerns stakeholders have regarding an innovation. The innovation in the case of this study was the development of an 11th grade integrated curriculum among teachers who had

not taught, nor designed curriculum in this manner. The survey is a structured a 35-question Likert scale assessment. The questions are adaptable to any educational innovation; therefore the questions were tailored to match the PBL curriculum planning innovation at PBL school. Data were also generated for the collective team responses. Each question on the questionnaire relates to one of seven SoCQ categories. These seven categories fall under four larger descriptive categories that Hall and Hord (2006) originally designed for the stages of concern model. The various levels represented characteristics of concern by the teachers about the development of the PBL integrated curriculum.

- Category 1. “Unrelated” level of concern shows respondents who either have little concern or involvement with the innovation, or their concern for other things is more intense. The implication is that the respondents are unconcerned.
- Category 2. “Self” level points to participants who are most concerned with their own understanding of the innovation, how the innovation impacts them, their ability to meet the demands of the innovation, and their role in the innovation. Responses relate to informational and personal concerns.
- Category 3. “Task” level participants are concerned with all issues related to management of the innovation such as processes, best use of information and resources, and issues related to efficiency, organizing, managing, scheduling, and time demands.
- Category 4. “Impact” level participants are concerned with how the innovation impacts students, how they can coordinate and cooperate with others to impact students, and exploring the future more universal benefits of the innovation, including the possibility of major changes or replacement with a more powerful alternative. The SoCQ is found in Appendix A.

Innovation Configuration Map

The IC map is a document that provides clear and specific descriptions of what an innovation should look like, and it informs CFs where participants are in relation to the goals of an innovation. Each IC map is unique to the innovation and change situation. It focuses on the components of a program or practice. For the purpose of this study, the researcher and CF created the IC map. The IC map was a detailed description of the innovation and a tool to inform the CF of the participants' observable level of use of the innovation. The IC map identified the goals for the team during their zero year. Four goals were identified: teachers develop a deep understanding of each content area and how they are connected; teachers demonstrate a spirit of collaboration, including cooperation and cognitive/ collegial conflict; teachers engage in work happening on the entire campus, and; teachers consistently create units that honor PBL unit product goals. Measures of evidence were developed for each goal. The CF and researcher used the IC map at the beginning, middle and end of the study to assess where each participant was at the various junctures of the innovation. The IC map is found in Appendix C.

Levels of Use Interview Protocol

Each participant was interviewed at the beginning, middle, and end of the study to further determine their level of use of the innovation. Questions were framed around the four domains developed for the IC map. The October interview focused on the background of each participant: perceptions and understanding of the learning space, team collaborative process, and perceptions and understanding of PBL. The January interview protocol probed growth and

concerns in the content connections process, the collaborative team process, areas of campus involvement, and the PBL products and units that were in development. The April interview focused on each teacher's reflections of the zero year, including the role of the CF throughout the process. The protocol is found in Appendix D.

Change Facilitator Style Questionnaire

The Change Facilitator Style Questionnaire (CFSQ) is a 30-question Likert questionnaire that measures the extent to which participants perceive leaders as facilitating change (Hall & Hord, 2006). The questions provide data on the CF style that is measured in six possible dimensions: social/ informal; formal/meaningful; trust in others; administrative efficiency; day-to-day, and; vision and planning. CBAM identifies three CF styles- initiators, managers, and responders. Initiators have clear, decisive, long-range policies and goals that transcend, but include implementation of the innovation. They tend to have strong beliefs about what good schools and teaching should be like, and they work intensely to attain this vision. Managers place heavy emphasis on organization and control of budgets, resources, and the correct application of procedures, and policies. They demonstrate responsive behaviors in addressing situations and people, and they initiate actions in support of change efforts. Responders place heavy emphasis on perception checking and listening to people's feelings and concerns. They allow teachers and others the opportunity to take the lead with change efforts. They believe their primary role is to maintain a smoothly running school by being friendly and personable. The CFSQ is found in Appendix E.

Demographic Survey

The participants responded to a demographic survey on Survey Monkey that included: ethnicity, age, teaching experience, curriculum design experience, and experience with PBL. The survey link and questions are included in Appendix F.

Field Note Observations

The researcher observed the 11th grade team at PBL school twice weekly for 28 weeks for 1-2 hours during each observation. Field note observations were recorded in written form using the Noteworthy application. Photos were taken of documents created by the team. The documents included poster size TEKS for each subject and a whiteboard with sticky notes to align TEKS and project ideas.

Data Collection

Stages of Concern Questionnaire

The SoCQ instrument was administrated in September and April to track changes in participants' concerns as they progressed thorough the PBL curriculum planning process. The participants accessed the questionnaire through a website link (included in appendix A) provided by the Southwest Educational Development Laboratory (SEDL). The SEDL site generated percentile data and line-graph data of each participant's response and a composite group response in all six of the SoCQ domains (SEDL, 2014 September).

Innovation Configuration Map

Both the researcher and the CF used the IC map instrument in October, January, and April to observe and assess each participant as they progressed through the PBL innovation. Each had IC maps in hand during each data collection observation. The IC maps data in October and April were collected while observing the curriculum process in the war room. The January data were collected during a business meeting with an executive from Deloitte and Touche who was walking the team through a typical business plan.

Level of Use Interview Protocol

Three interviews were conducted in October, January, and April. Each participant was interviewed individually and the interviews were audio recorded using the Noteworthy application. The interviews took place in a seminar room on the PBL school campus.

Change Facilitator Style Questionnaire

Each participant completed the Change facilitator Style Questionnaire at the end of the curriculum writing process.

Demographic Survey

Participants accessed the survey through a Survey Monkey, as survey-based website provided by the researcher. This survey was completed in September.

Field Note Observations

The researcher observed the 11th grade zero year team process on the average of two times a week for 1-2 hours per observation from the beginning of the study in October through the end of the study in May. Field notes were taken of each observation session. Photos of the war room and documents displayed on the wall were taken as further field note evidence. On two occasions the team met with business executives who were assisting the team on PBL projects, and field notes were made of those observations. During one observation, the team was serving on presentation panels for students in the ninth and tenth grades and observation field notes were recoded. Occasionally, team members performed duties assisting the 9th and 10th grade students and facilitators. Field notes were collected as team members moved about the building in this process.

Data Analysis

Stages of Concern Questionnaire

Once participants completed the SoCQ instrument, data were generated by Southwest Educational Development Laboratory (SEDL), the data managing company, and displayed in tables and graphs. An analysis document was created that placed each participant's October and April data side by side so that trends and changes in concerns could be determined. Based on recommendation in the CBAM guidebook, notes on trends from the data from each participant were scrutinized for the top one or two stages of concern using the descriptions and meaning of each stage from CBAM. The same charts from SEDL were accessed to analyze the team profile from the October and April submissions.

Levels of Use Interview Protocol

The interviews were transcribed from an audio recording into a Word document. The LoU data were coded into NVivo, a qualitative data analysis program. NVivo ("QSR International", n.d.) is software that supports qualitative and mixed methods research. It is designed to help organize, analyze and find insights in unstructured or qualitative data like: interviews, open-ended survey responses, articles, social media and web content. The categories for analysis are called "nodes" in NVivo. The CBAM Levels of Use Matrix and descriptions were uploaded into NVivo as nodes. In this study, nodes and subnodes were built in the program that corresponded with the LoU matrix. The LoU matrix is included in Appendix B and the LoU interview protocol is included in Appendix D. A sample of the NVivo nodes and subnodes are as follows:

1. Non-use (node)
    a. Knowledge
    b. Acquiring Information
    c. Sharing
    d. Assessing
    e. Planning
    f. Status Reporting
    g. Performing

This coding followed through the remaining levels of the LoU matrix in Appendix B. The interview documents were uploaded into the "Sources" folder of NVivo. Statements from the interview were coded into the nodes. The levels of use of the innovation, based on

interviews, was determined according to the frequency a statement fell into a category. Statements from the interviews were copy and pasted into the nodes based on the original coding from the Word document. After the second interview, the researcher coded the first and second interviews again as she became more knowledgeable in the LoU matrix at the nuances between categories of the LoU matrix. A CBAM description from Hall and Hord (2006) on the levels of use and corresponding interview statements from the study participants that illustrate how each statement was coded is included in Appendix H.

The data were charted for each individual participant on a large poster of the LoU matrix. Each participant was assigned a marker color to record the data. For example, a red dot might indicate Teacher 1 Allison, and beside each red dot a number was recorded such as 1-1, 1-2, 1-3. These numbers indicated Allison, Interview 1; Allison, Interview 2; and Allison, Interview 3. The same process was repeated for all teacher participants. Trends for the whole team emerged through this process.

Innovation Configuration Map

After each data collection time, the researcher and CF met in a conference room at PBL school to discuss each participant's observed performance in relation to the four domains of the IC map. The CF tended to be reflective of participant growth when discussing indication of performance on the IC map. Her role as the CF influenced her assessment because of her personal investment in the team and in the process. Since she worked with each participant on a daily basis, her IC map assessments were more holistic over time. The researcher placed participants' observed performances on the IC maps based solely on the behaviors noted

during the observation time the data were collected. After discussing our individual assessments and indicators on the IC map, we came to a consensus of placements on the IC map for the three observations. The researcher created an LoU Word document chart for each participant and indicated onto the chart the October, January, and April data for each domain-content, collaboration, campus engagement, PBL design.

The IC data were transferred onto as second, separate LoU matrix poster, in a similar fashion by color-coding and number systems used in the analysis of the interview data. A group chart was created indicating the observed behaviors in the PBL domain only, as this was the primary outcome of the innovation, the creation of the PBL curriculum. The other three domains of content, collaboration, and campus involvement were used as tools to build the PBL domain.

Change Facilitator Style Questionnaire

The CFSQ instrument was scored by hand and charted using the CBAM formula and chart employing the CFSQ scoring device to sort questions into corresponding CF style domains. The scores were calculated into a percentile equivalent using a table from the CBAM instrument, and the percentiles were graphed on a bar graph for a visual representation of the data.

A group composite analysis was completed by taking all the individual percentiles from each style domain and finding the mathematical mean for each style domain. The data were mapped onto a percentile matrix, which created a composite understanding. The 11th grade

team CF was compared to the CBAM Change facilitator Style Profiles on p. 154 (Hall and Hord, 2006). Hall and Hord identify three change facilitator styles in (CBAM):

- Initiator change facilitators. Initiator change facilitators have clear, decisive long-range goals and policies for the entire organization, not just the current innovations (see Figure 2). They tend to have strong convictions about what constitutes good schools and effective teaching, and have high expectations for students, teachers, and administrative leadership. Decisions are always made through the filter of what is best for students, and such decisions are framed with current research and data on classroom practice. They are also master communicators throughout the process. Initiator principals make it happen.

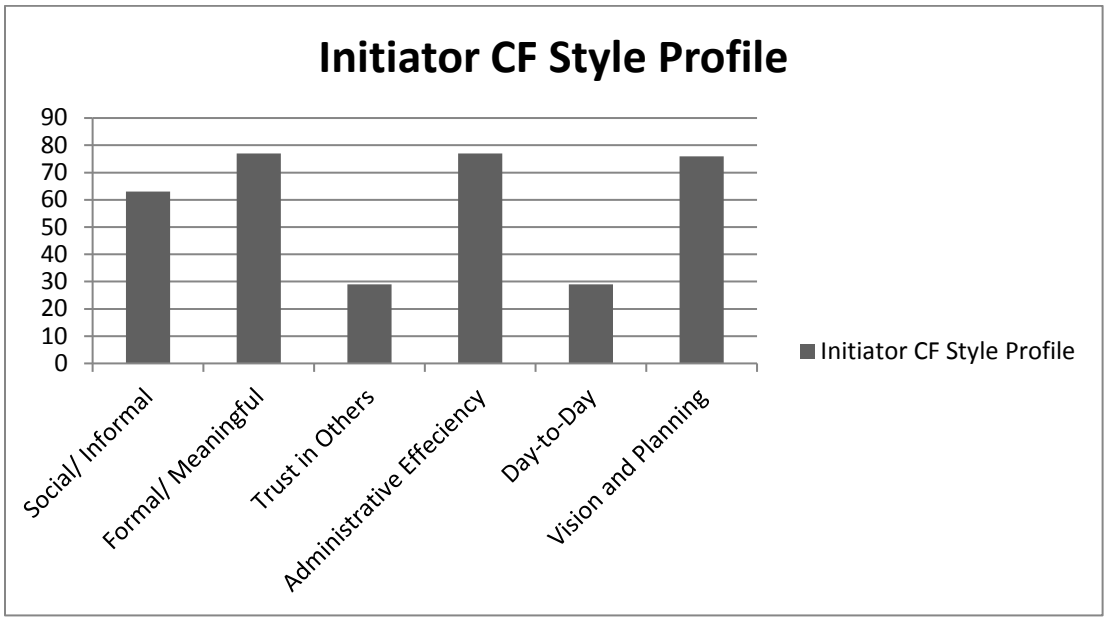

Figure 2. Initiator change facilitator style profile. Adapted from Hall & S. Hord (2006, p. 154).

- Manager change facilitators. Manager change facilitators focus on resources and organization of activities. They are responsive to situations and the needs of people (see Figure 3). They tend to have good rapport with those involved in the innovation at all levels, and they serve as a bridge between the various levels. They keep teachers informed about expectations

from district administrators and support changes that have been initiated. However, they are not typically the initiators of such change and do not move far beyond the basics of a proposed innovation. Manager principals help in happen.

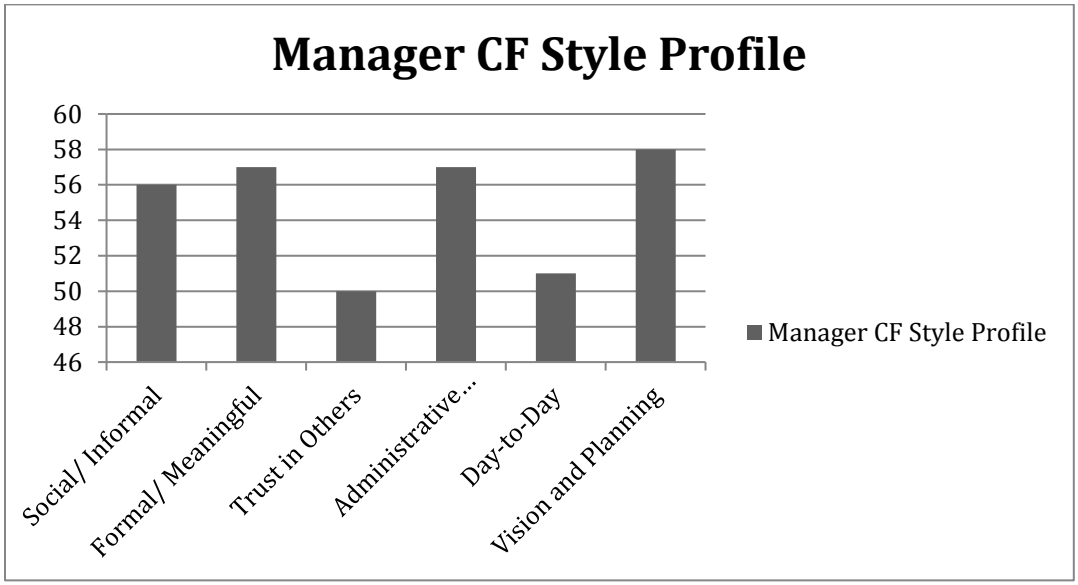

Figure 3. Manager change facilitator style profile. Adapted from Hall & S. Hord (2006, p. 154).

- Responder change facilitators. Responder change facilitators place emphasis on teachers and others having the opportunity to take the lead (see Figure 4). They view their role as keeping the day to day function of the school running smoothly. They believe that teachers are professionals and give them latitude to perform their job with minimal guidance. They solicit input and take into account feelings of others when decisions are being made. They tend to make decisions based on what is immediately in front of them rather than goals and a vision for the future. Responder principals let it happen.

Data analysis of the CFSQ placed the CF for the 11th grade team in the Initiator CF Style, which is further analyzed in Chapter 4.

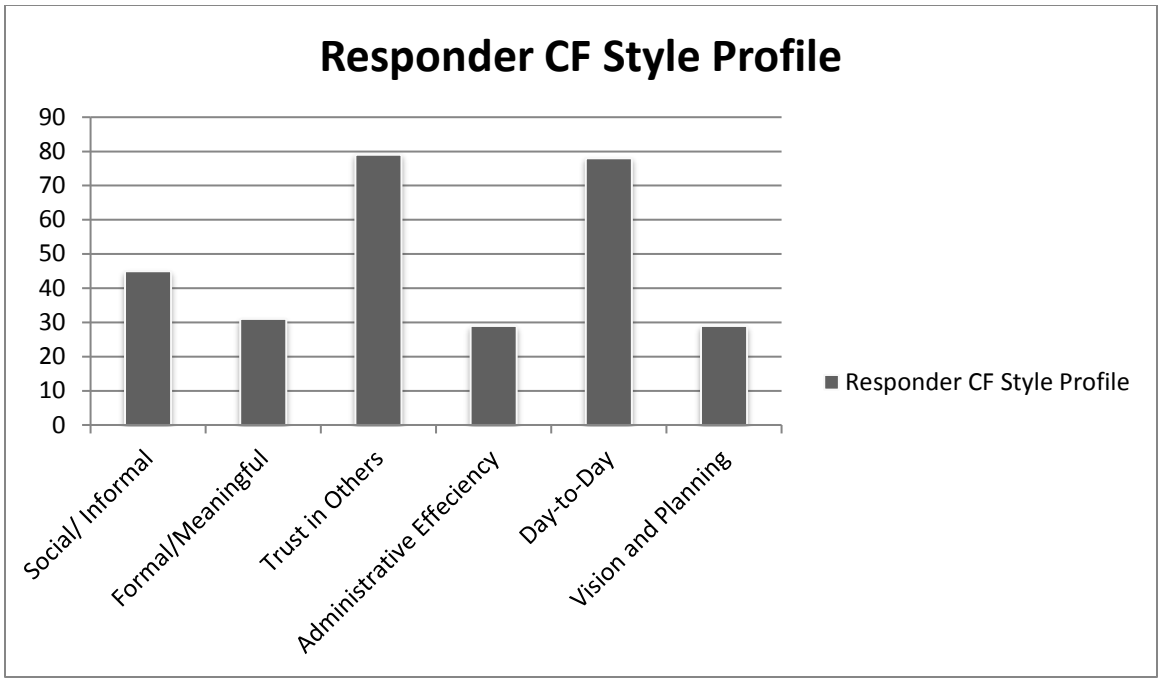

Figure 4. Responder change facilitator style profile. Adapted from Hall & Hord (2006, p. 154).

NVivo Interview Analysis *of the* Change Facilitator

NVivo was used to code statements about the CF from participant interviews. The nodes and sub-nodes were created using the categories and sub-categories of the CF styles from CBAM:

1. Concern for people
    a. Social/informal
    b. Formal/meaningful
2. Organizational efficiency
    a. Trust in others
    b. Administrative efficiency
3. Strategic sense

a. Day-to-day

b. Vision and planning

Each statement from the teacher interview protocols that referenced the CF was compared to the CF leadership style categories and then coded accordingly into NVivo.

Triangulation

Each participant's SoCQ and LoU were examined to create a profile of concern and use of the innovation over time. Next, a group profile for the SoCQ and LoU was generated to illustrate the changes in concern and use of the innovation of the 11th grade team over time. The group profile SoCQ indicated the 11th grade team moved from concerns about self to those of task and impact. The LoU indicated movement from the lower levels of use at the orientation level to higher levels of use at the routine level. This movement was examined in relationship to the participant's overall perception of the CF.

Summary

This study sought to determine the concerns teachers have as they worked through PBL curriculum design, the progression of teachers in a PBL design process, and the role and impact a Change facilitator had in the process of PBL development. The primary data collections components of the study were instruments included in the concerns-based adoption model, such as the Stages of Concern Questionnaire, Levels of Use interview protocol, IC map, and Change facilitator Survey Questionnaire. These data were analyzed using formulas from CBAM. The researcher also used the NVivo qualitative data analysis program to code the interviews.

This data further informed both individual participant and group Level of Use and IC mapping data, which was recorded on a LoU matrix. The CFSQ was administered to gather data about that informed the researcher of the leadership style of the CF. Nvivo was also used to code participant interview data regarding the CF. From this data a profile of each participant the groups as a whole, and the CF was determined. The CF data was used to further inform the impact of a CF in the progression of PBL curriculum design. The participants concerns, progression, and impact of the CF in this process is discussed in Chapter 4.

CHAPTER 4

DATA ANALYSIS AND RESULTS

Research Purpose

Facilitating the design of a PBL program is a large task and one that requires paradigm shifts, training, and growth among the participants. This study sought to understand concerns and levels of use of a group of teachers in the process of developing a PBL program, and the impact of a change facilitator (CF) on these processes and on the development of the teachers as designers of PBL curriculum.

Research Questions

The research was guided by the following research questions:

1. What are the concerns of teachers regarding the planning of a PBL curriculum?
2. What are the levels of use of teachers in the processes of planning the PBL curriculum?
3. How does a Change facilitator affect the process of change in the planning of a PBL curriculum?

Findings

The research questions of this study and the CBAM process guided the reporting of findings. Research questions one and two focused on the individual teachers, exploring the SoCQ affective data and the LoU performance data of each teacher. CBAM recognizes the importance of the individual in the change process. Hall and Hord (2006) state in their twelve principle of change, “An organization will not change unless the individuals within the

organization change. Individuals will progress through change at different rates and in varying degrees." The SoCQ measured the personal feelings of each teacher about the PBL innovation across time. The LoU matrix measured the performance data across time. NVivo interview data further informed placement of data on the LoU matrix. The triangulation of this data elicited a profile of each teacher across time. Data were analyzed about group performance in this same fashion. The group profile was included because CBAM can be used to evaluate any innovation at all organizational levels in education, from individual, to team, to campus, or larger. The PBL school team functions as one multidisciplinary unit, so an understanding of the team as a whole is crucial to this zero year phase and crucial to the upcoming implementation phase of the school year.

Results

Results are reported in multiple stages consisting of individual teacher data, group data, and Change facilitator (CF) data. Teacher data are reported in the form of individual teacher profiles, which combined the results of the SoCQ, and LoU matrix, which consisted of the IC observations -and interview data. Each participant's SoCQ and LoU were examined to create a profile of concern and use of the innovation over time. The profile informed how teachers progressed across time within the context of their concerns about and levels of use of the innovation.

Teachers completed a SoCQ questionnaire in October and April. A comparison and interpretation of the changes in concerns is discussed individually by teacher. The LoU for each individual teacher was charted in October, January, and April by the researcher and CF using

the IC map. Observations and research interviews determined individual teacher placement on the LoU matrix. Triangulation between the SocQ, LoU, and coded interview data in Nvivo further informed the teacher profile.

Results of group data and profile follow the individual teacher profiles. The Southwest Educational Development Laboratory (SEDL, 2014, September) generated a group SoCQ profile in October and April, and interpretation of this data is discussed.

The final stage of reporting was interpretation of the CF data. Each teacher completed the CFSQ to determine the leadership style of the CF. Results and analysis are discussed in the CF Data Analysis section of this chapter. Interviews from the teachers and the CF were also coded into NVivo using the CF style domains as nodes. These data further informed about the CF leadership style.

Allison's SoCQ and LoU Data Analysis and Profile

SoCQ Data Analysis

Allison is a 54-year-old female and the career and technology teaching member of the team. She had 12 years of teaching experience. She completed the SoCQ in October (see Figure 5). When the second SoCQ instrument was administered in April, Allison made a decision to not continue as a teacher at the PBL school and return to a traditional campus. Allison did not provide SoCQ data at the end of the study.

Self

The October data analysis of the SoCQ revealed that Allison had highs 0 unconcerned (87%), indicating she had other concerns that were more important to her than the PBL

innovation. Her other self domain concerns at stage 1 information (61%) and stage 2 personal (56%) indicated that her concerns related to the immediate impact of the PBL innovation on her personally. She was unsure of the innovation at this early point in the zero year, which was driving her desire to learn more information about the innovation.

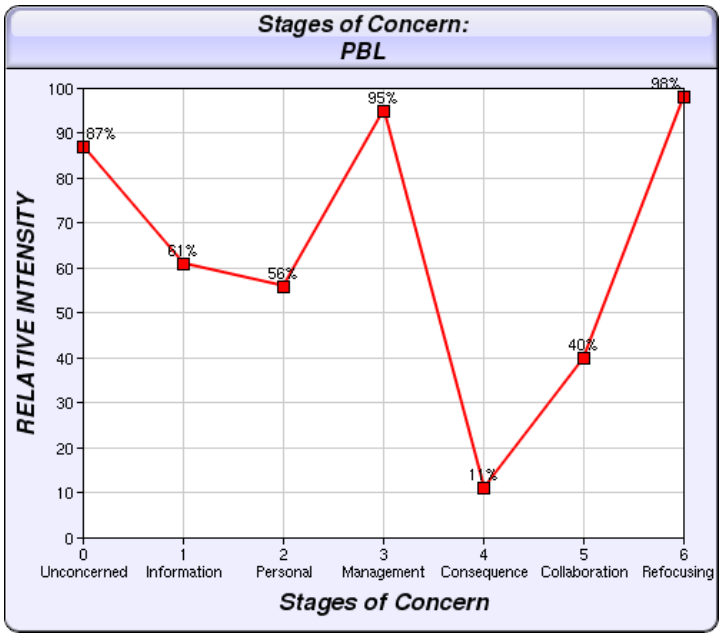

Figure 5. Allison's October SoCQ data (SEDL, 2014).

Task

The October SoCQ indicated Allison had high concerns in the stage 3 management (95%) domain. She had great concerns around management of the PBL innovation. She was concerned about the time, logistics, and events necessary to implement the innovation. Her concerns were centering on the question of "How do I do this?"

Impact

Allison had high impact concerns with a peak score in stage 6 refocusing (98%). The high refocusing peak indicated Allison was not just posing questions of management, but had strong

ideas about how to do things differently and that she was not entirely comfortable with the PBL innovation. The data indicated her concerns in the stage 5 collaboration (40%) were not as high as other domains. While collaborating with her team was of some concern, her self and task concerns were of greater importance. The stage 4 consequence was her lowest score (11%). The impact the PBL innovation had on students was the least of her concerns.

Changes in Concerns across Time

There is no analysis of changes in SoCQ data across time since Allison participated in the October SoCQ data collection but not in the April SoCQ data collection.

LoU and IC Map Data Analysis

Observation Data Analysis

Each criterion on the IC map for Allison was examined across all observations and changes in the IC map goals are discussed in the form of progress (see Figure 6).

Content integration. Observation data gathered on the IC map indicated Allison was at the orientation-knowledge level of use in her ability to integrate her career and technology content. At this early point of the zero year, Allison focused on becoming expert in her content area, with little regard to the content of the other core subjects. She had a general understanding of the processes for content integration, but had not begun making the cross-curricular integration connections. Allison had progressed to the preparation-knowledge level of use at the January observation. She was comfortable with her own subject area and beginning to make connections with the other disciplines.

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation	○ October ☆ October Interview 1	□ October		△ October			
	2 Preparation	○ January		□ January △ January				
	3 Mechanical	☆ January Interview 2			☆ April △ April Interview 3			
	4a Routine		○ April	□ April				
	4b Refinement							
	5 Integration							
	6 Renewal							

Figure 6. Allison's LoU matrix with IC map observation data and interview data combined.

Content Integration- ○
Team Collaboration- □
Campus Involvement- △
PBL Unit Planning- ☆

The April observation data indicated Allison was at the routine-acquiring information level. She was familiar with the content integration process of the team, comfortable with her own content knowledge, and making connections across at least two other subject areas. However, she was still in an information acquisition role, making no special effort to seek content connections beyond a superficial level.

Team collaboration. October IC map observation data indicated Allison was at the orientation-acquiring information level of use when collaborating with her team. She was using her team members as a resource to acquire knowledge about the PBL innovation through discussions and sharing of opinions. She was at the preparation-sharing level of use at the January data collection point. She was working with her team in PBL training, logistics, schedules, and resources in preparation for implementation of the PBL units. In April she moved to the routine-sharing level of use, describing the use of the innovation with her team, but with little or no reference to ways of changing its use.

Campus involvement. Data from the October IC map observation revealed Allison was at the orientation-assessing stage in the campus involvement goal. She slowly began spending time on the floor and was initially in an observation role, analyzing the interactions of students and teachers. She was observing PBL in action on the floor and evaluating the potential outcomes, strengths, and weaknesses for the purpose of making a decision about her use and comfort level with the PBL innovation. In January she was at the preparation-sharing level of use. She was engaging in conversations with the 9th and 10th grade teachers on the floor. Instead of simply observing and evaluating logistics, strengths, and weaknesses of the PBL innovation, she was discussing her observations with the teachers already at the

implementation stage. Allison was at the mechanical-assessing level of use in April. She was assessing the strengths and weaknesses of PBL units as she was spending time on the floor observing the 9th and 10th grade teams in action. Her focus was still on evaluation of the PBL innovation to determine if it fit into her own schema, use, and comfort level.

PBL unit planning. The October IC map data indicated that Allison was at the orientation-knowledge level of use in the overall PBL unit planning goal. Those at this level are taking action to learn more detailed information about the PBL innovation. She had general information of her content and of PBL. The January LoU observation data indicated she had moved to the mechanical-knowledge level of use. At this level the user is focusing on the short-term day-to-day use of the innovation with little time for reflection or long-term implication of the innovation. The April LoU observations data indicated Allison was at the mechanical-assessing level of use of the PBL innovation. A collaboration pattern had been established in the PBL curriculum planning process and she was actively making connections to other content areas. She was evaluating the processes she observed on the floor, and sharing those observations with her team to further refine units.

Interview Data Analysis

Interview data were gathered in interviews conducted in October, January, and April. Each participant was interviewed individually and the interviews were audio recorded using the Noteworthy application. The interviews were transcribed from an audio recording into a Word document. The LoU data were coded into NVivo, a qualitative data analysis program.

Interview 1. NVivo coding of the interview data gathered on the IC map across the year, as noted in Figure 1, the LoU matrix, indicated Allison began the zero year at the orientation-knowledge level. The NVivo coding of the first interview revealed that Allison was at the orientation-knowledge level of use of the PBL innovation in October. The interview data analysis showed twelve references coded at this level. She reflected on what surprised her about the PBL innovation by saying,

> Personally, it is how much unlearning I have to do. I thought I got it, and how much learning there is to it. Unlearning and relearning is what has surprised me. I have had to relearn things like giving them (students) their independence and encouraging them and meeting them where they are. I think I am very good at encouraging and coaching, and now this has left me with some doubt.

Allison was not only trying to come to her own understanding of the PBL innovation, but doing so while struggling with its effect on her personally and evaluating if she can accept the PBL innovation in her instructional philosophy and practice.

Interview 2. The NVivo coding of the second interview revealed that Allison was at the mechanical-knowledge level of use of the PBL innovation in January. The interview data analysis showed four references coded at this level. In describing her concept of the PBL innovation at this juncture, she stated, "It starts with the process of ideating, where we zoom out and try to see what the big picture connections are. Each person begins thinking how they can connect to other areas. We have to entertain every idea, because there is just as powerful learning and finding our direction in the ideas that don't get pushed forward as in the ones that do." Allison did not have a concept of PBL at this juncture, but she was able to articulate the content integration goal the CF imbedded in creating the PBL units and products.

Interview 3. NVivo data analysis of the final interview in April revealed that Allison was at the mechanical-assessing level of use. The interview data analysis showed five references coded at this level. In discussing the strengths of the PBL innovation, she mentioned,

> Definitely capturing the interest of the learners is a huge strength. I believe we have talked earlier that I am not sure this is for all learners or teachers, but for those who a more non-traditional path is good for them, then this is a very strong path. I think the collaboration is a positive, but I am not sure the constant collaboration is always good. Our learners need some time to individually reflect, and also demonstrate their own learning. The connections students are able to make, those real-world connections, are extremely important and sets PBL learning apart from traditional learning in a positive way.

By the end of the zero year, Allison had a concrete concept of the PBL innovation, and could assess how the PBL innovation can affect certain learners.

Summary of interview data across time. The interview data for Allison revealed her understanding of the PBL innovation progressed from an orientation level of use to a mechanical level of use. At the beginning of the zero year, she did not have a clear understanding of the PBL innovation, and she seemed unsure of her ability to use the innovation. Through the scaffolding of content integration, team collaboration, and campus interaction provided by the CF, Allison progressed to a mechanical level of use, particularly in her understanding of PBL and making content connections. However, her she did not progress past her personal use of the innovation. She was assessing the PBL processes and products for her own use and not for the purpose of affecting student outcomes.

Interview and LoU Data Combined

October data analysis. The October IC map observation data showed that Allison was at the orientation level in all IC map criteria. She was acquiring information about the PBL

innovation and its components of content integration, collaboration, and campus engagement. Observation data revealed Allison was at the orientation-knowledge level of use in content integration. She initially struggled with the content integration process and how the career and technology content integrated into other content areas. This was consistent with the NVivo interview data. In discussing career and technology content integration, she said,

> I see it as the fun pieces, the complimentary piece to all courses. It the complimentary course for all the students and facilitators. When I say 'complimentary' it would be using their content but learning some form of technology. It complements the English, the science, and the math in the form of a web page.

She viewed her content as an overlay to the other courses, and did not fully understand how career and technology could be integrated. However, she was beginning to use her team to acquire information to make deeper connections, and she was spending some time on the floor to further inform and evaluate the PBL processes.

January data analysis. Allison progressed to the preparation level of use in the supporting IC map criteria of content integration, collaboration, and campus involvement. She was more engaged in campus activities on the floor, and she was sharing observations and learning with the 11th grade team to further inform their logistics around PBL unit planning. She continued to gain knowledge about the other content areas and focused more on the logistics and timing of how the content connections are related to the larger PBL initiative, and this was supported with interview data. When asked to further reflect the role of career and technology in the PBL innovation, she indicated she was more actively engaged in content integration. She said, "We can integrate technology, web mastering, production- really anything – at anytime. So I listen to the ideas, try to grasp the content as much as possible, then put my two cents in on how tech can be layered, supportive, a driving piece, whatever might work."

Observation and interview data showed Allison at the mechanical-knowledge level of use of the overall PBL innovation. When asked about her concept of PBL, she stated,

> The questions that are important are: Does it have meaningful information from all content areas? Is it of interest to the learners? Are there multiple avenues for discovery and 'correct' answers? Does it require them to take their knowledge deeper and wider? Honestly, we won't really know if we have hit our mark until we are with the learners and reflecting on each unit after the first year.

While her understanding of the PBL initiative had deepened, she was in transition from preparation to some mechanical use, which explains the level of use and interview data spread over two stages.

April data analysis. Allison was a routine user in the IC map criteria of content integration and team collaboration at the end of the zero year. She had a routine pattern in content integration, but made no special effort to seek information as part of ongoing use of the PBL innovation. She was comfortable sharing information with her team, and could describe her current use of the innovation, but with little or no reference to ways of changing her use. She was also more comfortable spending time on the floor and engaging with students and teachers so that she could make meaning in her own use of the innovation, which was at the mechanical-assessing level of use. Her overall use of the PBL innovation was at the mechanical-assessing level, as well. She was adept at evaluating the strengths and concerns of the PBL innovation. She stated in the final interview,

> You have to dive in, but it takes a lot of time to process and learn all of this. Perhaps another concern is that the facilitators who come after the zero year do not have a zero year. That is a lot to learn on the fly. Listen to everything. Something that may not seem pertinent in planning today has a great connection later on. Take break, go to the floor, and interact with students. This is brain heavy stuff. Have some balance.

Allison's Summary Profile

The October SoCQ profile indicated Allison had significant and multiple concerns about the PBL innovation as indicated by high self, task, and impact concerns. The high self concerns suggest she was concerned about the impact on her personally, and she was overall unsure about the PBL innovation as indicated by the high stage 0 unconcerned (87%). The high management (95%) concerns suggested she was questioning her ability to perform the tasks inherent in the PBL innovation. The very high and tailing up refocusing (98%) in the impact domain suggested she had very strong ideas about how to do things differently. The least of her concerns was impact on students, indicated by a low stage 4 consequence (11%). This pattern of concerns from the SoCQ data is supported by the IC map and LoU observation data and by the NVivo interview data. Allison began the zero year at an orientation level of use in all the IC map goals. She was reticent and slow to make initial content connections in a collaborative process with the team. She often sat apart from most of the team during times of collaboration and shared little in whole group discussions. This could be because she viewed her content as a complementary overly at this point, and not a piece integrated to the same extent as the other content area. In her initial interview, Allison stated her greatest concerns were how such a model would prepare students for end of course exams and a college environment. Test scores and college preparation are often a focus of curriculum and instructional practice on traditional high school campuses, so this ingrained focus might explain why she was unconcerned about the PBL initiative at the beginning of the study. She had concerns and misgiving about her fit in a PBL environment, but saw the value in the PBL initiative and how it could be positive for students. She stated in the first interview, "I waited a week to go down there (to the floor)

because I was skeptical, and conversely I was blown away by the buzz of learning." This dichotomy of seeing the strengths in the PBL innovation, but at the same time questioning her personal feelings and comfort as a teacher in the innovation, was a theme that ran throughout all the interviews. By January, she was more comfortable with the PBL innovation and IC map observation data indicated she was preparing to use the content integration, team collaboration, and campus involvement structures designed by the CF. The data showed increased collaboration with her team, which facilitated greater content connections. She worked well in the team processes and contributed to logistics such as finding speakers and panelists for student project presentations. She made her way to the floor often and was more interactive with the teachers and students. The growth in these areas supported her overall understanding of the PBL innovation, which would explain why the interview data and observation data reveal a higher level of use at the mechanical-knowledge level. The April data for Allison is not complete because Allison decided at the end of the zero year to return to a traditional campus. Therefore, she did not participate in the April data collection of the SoCQ. Observation and interview data revealed that Allison was at the mechanical and routine levels of use. While the LoU, IC map, and interview data showed growth in all four of the zero year goals, Allison was not able to reconcile her misgivings and discomfort as a teacher at the PBL school. She acknowledged the strength of the PBL innovation, but also had to acknowledge it was not for her as a teacher. She stated in the final interview:

> Oh wow. I have questioned where I have been in education, my past thinking, and I am trying to meld it with what is expected in this environment. Actually, I am choosing to go back to a 9/ 10 high school. I miss teaching English and I am not sure I can adequately wrap my head around all of this. It is not that I don't believe in it, but I am not sure this is the place for me. But I have grown a lot. I have changed my thinking about my role as a teacher in the classroom. I will be more 'hands-off' in what I give students and let

> them give me what they have learned. I definitely value the importance and strength in a collaborative team process. Teachers are better when they share with one another, support one another, than when they just operate within their own classroom.

Allison progressed in the content integration, team collaboration, campus involvement, and PBL unit planning goals that were designed by the CF. However, her growth was slow compared to the other team members. At the end of the first semester, she was still mostly in the preparation level of use, while most other team members were at least mechanical users of the innovation. The reason for her slow progression was that she was often conflicted about her role as a teacher in this unique PBL setting. She admitted in the first interview she was surprised how much unlearning she had to do. She was the only team member who elected to return to a traditional campus after her zero year. However, she reflected that her personal growth in the PBL innovation processes changed her constructs about her role as a classroom teacher. She was now more comfortable in a student-centered classroom environment. She also had a greater appreciation for the collaboration process with other teachers when planning learning experiences.

Amber SoCQ and LoU Data Analysis and Profile

SoCQ Data Analysis

Amber is a white female, age 31. She was the U.S. history and Economics member of the team. She worked 4 years in education teaching AP U.S. history, American Studies, economics, and developed a special education economics curriculum at the district level. She completed the SoCQ in October (see Figure 7) and April (see Figure 8).

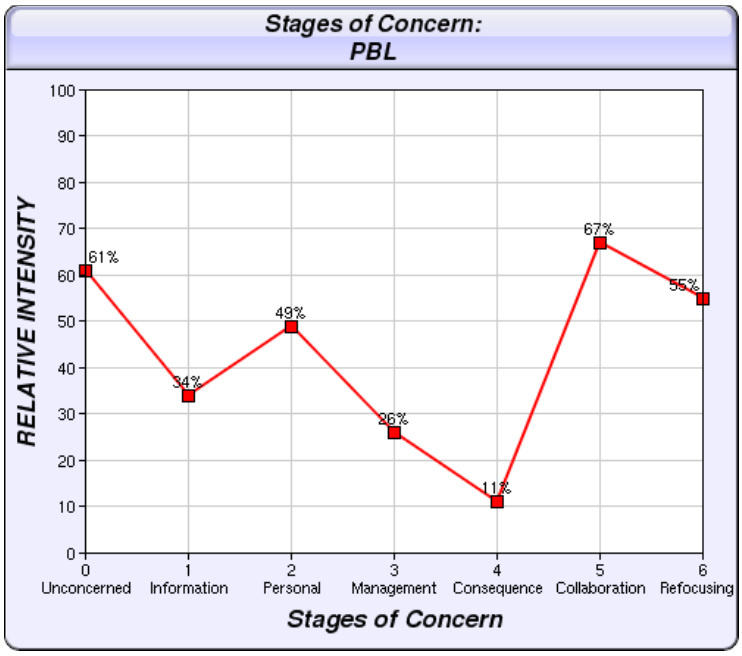

Figure 7. Amber October SoCQ data (SEDL, 2014).

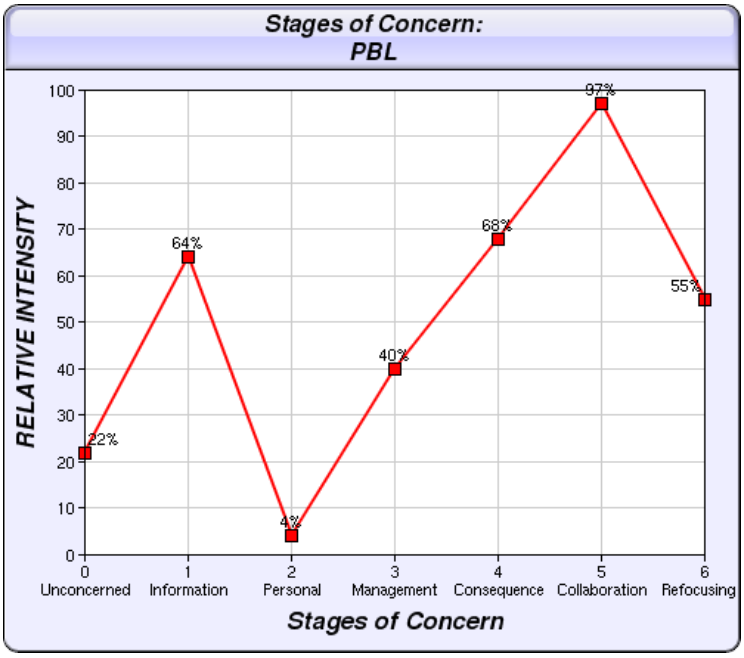

Figure 8. Amber April SoCQ data (SEDL, 2014).

October Data Analysis

Self. Amber had one peak stage concern in the self domain at stage 0 unconcerned (61%). A high 0 indicates the individual has little concern about or involvement with the

innovation. It is an indicator that she has other concerns besides the PBL innovation. Her other two stages in the self domain were stage 1 information (34%) and stage 2 personal (49%). She was not too concerned about needing more information, but the moderately high personal indicated that she was concerned about the PBL innovation as it relates to the impact it may have on her.

Task. In the task domain the individual is focused on the processes and tasks of using the innovation and the best use of the innovation. Amber had a low stage 3 management concern (26%), so issues that relate to use of the innovation such as organizing, managing, scheduling, or resources are of little concern to her.

Impact. The October SoCQ data indicated a peak concern at stage 5 collaboration (67%). Those with high collaboration concerns have begun to work with others and discuss the innovation, but may have feelings of uncertainty as they are learning about the innovation and their team. The stage 6 refocusing stage was moderately high (55%). A high stage 6 and low stage 1 (34%) indicates that a person already has some knowledge of the innovation and has ideas about improving the situation. Her lowest concern was stage 4 consequence (11%). This suggests she has minimal concerns about the effects of the PBL innovation on students.

April Data Analysis

Self. The April SoCQ data revealed that Amber had a low stage 0 unconcerned (22%), which indicated that she was concerned about and focused on the PBL innovation. She had one high self peak stage at stage 1 information (64%). This indicates a person who wants more information about the innovation. Her stage 2 personal (4%) was low indicating she felt no

personal threat in relation to the innovation.

Task. Amber had some task concerns about the innovation as reflected her stage 3 management score of 40%. This was not significantly high or as high as some other areas of concern, but she is thinking about the time, logistical, and resource demands of the PBL innovation.

Impact. Amber's greatest concerns were in the impact domain, with her highest score at stage 5 collaboration (97%). She has significant concerns about working with her team in the PBL innovation. This, coupled with a high stage 2 information (64%), indicated a desire to learn from what others are doing. Her stage 4 consequence (68%) was one of her highest scores, which indicated concerns about the consequences of use of the innovation for students, such as relevancy of the innovation for students and the evaluation of student outcomes. Her stage 6 refocusing score is fairly high at 55%, which could indicate a level of discomfort with the innovation as she may have been concerned about PBL innovation and thinking of ways to change it so that she was more comfortable.

Changes in concerns across time. The SoCQ data across time revealed the concerns of Amber shifted from self to task and impact. Her initial self concerns changed from personal concerns about her use and comfort of the PBL innovation to a desire for more information about the innovation so that she could better implement PBL unit planning. As the year progressed and implementation was imminent, her task concerns increased as she became focused on how the innovation would be implemented. At the end of the zero year, her greatest concerns centered on how the PBL innovation would affect student learning.

LoU and IC Map Data Analysis

Observation Data Analysis

Each criterion on the IC map for Amber was examined across all observations, and changes in the IC map goals are discussed in the form of progress (see Figure 9).

Content integration. IC map observation data indicated that Amber was at the mechanical-acquiring information level of use with content integration in October. As a seasoned U.S. history teacher, she possessed a working knowledge of her content area, hence early in the process she was already beginning to learn about the other content areas and make initial interdisciplinary content connections with at least one content area. By January, she had moved to the refinement-sharing level. She was making connections to three content areas. Her focus had begun to shift from understanding content connections to engaging in the creation of student-centered PBL units. While she was making multiple connections, there was still an element of self at the refinement stage. Those at the refinement stage are centered on their own impact on the content process as it affects student outcomes. Her content area was still the basis of these connections. “How do other disciplines connect to my content?” was the focal question. In April she had progressed to the integration-planning level. Those at the integration stage are combining their own efforts with their colleagues to increase a collective affect on students. The guiding question becomes, “What are the connections between all disciplines?” At this stage of the zero year, she was able to integrate multiple connections from a variety of disciplines as she engaged with her team to plan the content of all PBL units.

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation	☆ October Interview 1						
	2 Preparation							
	3 Mechanical		○ October	□ October △ October	☆ January Interview 2			
	4a Routine							
	4b Refinement			○ January	☆ April Interview 3	□ January △ January		
	5 Integration					○ April □ April		△ April
	6 Renewal							

Figure 9. Amber LoU matrix with IC map observation data and interview data combined.

Content Integration- ○
Team Collaboration- □
Campus Involvement- △
PBL Unit Planning- ☆

Team collaboration. IC map data indicated Amber was collaborating with her team at the mechanical-sharing level of use in October. She worked collaboratively with one other team member, usually the English teacher since there are more natural connections between U.S. history and English. She was comfortable with her command of her subject area, and one of the more outspoken team members who lead conversations in content integration and team collaboration. In January she was at the refinement-planning level. She was a leader on the team who was instrumental in orchestrating the collaboration processes with most team members. By the end of the zero year in April, she moved to the integration-planning level of use. She was making the connections with all content areas and working collaboratively with team members. She was able to zoom out and view the team collaboration of PBL products from a multidisciplinary lens.

Campus involvement. October IC map observation data of campus involvement indicated Amber was at the mechanical-sharing LoU. She quickly felt comfortable interacting with teachers and students on the floor. Her initial interactions were in an observation role as she took observation notes and asked questions. The January observation data revealed she had moved to the refinement-planning LoU. She interacted with students and helped the 9th and 10th grade team on the floor. She used this experience to refine the PBL curriculum products for the 11th grade team. By April she progressed to the integration-performing level. She was very comfortable as a member of the PBL school community, leading student clubs, working with academic groups, reaching out to community resources, and building relationships with her future students. She was vocal in using her experiences and observations of PBL in action on the floor to evaluate and refine the 11th grade products. She discussed

management and logistics of PBL planning with multiple groups on the campus. She also shared the 11th grade team's current processes with other stakeholders on the campus to improve management and logistics of the planning process.

PBL unit planning. Data from the October IC map indicated Amber began the zero year at the orientation-knowledge level of understanding PBL and creating PBL products. She had general knowledge about PBL and was taking action to learn more detailed information about planning a PBL product. IC map data in January indicated Amber had moved to the mechanical-assessing level of use. Those at this level are knowledgeable about the innovation and are comfortable trying it out. They are examining their own use of the innovation with respect to problems of logistics, management, time, schedule, resources, and general actions of students. Amber could engage fully in the brainstorming process of creating PBL products. She was able envision possible multidisciplinary collaborative products, and could engage in creative PBL scenarios that would generate learner interest. The April IC map data indicated Amber was at the refinement-assessing level of use in her knowledge of PBL. Users at this stage vary use of the innovation to increase the impact on students within his/her immediate sphere of influence. She was assessing the use of the PBL innovation for the purpose of changing current practices for the improvement of student outcomes. She used her involvement with student and teachers on the floor and other community stakeholders to inform refinement of the 11th grade PBL products.

Interview Data Analysis

Interview 1. NVivo coding of the interview data gathered on the IC map across the year, as noted in Figure 2, the Level of Use matrix revealed that Amber was at the orientation-knowledge level of use of the PBL innovation in October. The interview data analysis showed nine references coded at this level. In describing her concept of PBL, Amber stated, "Students are given a result or end or something and they have to figure out how to get to that end result. Whatever that means. Whether an answer or solution or a product they make. It is forcing the kids to actually work to their desired goal is what I see PBL is." Her concept of PBL is vague, though she has some basic knowledge that an overarching end product is the guiding element of a PBL model.

Interview 2. The NVivo coding of the second interview revealed that Amber was at the mechanical-assessing level of use of the PBL innovation in January. The interview data analysis showed six references coded at this level. When asked about goals in a PBL product, she stated,

> Our goal is something the learners will encounter in the real world. Other goals are not so ambiguous. We make sure knowledge from all subjects is required to work through the PBL. We are always working on a variety of skills such as collaboration, presenting, writing, research, and others. But right now I am nervous that our units may not be what we are hoping, not that I have reason to think they are not good, it is just the untried and unknown aspect.

As a mechanical user, she had a working knowledge of the PBL innovation and was making her personal meaning of the PBL product goals and assessing potential strengths and weaknesses of the PBL unit products.

Interview 3. NVivo data analysis of the final interview in April revealed that Amber was at the refinement-assessing level of use. The interview data analysis showed five references

coded at this level. In discussing her growth as a result of the zero year experience, she reflected, “Learning and connecting with others’ curricula has sharpened me as a learner and teacher. I have had to learn more about collaborating, compromising, and leading. I have had to really reflect on what learning is, what is important for students to learn, and change my concepts of how that should look.” She was evaluating her own learning and discussing how she changed to affect student learning.

Summary of interview data across time. The interview data for Amber revealed that her understanding of the PBL innovation progressed from a knowledge level of use to an assessment level of use. Initially, the PBL innovation was not concrete for Amber, so she was seeking knowledge about the innovation for her own understanding and use. As she became a more adept user at the mechanical level, she was assessing the strengths and weaknesses of the PBL innovation so that she could make her own meaning of the innovation to guide her personal use of the innovation. By the end of the zero year she was assessing the PBL innovation at the refinement level of use. Her assessment progressed from evaluating the innovation for her personal use to assessing the PBL units and products created by the 11th grade team for the purpose of making any changes that would positively affect student learning.

Interview and LoU Data Combined

October data analysis. The IC map observation data showed that Amber was at the mechanical-acquiring information level of use in content integration and mechanical-sharing in team collaboration and campus involvement. However, her overall use of the PBL curriculum planning innovation was at the orientation-knowledge level. She was at the mechanical level of

use of the IC map goals that support eventual PBL content curriculum integration, but she was not working toward creating PBL unit products. This level of use was supported by interview 1 in October. Much of her PBL innovation knowledge was at the orientation-knowledge level. When asked about her perception of PBL she stated, “Students are given a result, or end, or something and they have to figure out how to get to that end result, whatever that means. Whether an answer or solution or a product they make, it is forcing the kids to work on their desired goal.” Her concept of a PBL product was not concrete, but according to the IC map observation data, she was beginning to engage with the team in creating the first PBL product.

January data analysis. Amber progressed to the mechanical-assessing level of use by January. She was creating PBL units and products that addressed three of the PBL product goals. She was examining her own use of the PBL innovation with respect to problems of logistics, management, time, schedules, resources, and general concerns of students. This observation data was corroborated by NVivo interview data analysis, which also showed Amber at the mechanical-assessing LoU of the PBL innovation. When asked about her concept of PBL and the impact on students, she stated, “Well, I am not sure we do know. Nothing has been implemented, and things sometimes can sound awesome on paper or in theory, but in practice may not hit the mark. Even some of our goals can seem ambiguous. Like we aim for all PBLs to be authentic learning- but really what is that or how do you know you have hit that level? Can you know unless you teach it, and even then, what measure do we have for authenticity?” She could speak more fluently about the aspect of PBL curriculum design, such as the concept of “authenticity.” She was wrestling with concerns about evaluating learning. All of this data is evidence of growth in her understanding of the PBL innovation. Her development in the

supporting goals of content integration, team collaboration, and campus involvement had progressed to the refinement level of use.

April data analysis. Amber's level of use of the PBL innovation had progressed to the refinement-assessing level by the end of the zero year. She was assessing her use of the PBL innovation to change current practices to increase student outcomes. NVivo interview data also showed Amber to be at the refinement-assessing level of use. By this point in the year, she was assimilated in the campus culture and using her time on the floor to assess and refine the unit products the 11th grade team had designed. She stated, "We are just as much a part of this campus as the 9th and 10th grade facilitators. I have found this to be invaluable to bring back to our team and discuss, even troubleshoot units and PBLs that sound good in theory."

Amber Summary Profile

The October SoCQ data indicated that Amber began the zero year of PBL curriculum planning focused on concerns other than the actual PBL innovation. She was concerned about how the innovation had a personal impact on her, and she was concerned about her personal relationship with her team. Though she was focused on some self concerns, she was comfortable with her content knowledge, and this allowed her to take initial steps in content area integration and collaboration. She did not fully understand the PBL innovation; hence her use was at the orientation-knowledge level for this goal. However, she was able to conceptualize the supporting IC map goals of content integration, team collaboration, and campus involvement at the mechanical level of use. By January, her use of the PBL innovation was at the mechanical level. She moved quickly from acquiring an understanding of the PBL

innovation to a user of the innovation. She had emerged as one of the team members most comfortable with the innovation, and had taken on the informal role of teacher leader of the team. The supporting goals of content integration, team collaboration, and campus involvement were at the refinement level. A pattern is emerging that shows how progression through the supporting goals works to pull Amber forward in the overall PBL innovation goal. At the end of the zero year, Amber was firmly in the role of the team teacher leader, and her SoCQ profile fits those who are in roles of leaders, managers, or coordinators. Her concerns shifted from the self domain, where she was concerned about the PBL innovation in relation to how it impacted her, to the impact domain, where her concerns were focused around how the innovation will impact students. She does have one peak self domain at the information stage (61%), but the low personal (4%) and high collaboration (97%) again shows that she wanted information around the PBL innovation that positively influences student outcomes, not for her personal comfort with the innovation. She also had some concerns around management issues, which further points to her emergence as a teacher leader. This profile is supported by the LoU data. The pattern of the supporting goals pushing the PBL innovation goal forward was consistent in that the supporting goals for Amber are at the integration level, and the overall PBL innovation goal was at the refinement level. She was refining PBL products as the zero year is drawing to a close and implementation of the created PBL units and products was imminent in the next school year. Both the SoCQ and LoU indicate Amber was asking, "How do we implement this innovation most efficiently, and how can we improve on the PBL units we have designed?"

In essence, Amber progressed from personal concerns and orientation levels of use, to

impact and refinement and assessment, respectively. At the beginning of the zero year, she did not clearly understand the PBL innovation. Her initial self concerns were focused on her own comfort with the PBL model and her interaction with her team. However, she was a willing participant in the content integration processes and being present on the floor working with and learning from the 9th and 10th grade teachers and students. She began making connections with her team members for the purpose of collaboration early in the PBL innovation process. This early willingness, along with the PBL curriculum development processes guided by the CF, enhanced Amber's quick progression from self concerns and orientation use to impact concerns and refinement and assessment levels of use.

Jessica SoCQ and LoU Data Analysis and Profile

SoCQ Data Analysis

Jessica is a white female, age 52. She was the art member of the team, and taught art for 15 years. She was also the art member of the 9th and 10th grade zero year team, so she had experience in the PBL school philosophy and zero year processes. She completed the SoCQ in October (see Figure 10) and April (see Figure 11).

October Data Analysis

Self. The October data for Jessica indicated low scores in all of the self domains. She had a very low stage 0 unconcerned (7%), stage 1 information (8%), and stage 2 Personal (7%). These low stages 0-3 indicate an experienced user with intense involvement with the innovation.

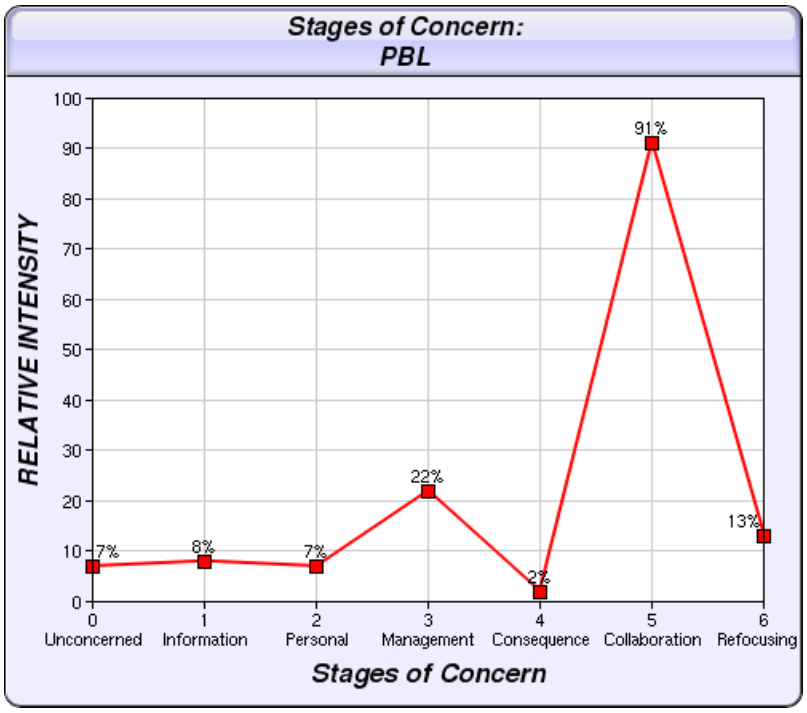

Figure 10. Jessica October SoCQ data (SEDL, 2014).

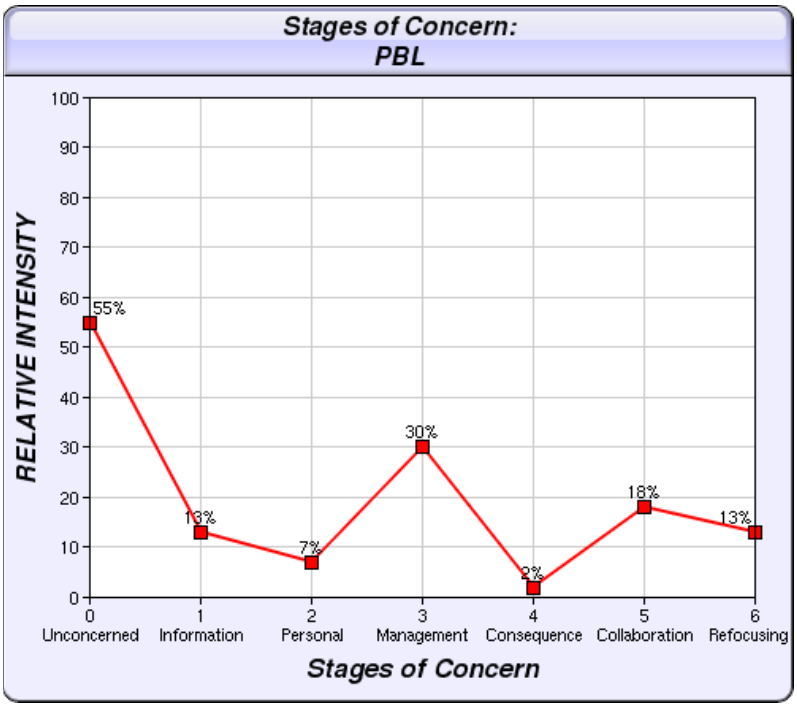

Figure 11. Jessica April SoCQ data (SEDL, 2014).

Task. The task domain for Jessica followed a similar pattern with a low stage 4 management (22%). The logistics surrounding implementation of the PBL innovation are not at the forefront of her concerns in October, which is probably affected by Jessica being a seasoned teacher at the PBL school and, therefore, experienced a year of PBL implementation.

Impact. The initial October SoCQ indicated Jessica had one peak concern in stage 5 collaboration (91%). As this new 11th grade team is forming, her focus was on moving to a new team and her concerns centered on team dynamics and collaboration. The lowest score was at stage 4 consequence (2%), which indicated little concern on the impact of students. The stage 6 refocusing was also low at 13%, which indicates a comfort with the innovation with little concern of how it should be implemented differently.

April Data Analysis

Self. The April SoCQ data revealed a change in the stage 0 unconcerned from 7% in October to 55% in April, which was a peak stage for Jessica. While this would seem that Jessica became less involved with the innovation, other SoCQ and LoU data needs consideration. Jessica is a seasoned user of the PBL innovation, so the rise in unconcerned indicated a high comfort level with the innovation as opposed to a lack of interest or understanding of the innovation.

Task. The second peak stage for Jessica in April was stage 3 management (30%). The logistics of implementation were more of a concern in April than in October (22%), however, neither number is exceedingly high. Again, Jessica was the seasoned PBL school teacher who

had been through one zero year curriculum planning phase and witnessed the PBL innovation transformation from planning to implementation.

Impact. The biggest change from the October to April SoCQ data for Jessica was at stage 5 collaboration. She was greatly concerned about team collaboration in October (91%), but had little concern in April (18%). She felt comfortable with team collaboration after a year of working together towards the PBL curriculum innovation. The other impact domains remained the same with lowest score was at stage 4 consequence (2%), which indicated little concern on the impact of students and a stage 6 refocusing (13%), which indicated a comfort with the innovation with little concern of how it should be implemented differently.

Changes in concerns across time. The SoCQ data across time revealed the concerns of Jessica shifted from collaboration concerns to task concerns. The self domains were all relatively low, possibly because she was in her second year of the PBL curriculum planning process and experienced initial concerns in earlier domains during her first year. It would be reasonable that her comfort level with the innovation was high since she had prior experience with PBL in the PBL school setting. The initial high collaboration concerns are not unusual for a person who was changing teams within a school, especially if they are leaving a comfortable and functioning team for one that is unknown. Those who are leaving a team often have higher collaboration concerns that those who are new to the environment and have no prior positive attachment to a collaborative group. By the end of the zero year, any concerns regarding leaving a known team for one that was unknown had been addressed, and her collaboration concerns lessened while the task concerns of imminent implementation increased.

LoU and IC Map Data Analysis

Observation Data Analysis

Each criteria on the IC map for Jessica was examined across all observations, and changes in the IC map goals are discussed in the form of progress (see Figure 12).

Content integration. IC map data indicated Jessica was at the mechanical-acquiring information level of use in content integration in October. She was familiar with the steps involved in planning the PBL units and with her content area, so she quickly began the process of making content connections with at least one other subject area. Since she was familiar with the PBL innovation, she was engaged in seeking more information about the other subject areas for content integration. Jessica moved to the routine-sharing level of use in January. She was knowledgeable about at least three other content areas, and she was beginning to make content connections. She was comfortable with the content integration processes and could articulate the content connections with her team members. At the end of the zero year in April, Jessica was integration-status reporting level of use. This is the state in which the user is combing their own efforts to the use of the innovation with the related activities of colleagues. Jessica reported spending time and energy collaborating with others about integrating own use of content integration. She had some understanding of all five content areas and could make multiple content connections.

Team collaboration. The October IC map data showed Jessica was at the mechanical-sharing level of use in the goal of team collaboration. She worked collaboratively with at least one other team member, and she had discussions with her team that focused on the management and logistical issues related to the use of the innovation for the purpose of

greater collaboration and more efficient content integration. In January she was at the refinement-planning level of use. She was working collaboratively with most team members for the purpose of increasing the PBL unit products impact on students. She was engaged with the team in developing immediate and long-range plans that anticipated possible and needed steps, resources, and events designed to enhance student outcomes. At the end of the zero year in April, Jessica was at the integration-status reporting level of use in the team collaboration criteria. She could work collaboratively with any configuration of team members and engage in cognitive conflict while planning PBL units. She reported spending time and energy collaborating with her team about integrating her own use of the PBL innovation.

Campus involvement. IC map data showed Jessica was at the mechanical-assessing level of use of campus involvement in October. She worked consistently with 9th and 10th grade teachers and students on the floor, assessing the strengths and weaknesses of their PBL units and processes. In January she was at the refinement-status reporting level of use. She was not just analyzing the strengths and weaknesses observed on the floor, but she was using that information to report back to the 11th grade team for the purpose of refining their PBL products to improve student outcomes. At the end of the zero year in April, Jessica was at the integration-performing level of use in campus involvement. She was collaborating with both the teams on the floor and her 11th grade team as a means for expanding the PBL innovation's impact on students. She was also working consistently with other stakeholders such as parents and other district and community members to refine the 11th grade products to positively impact students.

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation							
	2 Preparation							
	3 Mechanical		○ October ☆ October	□ October	△ October Interview 1			
	4a Routine				☆ January Interview 2			
	4b Refinement			○ January	☆ April Interview 3	□ January	△ January	
	5 Integration						○ April □ April	△ April
	6 Renewal							

Figure 12. Jessica LoU matrix with IC map observation data and interview data combined.

Content Integration- ○
Team Collaboration- □
Campus Involvement- △
PBL Unit Planning- ☆

PBL unit planning. The October IC map data indicated Jessica started the 11th grade zero year as a mechanical-acquiring information user of the PBL unit planning criteria of the innovation. Since she was involved in the zero year planning of the 9th and 10th grade team, she was comfortable with the PBL planning processes. As a user at the mechanical level, she understood on a day-to-day basis the requirements for using PBL and was knowledgeable in short-term activities and effects, but not necessarily long-term activities and effects. Jessica was at the routine-assessment level of use in January. The use of the PBL planning innovation had stabilized, a routine pattern of use had been established, and little thought was given to changing the use. Assessment was made around the goals outlined by the CF, and little thought was given to changing the use beyond those goals. She was sharing her assessments about what she learned in the 9th and 10th grade planning process with her current 11th grade team for the purpose of enhancing the management and logistics of the planning process. At the end of the zero year, Jessica was at the refinement-assessing level of use of the PBL innovation. Users at this stage vary the use of the innovation to increase the impact on students within his/her immediate sphere of influence. She was assessing the use of the PBL innovation for the purpose changing current practices for the improvement of student outcomes.

Interview Data Analysis

Interview 1. NVivo coding of the interview data gathered on the IC map across the year, as noted in Figure 3, the Level of Use matrix revealed that Jessica was at the mechanical-assessing level of use of the PBL innovation in October. The interview data analysis showed four references coded at this level. As the seasoned PBL school teacher who experienced a zero

year, she was already familiar with the PBL innovation and the planning processes. When evaluating the PBL innovation planning processes, she reflected,

> The easy thing for me this year is coming up with ideas and readily seeing some connections since I have already been trained in that way. The tough thing is nailing down those connections because the other team members are at different places in understanding this whole process. I feel like I am in the middle since I already worked with the 10th grade team.

As a practiced user of the innovation, she was able to reflect on the processes and made meaning for her continued use with her new team.

Interview 2. The NVivo coding of the second interview revealed that Jessica was at the routine-assessing level of use of the PBL innovation in January. The interview data analysis showed four references coded at this level. When asked about the team's progress in the PBL planning process, she stated,

> The totally integrated STEAM nature of (the PBL school) is what sets it apart from other STEM or PBL academies. So yeah, we do work hard at that- we ask ourselves, is this "STEAMy" enough? Is an idea different and related to learners, or is it different for the sake of being different but not really PBL- like we have a shiny cool project but no substance? So we have worked hard becoming experts in our subject and really working hard to become more than a little knowledgeable about the other subjects.

She clearly had a stable and concrete use of the PBL innovation and was focused on evaluating the process with student outcomes in mind.

Interview 3. NVivo data analysis of the final interview in April revealed that Jessica was at the refinement-assessing level of use. The interview data analysis showed three references coded at this level. She discussed the strengths of the PBL planning process in saying,

> The kinds of questions we ask when planning and reviewing a unit have become much deeper, and they surround all aspects of PBL, not just our subject and how we connect to the project. If we take parts of my ideas that are excellent, and parts of your ideas that are excellent, we have a better plan than either one of us hatched. We can't get

upset that our idea was not chosen in its entirety. We have a real culture of that kind of thinking and ideating.

Summary of interview data across time. The interview data showed Jessica to be at an assessment level of use in all three interviews, possibly because she was comparing the current 11th grade team PBL planning process to her experience with the 10th grade team process the previous year. Therefore, her initial question at the beginning of the 11th grade zero year was not "What is this?" but "How does this fit into my prior knowledge and constructs?" She began this assessment at the mechanical level, focusing on her own learning about the innovation and how she can take that learning forward to her experience with the new 11th grade team. In January, she had taken her learning forward and was routinely using that knowledge with the 11th grade team. She was involved in conversations about the level of a PBL product and evaluating if it meets the criteria developed by the CF. By the end of her second zero year, Jessica had an understanding how to use the team inquiry process to improve their PBL units and products to positively affect student outcomes.

Interview and LoU Data Combined

October data analysis. The IC map observation data showed that Jessica was at the mechanical level of use in all elements of the PBL planning innovation goals designed by the CF. She was acquiring information in content integration for the purpose managing projects and units. Since she was familiar with the content integration processes and final products of the 9th and 10th grade teachers, she was beyond making basic content connects but already thinking about how the connections would look in practice. She shared this day-to-day knowledge with her team, and further used observations on the floor as an assessment tool to assist the 11th

grade team in the PBL innovation. The NVivo interview data showed Jessica at the mechanical-assessing level of use. Perhaps the difference in the IC map level of use and interview level of use was she had an opportunity to be reflective about her previous zero year experiences in the interviews, and that reflection was not necessarily observed in the IC mapping. When asked about what PBL is to her, she was able to discuss her own use of the innovation. She said, "We give the kids a question, a hook, get them into it, excited about, get the wheels turning, get them thinking, get their questioner going, and hit with that anchor document which is explaining without explaining to much what we want them to do. Then they begin the process of identifying their 'need to knows'." She knew more than basic knowledge of the PBL process because she was involved in creating the 9th and 10th grade curriculum.

January data analysis. By January, Jessica was at the refinement level of use in the PBL innovation supporting goals of content integration, team collaboration, and campus involvement. Those at the refinement level of use are making changes in an innovation and/or their practice for the purpose of positively affecting student learning. She was sharing methods and ideas for modification of the innovation with her team, and developing intermediate and long-range plans that anticipate possible and needed steps, resources, and events designed to enhance student outcomes. She shared her past zero year experience and time on the floor with her team for the purpose of refining PBL units and products that would increase student learning. While Jessica was at the refinement level in the three supporting goals, she was at the routine-assessing level in the overall PBL innovation. She was a routine user of the PBL innovation, evaluating the strengths and weaknesses of the PBL units and products, but not yet refining them to positively impact students. The observation data is supported by the NVivo

interview data. She explained how the team collaboration process supports the overall PBL innovation. “Having differences and conflict is actually one of our norms. We have a culture of challenging each other on the professional, not personal, level. We call it ‘cognitive conflict’. It is through challenging our ideas, questioning everything, that we develop a product.” She had clear understanding of how the support goals lead to over PBL innovation goal of developing PBL units and products. At this point in the zero year, she was beginning conversations with her team that would lead to actual refinement of the PBL products, but observation data and interview data did not illicit evidence of actually revising products, hence she was at the routine level when evaluating her overall use of PBL innovation and not at the refinement level of use.

April data analysis. At the end of the zero year, Jessica was at the integration level in all three PBL innovation supporting goals and at the refinement level in her overall use of the PBL innovation. As implementation was imminent she was combining her effort with that of her team to refine the existing PBL units and products. This was supported by the NVivo interview data which showed Jessica at the refinement-assessment level in the overall PBL innovation, assessing the use of the innovation for increased student outcomes. When asked to reflect on the important elements of the PBL innovation, she stated,

> Establish norms early in the process and hold each other accountable. Write down every single idea during brainstorming sessions. Do not be judgy. Once products are ‘finished’, go through the criteria questions to make changes and improvements. Write in learner reflection time at the end of each PBL. That’s a new piece we are adding to the units right now.

Jessica summary profile

Jessica was the experienced teacher at the PBL school as part of the 9th and 10th grade zero years. She was familiar with the CF and her designed processes of content integration,

team collaboration, campus involvement, and planning of PBL units. The October SoCQ data indicated she was comfortable with the innovation and had few concerns about it, as indicated by the low self concerns. Her greatest concern was team collaboration. Jessica had a positive team experience as a member of the 9th and 10th grade teams, hence leaving a functioning team to a join an unknown team may be the reason for her unusually high concerns around collaboration. Her comfort with the PBL innovation was evident in the LoU data, which revealed a mechanical use of the innovation at the beginning of the year. Her LoU data viewed across time revealed a progression in the levels of use in the supporting criteria of content integration, team collaboration, and campus involvement. Her level of use of the overall PBL innovation moved to the routine-assessing level in January and refinement-assessing level in April. This was supported by the interview data that revealed Jessica to be at the assessing level of use in all three interviews. As a seasoned PBL school teacher, she was not initially learning about the innovation and corresponding processes, but was making meaning about what she already knew. She was also very passionate and thoughtful about her role as the art teacher on the team. The PBL school is a STEAM school- science, technology, engineering, art, and mathematics. Most interdisciplinary school models are STEM models, and do not integrate the arts into their model. Jessica was grateful and highly complementary of the district in their vision to include the arts in their model, and took her role as the representative from the arts very seriously. When reflecting about the importance of aArt in the PBL innovation, she stated,

> Problem-solving is all we do in a studio classroom. Even in art history, it is all about discerning… to understand the movements and their influence on each other. It helps make you empathetic and understand people. The STEM to STEAM is amazing. With STEM, you are going to create great engineers, but with STEAM, if you are going to have engineers, they will be empathetic, they will be well-read, and they will be articulate in

their response and be able to think way outside of the box. I think people do not realize how much the arts really are part of everything.

Jessica was able to bring her learning and experiences from her zero year with the 9th and 10th grade teams forward to the 11th grade team and continue the PBL integration processes designed by the CF with her new team. She also was strong advocate for the arts and humanities in each PBL unit.

Jill SoCQ and LoU Data Analysis and Profile

SoCQ Data Analysis

Jill was a white female, age 24. The PBL school was in the process of realigning their science courses, so she was one of two science teachers on the team. A chemistry teacher (Jill) and a biology teacher (Kate) worked together in this science realignment process. She was a first year teacher who designed PBL learning as part of her university teacher education program. She completed the SoCQ in October (see Figure 13) and April (see Figure 14).

October Data Analysis

Self. The October data for Jill indicated high self concerns. Compared to her other concerns, her stage 0 unconcerned (55%) was relatively high. She was concerned about other things besides the PBL innovation. Her highest self concerns were at stage 1 information (59%). She wanted general information about the innovation, what it would do, and what use of the innovation would involve. Stage 2 personal concerns were also among her highest stages at 49%. The data pattern on the October SoCQ instrument was not surprising for a first year teacher.

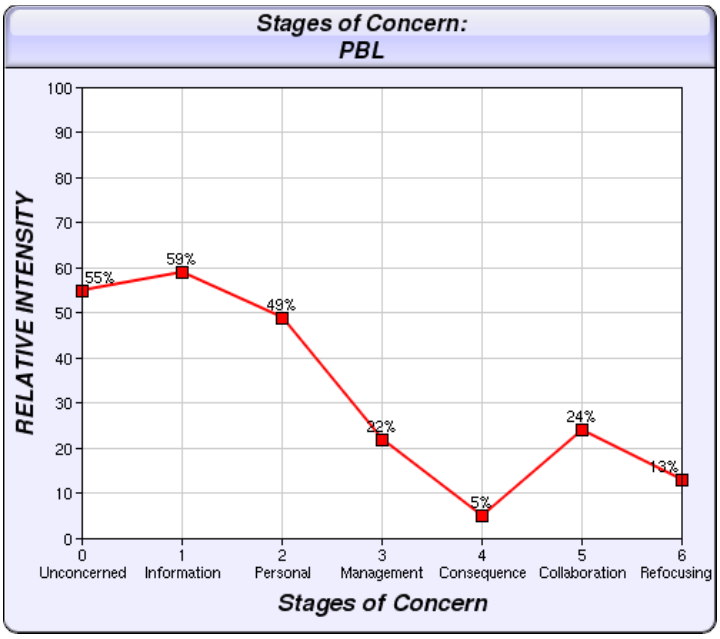

Figure 13. Jill October SoCQ data (SEDL, 2014).

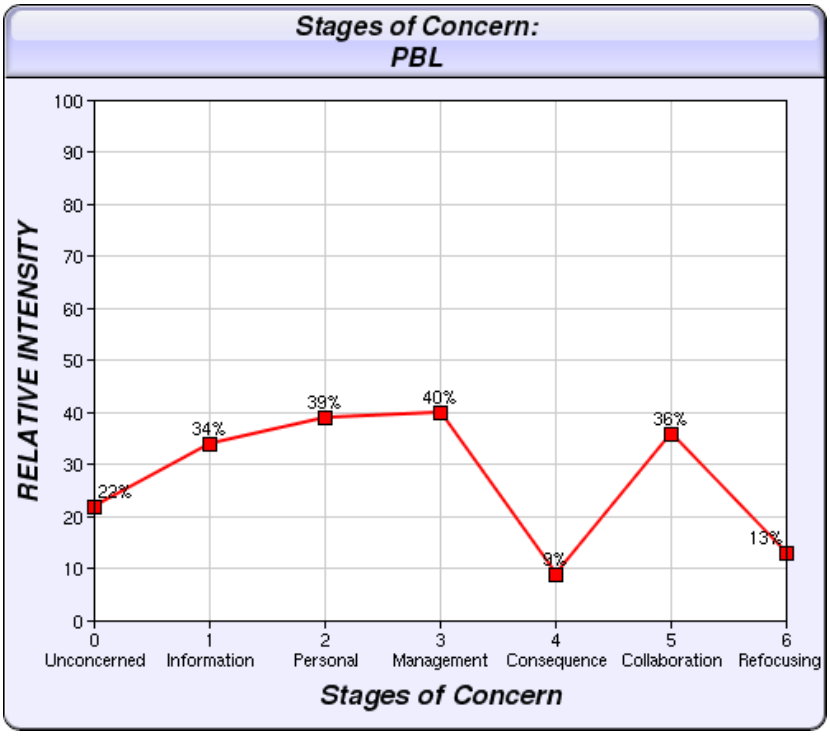

Figure 14. Jill April SoCQ data (SEDL, 2014).

Those with personal concerns are focused on ego-oriented questions and uncertainties about the innovation. They are concerned about status, reward, or how the potential or real effects of the innovation will affect them personally. As a new teacher, her concerns were focused on learning her content, student management, and feeling competent. The actual PBL innovation was not at the forefront of her concerns at this juncture because she was still trying to find her identity as a teacher.

Task. The stage 4 management concerns were lower for Jill at 22%. The logistics of the PBL innovation are not as important as the personal logistics associated with being a new teacher.

Impact. The impact domain is also low for Jill, with the highest peak being stage 5 collaboration (24%). She is concerned about collaborating with her team, but once again the self concerns are those most immediate to her in October. Similarly, the other impact domain scores were low with stage 4 consequence concerns at 5% and stage 6 refocusing concerns at 13%.

April Data Analysis

Self. The April data showed that Jill had continued concerns in the self domain, but they were not as high as in October, with the highest being stage 1 information (34%) and stage 2 personal (39%). Her stage 0 unconcerned was lower at 22%. While still a focus, hers concerns were not as great as she was gaining experience as a teacher. As she is gaining more confidence as a teacher and the self concerns are diminishing, the concerns in the other domains are increasing.

Task. Jill's peak concern on the April SoCQ was stage 4 management (40%). She is becoming more focused on the logistics of managing the implementation of the innovation. Her focus has shifted slightly from personal concerns to a focus on the PBL innovation itself.

Impact. Jill's stage 5 collaboration concerns (36%) were at the same level of concerns as her self and task concerns. She is concerned about working collaboratively with her new team. The other impact stages were comparatively low with a stage 4 consequence at 9% and a stage 6 refocusing at 13%. Once again, these concerns are influenced by Jill being a new teacher. Her focus at this very early stage of her teaching career is forming her identity as a teacher, not the immediate impact on students or the PBL innovation itself.

Changes in concerns across time. The SoCQ data across time revealed the concerns of Jill as typical of a first year teacher. She had high self concerns in October. The initial self concerns were centered on learning about the profession of education and concerns about her abilities as a teacher. Though they decreased in April, self concerns still were of importance to Jill. In April there were more concerns in the task and impact domain. She was becoming more aware of herself as a teacher, but concerned about how to implement and manage the PBL innovation in the upcoming school year. Her impact concerns were related to how she would collaborate with her team.

LoU and IC Map Data Analysis

Observation Data Analysis

Each criterion on the IC map for Jill was examined across all observations, and changes in the IC map goals are discussed in the form of progress (see Figure 15).

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation	○ October ☆ October ☆ January Interview 1	□ October Interview 2					
	2 Preparation	△ October						
	3 Mechanical		○ January □ January		△ January Interview 3		☆ April Interview 3	
	4a Routine			○ April □ April			△ April	
	4b Refinement							
	5 Integration							
	6 Renewal							

Figure 15. Jill LoU matrix with IC map observation data and interview data combined.

Content Integration- ○
Team Collaboration- □
Campus Involvement- △
PBL Unit Planning- ☆

Content integration. The initial October IC map data indicated that Jill was at the orientation-knowledge level of use in content integration. She had general knowledge about chemistry, but as a new teacher she was not as familiar with the state standards. She was learning her content, but not knowledgeable enough to make the interdisciplinary connections with the other disciplines. She moved to the mechanical-acquiring information stage by January. She was comfortable enough with her subject area to devote some time to learning at least one other content area. As a mechanical user, her focus on these connections was short term and superficial. She was able to see the immediate short-term connections, but not the entirety of the multidisciplinary PBL units. By April her content connections were deepening as she moved to the routine-sharing level of use. She expanded her knowledge to three subject areas and was beginning to see overarching connections. She could engage more in unit planning as her use had stabilized and she could describe the content connections between chemistry and other subjects to her team.

Team collaboration. The October IC map team collaboration data indicated Jill was at the orientation-acquiring Information level of use. She spent time working both independently of the team and utilizing the team. As a new teacher, her time was spent studying the state standards for chemistry. However, she sought others out, particularly the experienced biology teacher on the team, to share knowledge and opinions as she was acquiring basic content knowledge. In January she was at the mechanical-acquiring information level of use. She was working collaboratively with at least one other team member. Her use of the PBL innovation was day-to-day and step-by-step, but she was using her team to acquire deeper information other than content knowledge, such as management information, scheduling techniques,

logistics, and ideas to reduce the amount of time and work for herself in content connections and PBL planning. At the end of the zero year in April, Jill had progressed to the routine-sharing stage in team collaboration. She was working collaboratively with most team members and engaging in cognitive conflict. The use of PBL planning processes for content connections and team norms had stabilized and she was able to routinely engage in discussions about planning PBL units with her team.

Campus involvement. The October campus involvement IC map data indicated Jill was at the preparation-knowledge level of use. She was engaged in working in the war room with the 11th grade team, with very little time spent working with teacher and students on the floor. She was concentrating on learning her own content knowledge, which is why much of her time was spent in the 11th grade planning room. As she was learning more about her content, she was preparing to seek out others to learn more about the PBL innovation. By January Jill was spending time on the floor, and was at the mechanical-assessing level of use. She was assessing the use of the PBL innovation in the 9th and 10th grade teams and using those observations to inform her use about PBL instruction. Jill was at the routine-status reporting level of use in campus involvement at the end of the zero year in April. She was consistently working with 9th and 10th grade students and teachers, and she would report back to the team and CF that she was building relationships with students and her interactions with them were going satisfactorily.

PBL unit planning. The October IC map data indicated that Jill was at the orientation-knowledge level of use of the PBL innovation. She was a first year teacher; hence every aspect of teaching was new to her. However, she did have general knowledge about the PBL

innovation such as origin, characteristic, and implementation requirement. The January IC map data indicated that Jill was still at the orientation-knowledge level of use. As a new teacher, she was still experiencing many of the processes common to all new teachers, while also processing the uniqueness of a PBL model and the constructs of the PBL school. She was learning new content, a new team, a new space, and all the nuances of teaching. By April, Jill was feeling confident and competent enough in her growing knowledge of her content, interdisciplinary content connections and understanding of PBL to step into a more active role in the PBL curriculum planning process. The April LoU data indicated that Jill was at the mechanical-status reporting level of use. As a mechanical user, she was focused on short-term day-to-day implications of the innovation. And while she may be focused at times on student use of the innovation, she was still concerned with refining her own use of the innovation. This makes sense given the fact that she was new to the teaching profession, and as a zero year teacher in this unique setting she had not yet taught her first class of students. However, she was reporting her ideas about logistics, content connections, and concerns to the 11th grade team.

Interview Data Analysis

Interview 1. NVivo coding of the interview data gathered on the IC map across the year, as noted in Figure 4, the Level of Use matrix revealed that Jill was at the orientation-knowledge level of use of the PBL innovation in October. The interview data analysis showed seven references coded at this level. When asked about her concept of PBL, she stated, “The projects are generally dependent on how we set them up. I like that it connects to everything, especially how we do it here. Kids understand why they learn things in one class and apply it to others. It

makes it exciting and relevant." Though she was beginning to conceptualize the PBL innovation, she did not possess a concrete understanding of the various goals within a project. She was beginning to understand the importance of content connections, but was not able to articulate that process in October.

Interview 2. The NVivo coding of the second interview revealed that Jill was at the orientation-acquiring information level of use of the PBL innovation in January. The interview data analysis showed four references coded at this level. When asked about what she had learned about the PBL planning process, she stated,

> It's almost hard to wrap your mind around and even explain. We have had intense conversations about our TEKS. We began by pouring over our TEKS and learning them. I had to learn both biology and chemistry because we are transitioning when kids are learning each course, but that has been great to see the connections between grade levels. I also have been helping a lot on the floor. But that's ok, I am ok right now just learning my course and about being a teacher.

Jill was becoming more comfortable with team processes, and was seeking out others to learn more about her content connections and the PBL innovation.

Interview 3. NVivo data analysis of the final interview in April revealed that Jill was at the mechanical-assessing and mechanical-status reporting levels of use. The interview data analysis showed two references coded at each level. At the end of the zero year, she believed the PBL process was positive because,

> Students work together in collaborative groups to solve a scenario, and they have to use a variety of skills to solve the problem. They also have to use all subjects. They have to post their 'need-to-knows' to guide them, and these also help the facilitators create workshops. They PBLs should be real-world or something that kids could expect in a real working environment. We also hope they are of high interest to the kids.

Jill also spoke to how the PBL process has affected her learning as a new teacher.

> For me, as a new teacher, it has been working closely with experienced teachers. I have

> learned so much from them and from the CF. I also have been able to teach without the pressure of having my first year on my own. I am on the floor lots and working with those teachers and learning from them. I also know so much about the science subjects, and I have also learned about the other courses, and I know that definitely would not have happened on another campus.

Summary of interview data across time. Jill was at the orientation level of use for the first half of the zero year through January. As a new teacher, there were many aspects of the teaching profession she had to learn, not just her content and the PBL planning process. She began the year with a vague understanding of the PBL process, but by January she could describe the process, particularly how content connections were made. She was using her team, teachers on the floor, and the CF to help her in her understanding. By the end of the year was a mechanical user of the PBL innovation. She was able to evaluate the strengths of the PBL planning process, and also report how the PBL process contributed to her own growth and status as a new teacher.

Interview and LoU Data Combined

October data analysis. The IC map observation data showed that Jill was at the orientation-knowledge/ acquiring information in content integration, team collaboration, and her overall use of the PBL curriculum planning innovation. Her level of use in campus involvement was at the preparation-knowledge level. The October NVivo interview data analysis supports this level of use. When asked what has been challenging in implementing the PBL innovation, she stated,

> I get self-conscious when they (students) ask me questions that I am not sure about. I know the chemistry, but it is general. In the TEKS, some chemistry is cut and dry and others very messy. Finding a way to integrate and find the right pathway that I did not learn until my junior or senior year of college is hard, so I don't feel very expert.

January data analysis. The January level of use data indicated Jill had grown in the PBL supporting goals of content integration, team collaboration, and campus involvement. She was at the mechanical level in all supporting goals. However, she continued to be at the orientation-knowledge level of use with the overall PBL innovation. The January interview data indicated she was at the orientation-acquiring information level of use. She described her understanding of the PBL innovation as,

> Students work together in collaborative groups to solve a scenario, and they have to use a variety of skills to solve the problem. They also have to use all subjects. They have to post their 'need to knows' to guide them, and these also help the facilitators create workshops. They PBLs should be real-world or something that kids could expect in a real working environment. We also hope they are of high interest to the learners.

While she could articulate the team vision of the PBL innovation, the observation data and interview data showed that she was not yet planning to use the PBL innovation. However, she was beyond planning to utilize the support goals, and was a mechanical user of content integration, team collaboration, and campus involvement. The disparity in the observation and interview data can be explained by Jill's inexperience as a teacher, and by the process designed by the CF. The support goals are designed to build capacity in the teachers as they create PBL units and products, so it is reasonable that a teacher would experience a higher level of use in those goals before the overall PBL innovation goal. This gap between support goals and overall PBL goal was magnified with a new teacher who was most concerned with learning content, working with a team, and negotiating being in a learning space.

April data analysis. By April, Jill was a routine user of the supporting goals of content integration, team collaboration, and campus involvement. Her overall use of the PBL innovation had progressed to the mechanical-status reporting level of use. This was supported by data

from Interview 3, which revealed an equal number of responses in both the mechanical-assessing and the mechanical-status reporting levels of use. She was able to evaluate and articulate her own use of the innovation and the logistical and management steps that contributed to her growth. When reflecting on her growth in the zero year, she said,

> For me, as a new teacher, it has been working closely with experienced teachers. I have learned so much from them and from the CF. I also have been able to teach without the pressure of having my first year on my own. I am on the floor lots and working with those teachers and learning from them. I already know the students I will have next year. I also know so much about the science subjects, and I don't think I would have this depth of knowledge on a traditional campus. I have also learned about the other courses, and I know that definitely would not have happened on another campus.

Jill Summary Profile

The October SoCQ profile indicated Jill began the zero year of the PBL curriculum planning innovation highly focused on self concerns and not concerned about the overall innovation. This profile is not unusual for a new teacher concerned about her identity as a teacher, learning content, and collaborating with a team of experienced teachers. While she took a PBL class as a pre-service teacher in college, she did not have the experiences to build teacher efficacy as an in-service teacher at the beginning of the zero year. This lack of teacher efficacy, combined with the unique PBL innovation of the PBL school, was evident in both the October and January observation data and interview data, which indicated an orientation-knowledge/ acquiring information level of use. A pattern of growth began to emerge in January as her confidence and experiences in the supporting goals of content integration, team collaboration, and campus involvement were at the mechanical level of use. She was more comfortable in her understanding of the TEKS, she felt accepted as an equal member of the team, and she was engaging in some instruction on the floor. These experiences were designed

by the CF to build capacity in teachers as they engaged in the PBL innovation. The SoCQ data indicated that by the end of the zero year Jill's self concerns decreased from 55% unconcerned, 59% information, and 49% personal in October to 22% unconcerned, 34% information, and 39% personal in April. This is indicative of Jill growing in confidence with the opportunities to gain experience working with colleagues, students, and content. As her self concerns are decreasing, her task concerns of management and impact concerns of collaboration are increasing from 22% in October to 40% in January and 24% in October to 36% in January, respectively. The SoCQ data is supported by the LoU data of routine use in content integration, team collaboration, and campus involvement. As a routine user, her use of the PBL innovation in these three supporting goals had stabilized. She also had growth in her use of the overall use of the PBL innovation. She was at the orientation-knowledge level of use in October and January, but moved to the mechanical-status reporting by April. The pattern of building experiences in the supporting goals contributed to Jill's use of the overall PBL innovation, and to her growth as a beginning teacher.

Kate SoCQ and LoU Data Analysis and Profile

SoCQ Data Analysis

Kate was one of two science teachers on the team. She taught biology and environmental systems. She is a white female, age 54. She had 15 years of teaching experience, including experience in designing biology curriculum at the district level. She completed the SoCQ in October (see Figure 16) and April (see Figure 17).

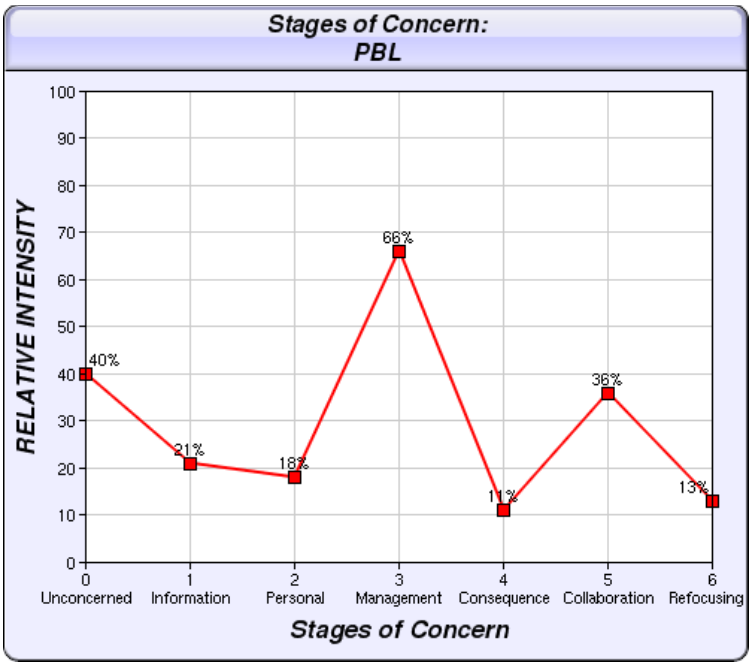

Figure 16. Kate October SoCQ data (SEDL, 2014).

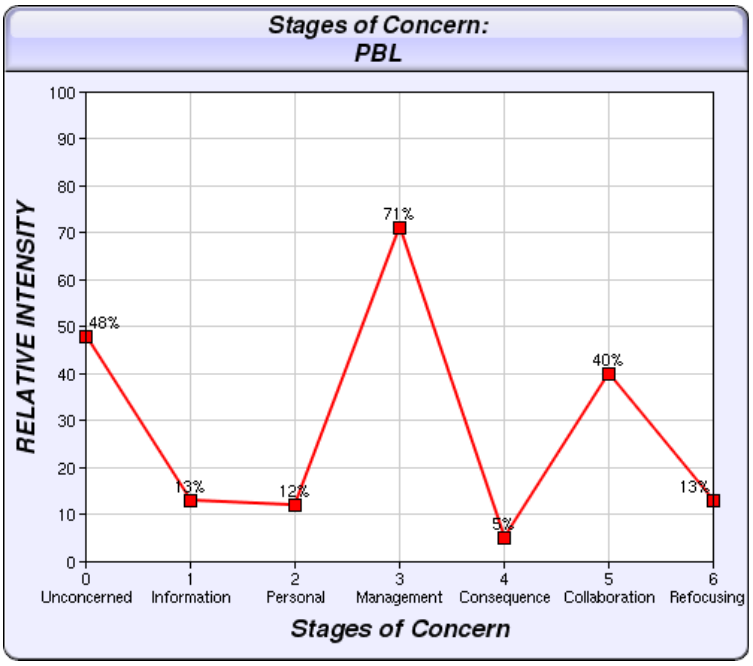

Figure 17. Kate April SoCQ data (SEDL, 2014).

October Data Analysis

Self. The October SoCQ data instrument showed that Kate had low concerns in the self domain. The stage 0 unconcerned was at 40%, indicating she had a level of involvement with

the innovation. The Stage 1 information (21%) was low, indicating that she felt she already knew enough about the PBL innovation. Her low Stage 2 personal (18%) indicated she was comfortable with the innovation and felt no personal threat.

Task. Kate's most significant concern on the October SoCQ instrument was Stage 3 management (66%), which indicated concerns around events, time, and logistical aspects of the PBL innovation. Since she was confident in her experience as a teacher and her knowledge of the PBL innovation, her underlying concerns focused on "How do we do this?"

Impact. Kate's greatest concern in the impact domain was Level 5 collaboration, though it was not significantly high at 36%. She did have some concerns about working with her team, but they were not as high as other concerns of management. Concerns at stage 4 consequence (11%) and Level 6 refocusing (13%) were low. She was not thinking about the PBL innovation impact on students, nor was she interested in changing the innovation.

April Data Analysis

Self. The April SoCQ data for Kate followed the same pattern as the October data with slight variations. The Stage 0 unconcerned increased to 48% indicated even more comfort with the PBL innovation itself. Stage 1 information (13%) and stage 2 personal (12%) both decreased. She was more confident in her knowledge about the PBL innovation, and had little concern about any negative personal impact.

Task. Stage 3 management concerns were still the highest at 71%. She continued to be most concerned about the logistics, times, scheduling, and resources involved in the PBL innovation, and her concerns increased as the team was getting closer to implementation.

Impact. There were similarities in the October data and April data in the impact domain. Concerns of collaboration were still the highest, and had increased slightly to 40%. The team relationship continued to be a priority for Kate. Stage 4 consequence decreased to 5%, so she is even less concerned about the impact of the PBL innovation on students. Level 6 refocusing remained the same at 13% indicating a continued level of comfort with the PBL innovation.

Changes in concerns across time. The SoCQ data across time for Kate revealed a similar pattern in both the October and April data collections. The self domain was somewhat more significant at the October data collection, but self concerns were not at the forefront at either collection point. She was comfortable with the PBL innovation and did not see it as a personal threat. Her highest concern at both data collection points was in the task domain, with only a few percentage points separating the two readings across time. She was concerned about implementation and the time, resources, and management that are part of implementation. She also had concerns about team collaboration, and the two collection points revealed a small change across time. Kate was the most experienced teacher on the team, and described as the practical, steady voice of reason. Perhaps her experience and practical nature kept her focus on aspects of implementation and also contributed to the small variations in her concerns from October to April.

LoU and IC Map Data Analysis

Observation Data Analysis

Each criterion on the IC map for Kate was examined across all observations, and changes in the IC map goals are discussed in the form of progress (see Figure 18).

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation			☆ October				
	2 Preparation				Interview 1			
	3 Mechanical		☆ January Interview 2	○ October				
	4a Routine			□ October	△ October			
	4b Refinement			○ January	□ January ☆ April Interview 3	△ January		
	5 Integration				○ April		□ April	△ April
	6 Renewal							

Figure 18. Kate LoU matrix with IC map observation data and interview data combined.

Content Integration- ○
Team Collaboration- □
Campus Involvement- △
PBL Unit Planning- ☆

Content integration. The October IC map data showed that Kate was at the mechanical-sharing level of use in content integration. She was an experienced biology teacher, so little time was needed to understand her own content. She quickly began making content connections with at least one other subject area. She was able to discuss connections within the three science courses offered in the 9th-11th grades, and she was beginning to discuss overarching connections between the interdisciplinary subject areas on the 11th grade team. Kate was at the refinement-planning level of use by January. She was making more detailed connections between three content areas, and developing intermediate and long-range plans that anticipate possible and needed steps, resources, and events designed to enhance student outcomes. At the end of the zero year in April, Kate was at the integration-assessing level of use in content integration. She had an understanding of all five content areas, and could make multiple connections. She had the ability to appraise the collaborative use of content integration in terms of student outcomes and the strengths and weaknesses of the integrated effort.

Team collaboration. The IC map data showed that Kate was at the routine-sharing level of use in October with team collaboration. She was immediately comfortable with the team and as a member of the team. She was quick to connect to all team members and was sharing her thoughts about content connections and the larger PBL innovation from the start of the zero year. By January she was at the refinement-assessing level of use. She was a keen observer of the team processes and was comfortable expressing her observations to the team for the purpose of changing current practices to improve student outcomes. At the end of the zero year in April, Kate was at the integration-status reporting level of use in team collaboration. She

was working with any configuration of team members and engaging in cognitive conflict for the purpose of increasing student outcomes.

Campus involvement. The October IC map data showed that Kate began the year at the routine-assessing level of use in campus involvement. She was comfortable being on the floor with the 9th and 10th grade students and teachers. She used her time to assist students and teachers, but also evaluated the PBL practice and processes currently in use. By January, Kate was at the refinement-planning level of use. She was using her time on the floor and involvement with other stakeholders in the PBL school community to develop immediate and long-range plans that anticipated possible and needed steps, resources, and events designed to enhance student outcomes through the PBL units. At the end of the zero year in April, Kate was at the integration-performing level of use in campus involvement. She continued to be present on the floor and in the larger PBL school community for the purpose of expanding the PBL innovation on students and for working with others to make any needed changed to the PBL innovation.

PBL unit planning. The October IC map data indicated Kate began the study at the orientation-sharing level of use in PBL unit planning. Those at this level can discuss the innovation in general terms and/ or exchange descriptive information, materials, or ideas about the innovation and possible implications of its use. Kate had command of her content knowledge and was comfortable making content connections with her team, but she was just beginning to understand the overall PBL curriculum innovation itself. However, she had knowledge of the inquiry process of science education, could see those connections to the PBL process, and shared those with the team. The January IC map data indicated Kate was at the

mechanical-acquiring information level of use. Users at this level are soliciting management information about such things as logistics, scheduling techniques, and ideas about reducing time and work for the user. The April IC map data indicated Kate was at the routine-assessment level of use. The use of the PBL planning innovation had stabilized and a routine pattern of use has been established. Assessment is made around the goals outlined by administrators, and little thought is given to changing the use beyond those goals.

Interview Data Analysis

Interview 1. The NVivo coding revealed that Kate was at the preparation-assessing level of use of the PBL innovation in October. The interview data analysis showed six references coded at this level. When asked what PBL means to her, she stated,

> As I mentioned, that inquiry piece is something I am passionate about. Inquiry is the basis for PBL. We give students the problem and content parts that are important. Really the desired content outcomes and they begin a process to discover or uncover what they know, don't know, and need to know. Next, they must process what the need to do or where they need to go to get their knowledge. Then, how do they show their knowledge in a product or process that makes sense? These problems or the process students engage in, should lead them to other problems, or make sense in real world problems. That transfer of learning is key to PBL, and in my opinion, it is that inquiry process that build transfer.

Kate possessed knowledge about the inquiry process inherent in the PBL innovation and was able to use that knowledge as she prepared to use the PBL innovation.

Interview 2. The NVivo coding of the second interview revealed that Kate was at the mechanical-acquiring information level of use of the PBL innovation in January. The interview data analysis showed three references coded at this level. When asked about key components of the PBL planning process, she stated,

> The CF led us through an extensive sharing of our TEKS process. We shared what our TEKS mean and their importance. As we did this we kept notes making all the connections we can think of. It was tedious work, but worthwhile in the end because once we started zooming out and thinking about overarching connecting themes, skills, and PBLs, I think that process was much more effective because of all the TEKS discussion.

She was aware of the day-to-day aspects of the PBL innovation and understood the role of the CF in acquisition of information for planning content connections.

Interview 3. NVivo data analysis of the final interview in April revealed that Kate was at the refinement-assessing level of use. The interview data analysis showed three references coded at this level. When reflecting on the strengths and weaknesses of the PBL innovation, she stated,

> This works best when everyone feels like they have equal footing. I think we did this well, but problems could arise if one person or subject dominates. Listen, learn, and compromise. You never know what a seemingly not related idea will take you, and it is in fact the perfect idea. I worry about the time in will take to maintain this system, and not having that zero year kind of time.

Summary of interview data across time. As an experienced science teacher, Kate began the zero year making her own meaning of PBL innovation through her experience in science-based inquiry. She quickly saw the connections between her understanding of inquiry models and the goals of the PBL initiative, so she was at preparation level of use in October. By January, she was a mechanical user and was learning about other goals of the PBL planning process other than the inquiry processes. She was learning about other disciplines through the content integration processes designed by the CF. By the end of the zero year, Kate was a refinement-assessing level of use of the PBL innovation and could evaluate PBL planning processes beyond simply stepwise connection of TEKS and beyond her own use. She was beginning to evaluate

how the PBL innovation and its processes affected students, and how they could be changed to provide more positive impact.

Interview and LoU Data Combined

October data analysis. The October IC map observation data revealed that Kate was at the mechanical and routine levels of use in the PBL innovation supporting goals of content integration, team collaboration, and campus involvement. However, her overall use of the PBL innovation was at the orientation-sharing level of use. As the most experienced teacher on the team, content, collaboration, and working with teachers and students were not novel to her, but the PBL innovation and environment of the PBL school was a new experience. She was orienting herself to the innovation; however, her experience in implementing inquiry-based instruction in her science classroom placed her at the orientation-sharing level. NVivo data from interview 1 showed Kate to be at the preparation-assessing level of use. She stated,

> I believe it truly is how the brain is designed to think, and our system runs counter to that. The connectivity and making your own meaning is awesome. The real-world application is exciting, and transfer of learning. I think it really is giving our student what they will need in a 21st century world- collaboration, inquiry, problem-solving, product design, and communication.

She could effectively evaluate her perceptions of the PBL innovation, and could articulate the reasons she was prepared to use it.

January data analysis. By January, Kate was at the refinement level of use in the supporting goals of content integration, team collaboration, and campus involvement. Those at the refinement level are student-centered and are examining and changing their use of the PBL innovation to positively affect student outcomes. IC map observation data revealed Kate was at

the mechanical-acquiring information level of use in the overall PBL innovation, and the NVivo interview data revealed that Kate was at the mechanical-acquiring information level of use. When describing her use of the PBL innovation process, she said,

> The CF led us through an extensive sharing of our TEKS process. As we did this we kept notes making all the connections we can think of. It was tedious work, but worthwhile in the end because we started zooming out and thinking about overarching connecting themes, skills, and PBLs. I think that process was much more effective because of all the TEKS discussion. Then we looked at a workable timeline.

While she was at the refinement stage to those supporting goals that were familiar to her as a classroom teacher, she was still working through the processes of PBL unit and product planning.

April data analysis. At the end of the zero year, Kate was at the integration level of use in the supporting goals of content integration, team collaboration, and campus involvement. However, she was at the refinement-assessing level of use in with the overall PBL innovation, and the IC map observation data was support by the NVivo April interview data. When discussing her own growth in the process, she stated,

> Examining what 'learning' really is, what it means. I don't have an answer to that, but I know it has changed from what I thought I knew it meant, and how we measure it. It is not a thing that can only be measured on paper. It is complex and we are OK in that complexity; that we are pushing kids in ways that are not traditionally observable or measurable. We are challenging our beliefs about those things and taking risks and we move through this.

She was evaluating how her beliefs on learning had the potential to affect student outcomes.

Kate Summary Profile

The SoCQ data for Kate was almost identical from the October and April administration of the instrument. Kate was the most experienced teacher on the team, hence she possessed a

level of confidence and expertise that translated to being comfortable with the PBL innovation, and she had few concerns about feeling personally threated by the innovation. As an experienced teacher, her initial thoughts were not "Can I do this?" but "How do I do this?" which is the central question at the task/ management level of concern. Her concerns remained centered around questions of implementation. The seemingly static appearance of her SoCQ profile across time could possibly indicate no growth in the zero year, or at least no change in her concerns. Examination of her LoU data showed otherwise. Her experienced confidence is evident in the observation and interview data. She began the zero year at the mechanical and routine levels of use in the supporting PBL goals, which revealed evidence of Kate being knowledgeable about her TEKS and content, confident in team collaboration, and comfortable engaging with the 9th and 10th grade teachers and students working on the floor. When asked about her role on the team in interview 1, she stated, "Often I am the experienced voice. I love that my team pushes the edges and limits of everything we are planning. However, occasionally someone needs to say 'that's great, but remember we are still working with teenagers' or 'is this logistically possible?'" The high management concerns and early use of the PBL innovation were not a surprise given her experience and pragmatic nature. She continued to grow in her role on the team and on the campus as the observation data shows her at the refinement level of use in January and integration level of use in April. She was open and committed to learning about the overall PBL innovation, progressing from an orientation level of use in October to a routine level of use in April. As a routine pattern of use in planning PBL units was established, Kate, as the pragmatic and practical member of the team, questioned and evaluated proposed units and products. Kate was passionate about inquiry-based instructional practice and willing

to take risks that pushed the team and ideas forward, yet she possessed a quiet confidence and steady voice of reason that often gently guided the team back to reality when "out of the box" thinking tangents veered from practical implementation.

Robert SoCQ and LoU Data Analysis and Profile

SoCQ Data Analysis

Robert was a white male, age 32. He was the English teacher on the team. He had 8 years teaching experience in another state, including some PBL experiences and curriculum writing. He completed the SoCQ in October (see Figure 19) and April (see Figure 20).

October Data Analysis

Self. Robert had low self concerns at the October SoCQ data collection point. Low stages 0-3 indicated an experienced user who is still actively concerned about the innovation. Robert was very supportive of the innovation and felt a high level of comfort with the PBL curriculum processes. This lack of concern and comfort level is reflected in a low stage 0 unconcerned score (2%) and low stage 2 personal (2%). His highest self domain score was at stage 1 information (18%), indicating that he had a need for learning more about the PBL innovation.

Task. Robert had slight task concerns as indicated by his stage 3 management score of 19%. However, this score is low indicated little concerns about the logistics and management of the innovation.

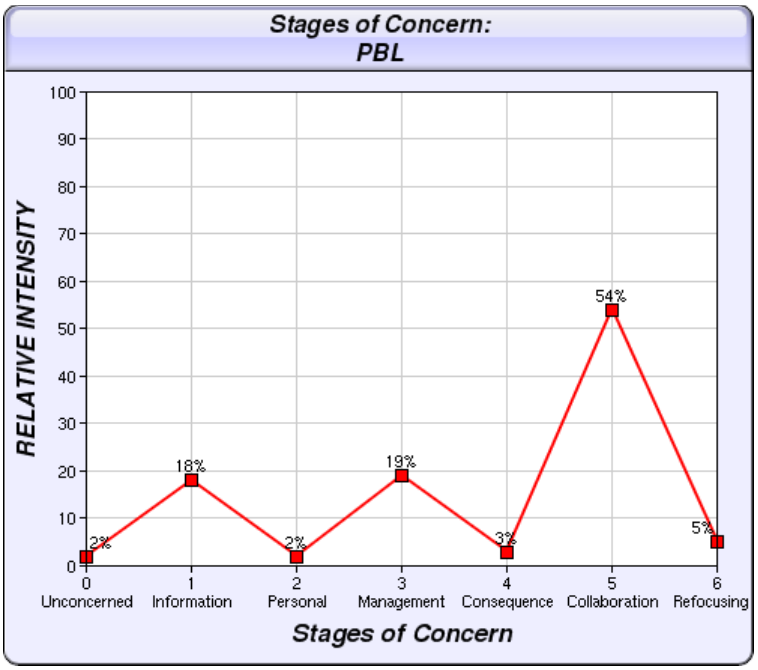

Figure 19. Robert October SoCQ data (SEDL, 2014).

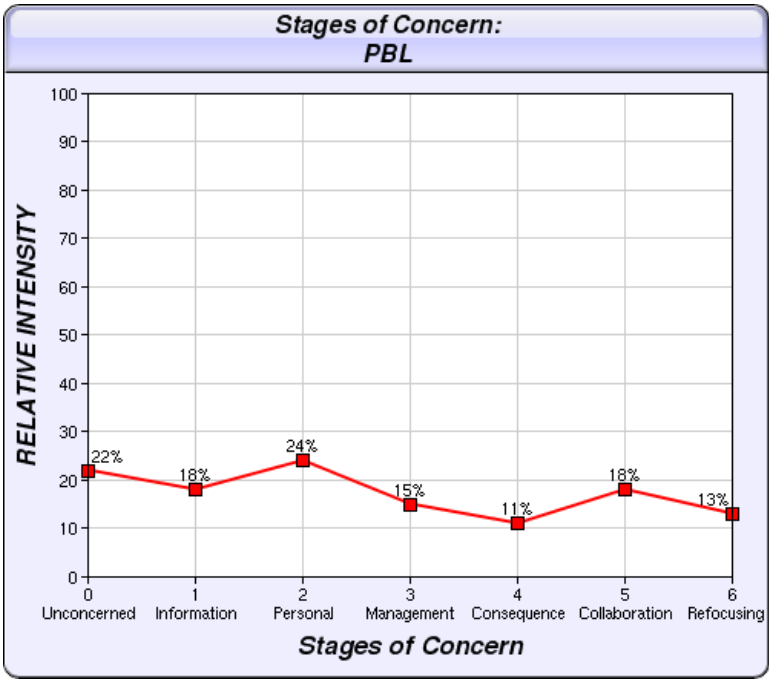

Figure 20. Robert April SoCQ data (SEDL, 2014).

Impact. Stage 5 collaboration (54%) was the greatest concern of Robert in October. He was most concerned about working with others on his new curriculum team. His other impact domain concerns were low at stage 4 consequence (3%) and Level 6 refocusing (5%). He was

not concerned about the PBL innovation impact on students, nor was he interested in changing the innovation.

April Data Analysis

Self. Concerns in the self domain had increased somewhat for Robert at the April data collection point, but they were still low. Low stages 0-3 indicates an experienced user who is still actively concerned about the innovation. His stage 0 unconcerned (22%) and stage 2 personal (24%) increased the most, indicating that he had some other concerns about the innovation that were personal in nature. He was thinking more about the impact the PBL innovation had on him, though the level was not high and he did not have negative personal responses to the innovation.

Task. Robert's Task concerns are even lower in April as indicated by his stage 3 management score of 15%. He has little concern about the logistics, time, scheduling, and management of the PBL innovation.

Impact. Robert had minimal impact domain concerns at the April data collection point. His greatest concern in October was stage 5 collaboration at 56%. In April his concern dropped to 18%. This would indicate that his initial concerns about collaborating with his team had been resolved. The other impact domains increased slightly to 11% at stage 4 consequence and 13% at stage 6 refocusing. He is thinking more about the PBL innovation impact on students and changes that may be made in the PBL curriculum to improve the product.

Changes in concerns across time. The SoCQ data across time revealed Robert began the zero year with minimal concerns in the self and task domains. His greatest peak concern was at

the Collaboration stage (54%) of the impact domain. He was most concerned about working with the new 11th grade team. The two other highest concerns were information (18%) and management (19%), which indicates he had some concern regarding learning about the PBL innovation and logistics of implementation. However, these concerns are still low percentages and not at the forefront of concerns. By April, Robert's greatest concern of collaboration had decreased from 54% to 18%. The April SoCQ revealed no significant spikes in any category and little differentiation between categories. The two highest categories were personal (24%) and unconcerned (22%).

LoU and IC Map Analysis

Observation Data Analysis

Each criterion on the IC map for Robert was examined across all observations, and changes in the IC map goals are discussed in the form of progress (see Figure 21).

Content integration. The October IC map data indicated Robert was at the mechanical-acquiring information level of use in content integration. Robert had some prior PBL learning experience and he taught his subject area for eight years, so he was familiar with the day-to-day requirements for using the innovation and comfortable making content connections. He began making connections with the U.S. history teacher and content early in the zero year. By January, Robert was at the routine-sharing level of use. He had knowledge of at least three content connections as was making overarching connections between his content and other disciplines. He often led discussions about content connections in team collaboration meetings.

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation							
	2 Preparation							
	3 Mechanical	☆ October Interview 1	○ October	□ October	△ October ☆ January Interview 2			
	4a Routine			○ January				
	4b Refinement				☆ April Interview 3	□ January △ January		
	5 Integration						○ April □ April	△ April
	6 Renewal							

Figure 21. Robert LoU matrix with IC map observation data and interview data combined.

Content Integration- ○
Team Collaboration- □
Campus Involvement- △
PBL Unit Planning- ☆

At the end of the zero year in April, Robert was at the integration-status reporting level of use in content integration. He reported spending time with team collaborating about integrating his own use of the connected content within the PBL innovation. He had an understanding of all five subject areas and could make multiple connections.

Team collaboration. The IC map data showed Robert was at the mechanical-sharing level of use in team collaboration in October. He could work collaboratively with one other team member, usually the U.S. history teacher. His interaction with his team included making content connections, but he was also able to discuss the management and logistical use of the PBL innovation. By January, he was at the refinement-planning level of use. He was working collaboratively with most team members and engaging in cognitive conflict. He was able to develop immediate and long-range plans that anticipate possible and needed steps, resources, and events designed to enhance student outcomes. At the end of the zero year in April, Robert was at the integration-status reporting level of use with team collaboration. He was comfortable with the team collaboration and reported that the team collaboration process enhanced his own use of the PBL innovation.

Campus involvement. The October IC Map data revealed that Robert was at the mechanical-assessing level of use with campus involvement. He was working consistently with 9th and 10th grade students and teachers on the floor and using his observations to examine his own use of the PBL innovation with respect to the problems of logistics, management, schedules, time, resources, and general actions of students. By January, Robert was at the refinement-planning level of use. He was able to utilize his experiences in working with various campus stakeholders to develop immediate and long-range plans that anticipate possible and

needed steps, resources, and events designed to enhance student outcomes. At the end of the zero year in April, Robert was at the integration-performing level of use in campus involvement. He was working with all stakeholders on the campus as a means for expanding the PBL innovation's impact on students.

PBL unit planning. Robert was at the mechanical-knowledge level of use of the PBL planning innovation at the beginning of the study in October. He had prior experience working in an interdisciplinary model that was project-based, so he had a familiarity with PBL. As a mechanical user, he was past acquiring an understanding of PBL. He was focused on short-term, day-to-day use of the innovation. He was comfortable discussing the management and logistics of the PBL planning process as a means to facilitate his own understanding of the process. The January IC map data indicated Robert was at the mechanical-assessing level of use. He was discussing management and logistical issues related to the innovation. He used his time on the floor to further inform his knowledge and of the PBL process and he was using this information to evaluate current practices and products of the 11th grade team He was soliciting information and opinions of others for the purpose of continued content integration. By the end of the zero year in April, IC map data indicated Robert was at the refinement-assessing level of use. Users at this level are assessing the use of the innovation for the purpose of changing current practices to improve student outcomes.

Interview Data Analysis

Interview 1. NVivo coding of the interview data gathered on the IC map across the year, as noted in Figure 21, the Level of Use matrix revealed that Robert was at the mechanical-

knowledge level of use of the PBL innovation in October. The interview data analysis showed seven references coded at this level. When asked about his concept of the PBL innovation, he stated,

> You hear people either delineate between project-based or problem-based and other use the terms interchangeably, but to me it is about the questions. Presenting the students with the question, then allowing them to formulate the questions on their own…inquiry-based learning…present them with problems that they have to work through products to find the answers to. The products should have authenticity, meaning it has real-world meaning and application. There are multiple answers and students have to follow a path and defend or prove it. I really like that aspect of that ball in their court, that they must take ownership of their own learning. Education is not a passive process.

Kate had some previous experience working in a school that promoted PBL, so his understanding of the PBL innovation was at the mechanical level.

Interview 2. The NVivo coding of the second interview revealed that Robert was at the mechanical-assessing level of use of the PBL innovation in January. The interview data analysis showed four references coded at this level. When reflecting on some concerns about the PBL innovation, he said,

> As open and as it might seem to the students, it has to be so organized. There is less room to modify on the fly when you are the one person in your one classroom. When you are designing a program when they get to go out and find the information, you cannot as easily modify on the fly. It all has to be kind of right at the outset. There are more unknown quantities. That is the scariest is wondering if this will really work.

He was reflective and could articulate differences between and PBL model and a traditional classroom environment.

Interview 3. NVivo data analysis of the final interview in April revealed that Robert was at the refinement-assessing level of use. The interview data analysis showed four references coded at this level. When asked about reflection and growth over the zero year, he offered,

> This place is really challenging all that I have held true about education, teaching, and learning. I have always believed in this concept, but believing and doing are not the same. I feel as I am one of the facilitators who is further along in my comfort level in PBL, but even at that I was surprised what I had to let go of and rethink, or relearn. Like grading…how should grades be assigned in PBL- or really what do they mean? I don't have an answer for that, but I do know that what made me comfortable about assigning a number to students based on a body of work does not equal learning, and I need to rethink what does.

Robert was assessing his use of the PBL innovation to change his current practice and positively affect student outcomes.

Summary of interview data across time. Robert began the zero year with some prior experience in a PBL curriculum model, so he had a mechanical understanding of the model and a comfort level in his use around PBL learning. In January, he was still a mechanical user of the PBL innovation, but his understanding had grown past understanding the elements of a PBL model and the curriculum planning processes. He was able to discuss nuances of a model, such as how to balance organization and direction of learning while giving students voice, choice, and ownership of their learning. At the end of the zero year, Robert was evaluating and refining his beliefs and practices as an educator. He was actively discussing his changing philosophy on what learning is and how learning is measured.

Interview and LoU Data Combined

October data analysis. The IC map observation data showed that Robert was the mechanical level of use in all of the supporting goals and in the overall PBL innovation. Those at the mechanical level are focusing their effort on the short term day-to-day use of the innovation. They understand several aspects of the innovation and feel comfortable to begin using the innovation. At an early stage of the zero year, Robert was making interdisciplinary

content connections, collaborating and sharing ideas with his team, and assessing the PBL in practice on the floor. His overall use of the PBL innovation was at the mechanical-knowledge level, and this was supported by NVivo data analysis from Interview 1. In reflecting on the potential issues of a PBL model, he discussed the issue of grading.

> At one of the conferences the point was brought up that when students walk up to get their diploma, they are getting a letter… and A, B, C, D… what does this letter mean? What are they actually getting? Why do we care about the letter? I think that PBL has to be less about the letter because we have such a culture of this fear of failure, and in PBL it is designed for them to fail. They will run into walls and hurdles and must figure ways over and around. This long-tail growth is not designed to be measured in our existing traditional structures. So things have to be looked at a little bit differently.

Robert had a working knowledge of the elements inherent in a PBL model, such as grading, and quickly grasped the processes of the PBL innovation.

January data analysis. Robert progressed to the routine-sharing level of use in content integration and the refinement-planning level of use in team collaboration and campus involvement by January. He was able to discuss his level of use of the innovation with his team, and he could refine his use based on his feedback from the team, the CF, and his observations from time on the floor with practicing teachers. His overall use of the PBL innovation was at the mechanical-assessing level, and this was supported by the NVivo data analysis of Interview. He was reflective about a PBL project by saying,

> We have created what we think are good PBLs. While they may have a single discipline as sort of the underlying base- 'K'Ching', for example is based in economics and 20th century American History, but all courses are part of the PBL and learners must tap all disciplines. And I really don't feel like it is artificial, at least we have consciously worked to make the PBLs authentic, real-world scenarios and not artificial packages.

His reflections in Interview 2 were at the Assessment level of use, but he was not articulating how his evaluations would affect students. Instead, his reflections were about making his own

meaning to inform his own practice, so the majority of Interview 2 was coded in NVivo at the mechanical-assessing level. Observation data of Robert revealed student-focused and outcome-focused discussion when collaborating with his team, which could be an explanation for the difference in the observation data at the routine/ refinement level of use and the interview data at the mechanical level of use.

April data analysis. By the end of the zero year, Robert was at the integration-status reporting/ performing level of use in the supporting goals of content integration, team collaboration, and campus involvement. He was combining his own efforts with his team and other teachers on the floor to positively affect student outcomes. His level of use of the overall PBL initiative was at the refinement-assessing level, and NVivo data for Interview 3 revealed Robert to be at the refinement-assessing level of use. When asked what advice he would give to the new 12th grade team as they are entering their zero year, he said,

> The team is vital to your survival and success. Work to be a positive and supportive team member. Take the time to learn. There is much preparation learning that may at first seem extraneous. You will want to start writing units and PBLs before you actually do. Let that process be. The basis for what you are doing must be learned. You must challenge yourself to give up long held practices that make your comfortable. All of this takes time, so allow yourself and each other that time. Your product and team will be stronger if you take the time. You will create better experiences for students.

A pattern of the supporting goals pulling the overall PBL innovation goal forward is evident.

Robert Summary Profile

The October SoCQ data indicated Robert began the zero year with few self and task concerns, and with an overall comfort of the PBL curriculum model. His peak concern was team collaboration. Users at the mechanical-knowledge level know on a day-to-day basis the

requirements for using an innovation. His comfort of use in the innovation is perhaps because he had some prior experience teaching in a PBL model, so his initial level of use was beyond the orientation level and at the mechanical level. He spoke very confidently in interviews about his philosophy and knowledge of PBL. When considering all team members, Robert seemed the most comfortable and least worried about the PBL innovation. His personality was very laid-back and unflappable. This calm confidence was evident in the April SoCQ, in which there are no significant spikes in the self, task, and impact domains, and little differentiation between domains. The two highest categories were personal (24%) and unconcerned (21%). This pattern of seemingly no significant concern is generally interpreted one of two ways: the respondent feels comfortable and confident in the innovation and has reconciled concerns at all levels, or; the respondent is an apathetic participant who sees little value in the innovation. This SoCQ data would be problematic if the Robert was a non-user of the innovation as it would indicate he only cares about how the innovation impacts him personally, and would most likely be unsupportive of the innovation. Robert fits the profile of the former interpretation. He participated in all activities in the 11th grade war room and was often on the floor with the 9th and 10th grade. He took the lead on certain tasks such as finding speakers or researching technology. When asked if he thought PBL was a worthwhile initiative, he responded,

> Yes. Unequivocally, yes. I think that there is… we are on the cusp of a gigantic shift in education. We cannot maintain in the industrial model that we have. It's not effective and if this turns out to be a direction that the change is going, then we are on the cutting edge. We are here first. I do think we are moving towards a much more interdisciplinary model. I do think there is much more team-teaching in our future. I think there is a whole lot more self-directed learning. I think there is a whole lot of reevaluation of the teacher's role in the classroom and I think that this is a start in that direction. Is it the answer? I don't know yet. But it is a start in that direction.

At the end of the zero year, Robert was approaching the higher end of the LoU matrix. The LoU data revealed Robert to be at the routine/ refinement-assessment levels. He was moving from evaluating activities required to implement this innovation to assessing the use of the PBL units for the purpose of changing current practices to improve student learning. This data fits the SoCQ profile, indicating his greatest concern was how he was changing his practice to meet the demands of the PBL innovation. Robert presented himself as very confident in his abilities to work in a PBL environment and was a collaborative team member. Robert presented himself as knowledgeable, and his was one of the most vocal team members.

Sara SoCQ and LoU Data Analysis and Profile

SoCQ Data Analysis

Sara was a white female, age 37. She was the math teacher on the team. She had 4 years of teaching experience in community college, and business experience prior to teaching. She completed the SoCQ in October (see Figure 22) and April (see Figure 23).

October Data Analysis

Self. The October data showed that Sara had a high stage 0 unconcerned (61%) score. The PBL innovation itself was not at the forefront of her concerns, and she probably had other concerns that were more of her focus. The other stages in the impact domain were low with stage 1 information at 13% and stage 2 personal at 12%. These scores indicate she felt she knew enough about the innovation and that she did not feel a personal threat in relation to the innovation.

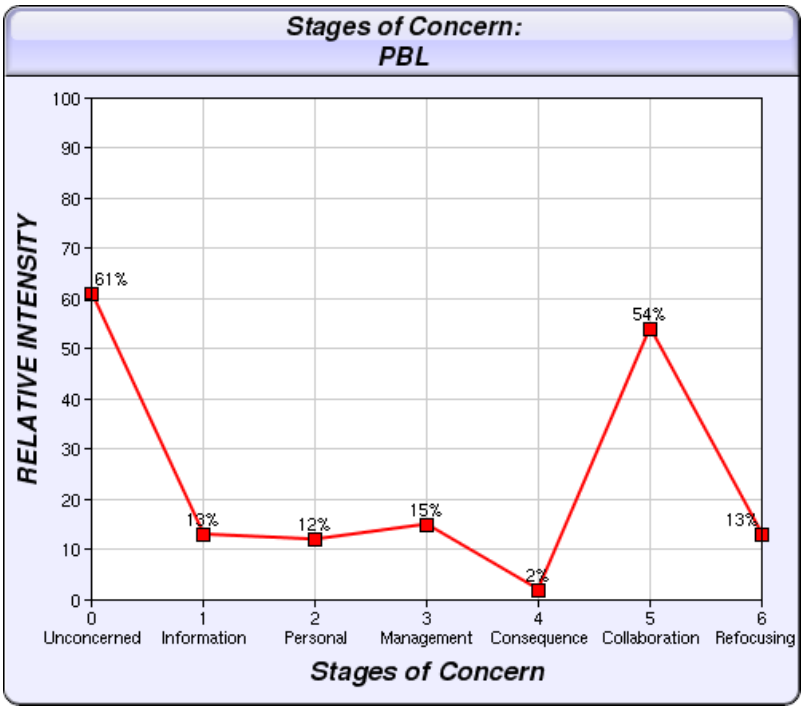

Figure 22. Sara SoCQ October data (SEDL, 2014).

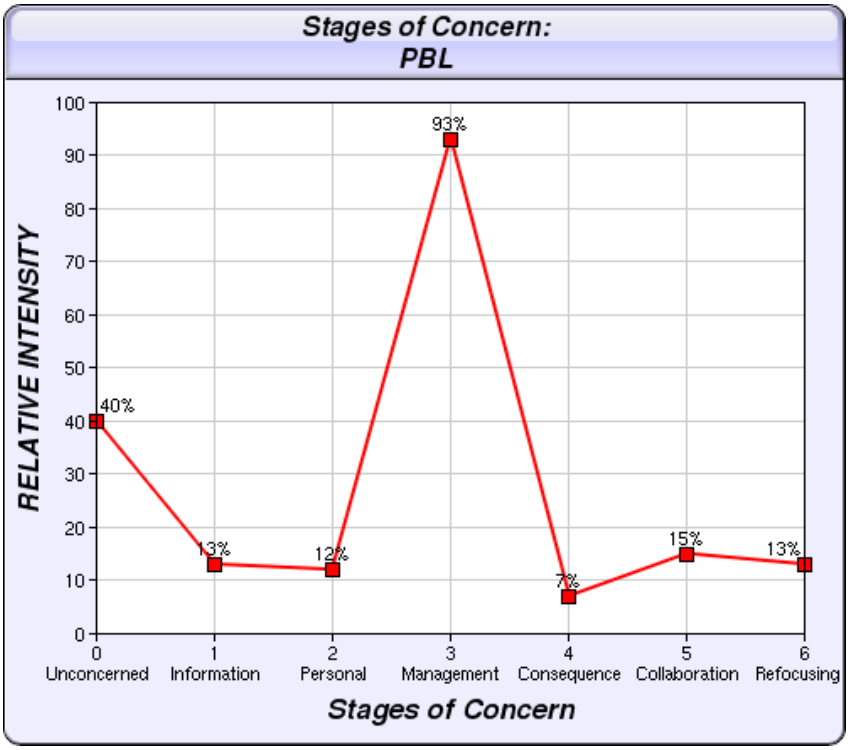

Figure 23. Sara April SoCQ data (SEDL, 2014).

Task. Task concerns were low with a stage 4 management at 15%. She was not thinking about the logistical demands of the PBL innovation.

Impact. Sara's peak concern in the impact domain was at Stage 5 collaboration (54%). She was concerned about working with her team members in relation to the PBL innovation. The other impact domains were low. Stage 4 consequence (2%) indicated that Sara was not concerned about the impact of the PBL innovation on students. Stage 6 refocusing (15%) indicated she was not concerned about changing the innovation to improve impact on students.

April Data Analysis

Self. The April data indicated that the initial concerns in the self domain had diminished greatly. The stage 0 unconcerned dropped from 61% to 40%, indicating she became increasingly involved in the PBL innovation. The low stage 1 information (13%) and stage 2 personal (12%) confirmed that she was an experiences user who was still actively concerned about the innovation.

Task. The April SoCQ indicated Sara had high concerns in the stage 3 management (95%) domain. This is a significant increase from the October data (26%). She was concerned about the time, logistics, and events necessary to implement the innovation. The team was entering the last phase of its zero year and beginning to look forward to actual implementation, hence managing that transition became important. Focus was shifting from the creation of units to the logistics of the impeding implementation. Questions of "What are we doing?" have been answered and replaced by "How do we do this?"

Impact. The April data indicated that Sara's concerns in the stage 5 collaboration (15%) were not as high the October data (67%). Initial concerns about her new team were not at the forefront as the team had time to collaborate and unify throughout the year. The stage 4 consequence concern remained low (7%) indicating the impact the PBL innovation has on students was at the lowest of her concerns. Her stage 6 refocusing scores dropped significantly from 56% in October to 13% in April. This low refocusing can indicate a comfort with the innovation with little concern of how it should be done differently. This low score, coupled with the high management indicated Amber's primary focus was the implementation of the innovation.

Changes in concerns across time. The SoCQ data across time revealed the concerns of Sara shifted from impact concerns to task concerns. The impact concerns we not student focused, but on team collaboration. As the year progressed and implementation was imminent, her task concerns increased as she became focused on how the innovation would be implemented. Her self concerns remained the same as her comfort with the innovation increased.

LoU and IC Map Data Analysis

Observation Data Analysis

Each criterion on the IC map for Sara was examined across all observations, and changes in the IC map goals are discussed in the form of progress (see Figure 24).

Content integration. The October IC map data indicated Sara was at the orientation-acquiring information level of use in content integration. She was focused on learning her own

content area standards. She was seeking descriptive information about the innovation, and seeking the opinions and knowledge of others through discussions and visits. By January, Sara was at the routine-sharing level of use. She had knowledge of at least three content areas and was beginning to make overarching connections between disciplines. The processes of content integration had stabilized, and she was able to describe the content development and connections processes so that the PBL products could be developed. At the end of the zero year in April, the IC map data revealed that Sara was at the integration-planning level of use in content integration. She had an understanding of all five content areas and could make multiple connections.

Team collaboration. The IC map data for team collaboration revealed that Sara was orientation-acquiring information level of use in October. She was working independently of the team, but was beginning to seek their knowledge and opinions about integrating content and other PBL processes. By January, she was at the routine-acquiring information level of use. She was working with most team members and engaging in cognitive conflict. A routine pattern for collaboration around content integration had been established, but no changes were being made outside of that pattern. At the end of the zero year in April, Sara was at the integration-sharing level of use with team collaboration. She could work collaboratively with any configuration of team members and engage in cognitive conflict. She could initiate changes in her use of the PBL innovation processes based on input of and in coordination with what her team was doing, and she could discuss the efforts to increase student outcomes through team collaboration.

Campus involvement. The October IC map data indicated that Sara was at the orientation-knowledge level of use for campus involvement. She was engaged with the 11th grade team and spending little to no time on the floor. By January she was at the routine-assessing level of use. She was routinely working on the floor with the 9th and 10th grade teachers and students for the purpose of evaluating the strengths and weaknesses of the PBL innovation. At the end of the study in April, Sara was at the integration-status reporting level use in campus involvement. She was consistently working with a various stakeholders on the campus. She would report to her team about collaborating with others on the campus, and used that information to reflect on potential changes in the 11th grade PBL innovation and processes.

PBL unit planning. At the beginning of the study in October, IC map data indicated Sara was in the orientation-knowledge level of use. Users at the orientation stage are acquiring information about the innovation and exploring its value. She had general knowledge about PBL and was meeting a minimal requirement to engage in campus activities to further inform her knowledge regarding PBL. The IC map data in January indicated Sara was at the mechanical-acquiring information level of use. Users at this level are soliciting information about an innovation in regards to such things as logistics, scheduling techniques, and ideas for reducing the amount of time and work for the user. The April IC map data indicated Sara was at the refinement-assessing level. Those at this level are assessing the use of the innovation for the purpose of changing current practices to achieve positive affect on student learning.

Interview Data Analysis

Interview 1. NVivo coding of the interview data gathered on the IC map across the year, as noted in Figure 24, the Level of Use matrix, revealed that Sara was at the orientation-assessing level of use of the PBL innovation in October. The interview data analysis showed five references coded at this level. When asked about her concept of the PBL innovation, she replied. "It's an inquiry process where students solve real-world problems and design deliverables that incorporate all disciplines, their content, and their skills. It is a discovery and uncovering process, instead of a direct teach. Students drive their own learning process with the guidance of the facilitators. The real-world application is, in my opinion, the biggest advantage." She was able to articulate general information about the innovation and could provide reasons for its use.

Interview 2. The NVivo coding of the second interview revealed that Sara was at the mechanical-assessing level of use of the PBL innovation in January. The interview data analysis showed three references coded at this level. When asked about how the team knows they have a strong PBL unit or product, she stated,

> Um we will see next year, won't we? (laughs) We all know our PBLs on paper will need to be tweaked in reality. But I think we have a strong launching point with our units. We have worked hard to incorporate all of our disciplines and also feel good about those things we can't get away from, like in order for learners to earn credit we must be true to the state TEKS. And they have to pass EOC. Our units are not 'cute', but really do aim to infuse authentic real-world skills and knowledge we believe learners will need beyond our school.

Interview 3. NVivo data analysis of the final interview in April revealed that Sara was at the refinement-assessing level of use. The interview data analysis showed three references coded at this level.

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation	△ October ☆ October	○ October □ October		Interview 1			
	2 Preparation							
	3 Mechanical		☆ January Interview 2					
	4a Routine		□ January	○ January	△ January			
	4b Refinement				☆ April Interview 3			
	5 Integration			□ April		○ April	△ April	
	6 Renewal							

Figure 24. Sara LoU matrix with IC map observation data and interview data combined.

Content Integration- ○
Team Collaboration- □
Campus Involvement- △
PBL Unit Planning- ☆

When asked about any concerns about the PBL initiative, she reflected,

> I hope we have designed units so that learners are getting everything they need. But I guess all good teachers worry about that in whatever environment. But so much has been put on the line, so much has been given to us, resources, trust, training, belief… that I think we feel great pressure to make this amazing and believe that it is all good. We just need to make sure our perspective is still open to things that don't hit the target and willing to let go and rework.

She was expressing the need to being open to changes and refining their units.

Summary of interview data across time. Interview data showed Sara at various assessment levels of use over time. Her answers to interview questions were often more reflective and evaluative than descriptive in nature. At the beginning of the zero year, she was at the orientation level of assessment in that she could concretely describe the elements involved in the PBL innovation, but she also had evaluative opinions about the elements of a PBL curriculum model. In January, she was evaluating the model as she saw the PBL innovation in practice on the floor and in the 11th grade planning meetings, so the level of assessment was at the mechanical level. By the end of the zero year, she was evaluating the strengths and weaknesses of the PBL innovation for the purpose of changing it so that would positively affect student outcomes.

Interview and LoU Data Combined

October data analysis. The IC map observation data showed that Sara was at the orientation-knowledge/ acquiring information level of use in all three supporting standards of content integration, team collaboration, and campus involvement, and she was at the orientation-knowledge level of use with the overall PBL innovation. The NVivo data from interview 1 revealed Sara to be at the orientation-assessing level of use. When reflecting on her

concerns about a PBL curriculum model, she stated,

> This model is not easy. It is not easy to design from a district standpoint, not easy to plan from a curriculum standpoint, and takes changes of thinking from a facilitator and student standpoint. It is not for everyone, but it is well worth all the effort to reach those will thrive in this environment. How do we know the students are making the connections and learning all the content? How will we determine that learning? This design process is very time intensive, so will we have time to continue developing and refining the units? Will our students have what they need to their next steps? I feel all of this will be positive, but those are the main concerns I have, mainly because it all remains to be seen.

While Sara could articulate in interviews some personal reflection about the PBL initiative and her personal reflections of the processes, her actual use of the processes remained at the orientation-knowledge level.

January data analysis. Sara was at the routine level of use in the three supporting goals of content integration, team collaboration, and campus involvement. She was at the mechanical-acquiring information level of use in the overall PBL innovation. The NVivo data for Interview 2 revealed that she was at the mechanical-assessing level of use. When discussing the PBL processes, she stated,

> We began by posting all of our TEKS on one wall of our room, then through discussion and the use of sticky notes, we began making connections. So if I don't understand what is mean by…oh… ,uses metaphorical language', then I ask Robert. Now once I understand that a metaphor is type representation for language, then I take a sticky note and make connections to mathematical 'metaphors'. So that is the process we use to simultaneously understand our TEKS deeper, learn others, and make connections. Then we began brainstorming overarching ideas and a few of that long list became the 'themes', I guess you could say, of our projects.

Sara could articulate evaluate her step-by-step use of the innovation, and observation data showed her moving forward in a mechanical level of use.

April data analysis. By April, Sara was at the integration level of use in the three supporting goals of content integration, team collaboration, and campus involvement. She was

at the refinement-assessing level of use with the overall PBL innovation, and this was supported by the NVivo data from Interview 3. She stated, “The facilitators on this campus are really good. We have been chosen because we are very strong teachers. However, I would tell the next group to remember that we do not know it all. Do not think that you are this campus because you have ‘arrived’ and do not need to change, learn, and grow. Listen, be humble, and be open to learning.”

Sara Summary Profile

The October SoCQ data indicated that Sara began the zero year of PBL curriculum innovation focused on concerns other than the PBL innovation. Her main concern was her personal relationship with her team. IC map data indicated she was at the orientation-knowledge level of use and NVivo interview coding indicated her level of use at orientation-assessing level. A look at Sara’s demographic profile might explain the SoCQ and LoU data. Sara taught math at a community college before accepting the math teaching position at the PBL school. She expressed her concerns about working with high school teachers and students in her interviews. “I have never taught high school. I am worried that I can relate to high school students and this environment. Connecting with students and teaching Statistics to younger learners is a question for me. It can be a stretch for college students. I wonder how I can do this, and I am the only teacher teaching this subject.” At the beginning of the zero year, Sara seemed most focused on the math piece of the curriculum. She was often not engaged in team collaboration, but working on the math elements by herself with little conversation about making connections. This may have been a necessary first step so that she could later make

connections, but her obvious focus was on math and not the overall PBL innovation, hence the high unconcerned (61%) SoCQ and orientation level of use. By January, Sara was a mechanical user of the PBL innovation and was a routine user of the three supporting goals of content integration, team collaboration, and campus involvement. Her initial concerns about the math had been resolved, and she was beginning to make connections to other disciplines. She purposefully spent time on the floor working with students in math and becoming more familiar working with students younger than those in which she was accustomed to teaching. She seemed less isolated from team conversations, and more warm and engaging in team discussion. This comfort with her team is evident in the April SoCQ data as her collaboration concerns decreased from 54% to 15%. Her peak concerns in April were management concerns at 93%. Individuals at this stage focus on the process and task of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, and scheduling dominate. This is a typical response as implementation of an innovation is imminent. By April, all PBL units had been planned, and more team focus was on how to implement the units created. This data was supported by the April LoU data, which indicated Sara was at the refinement-assessing level. Those at this level are assessing the use of the innovation for changing current practices to improve student outcomes. Both management SoCQ and refinement LoU focus on the question of, "How do we implement the innovation, and how to we refine it so that such implementation has the greatest positive impact?" Early in the study she was concerned about the functionality of the team. The team was highly collaborative by the end of the study, but with the realization that implementation of the PBL curriculum was forthcoming, the concern shifted to managing the implementation of their PBL units.

Sara began the zero year nervous about the PBL processes and the overall PBL innovation. She was skeptical that statistics could easily be woven into the multidisciplinary units. She was accustomed to teaching a singular subject in isolation, so team collaboration for a common product was a new experience. The CF had her work closely with the 9th and 10th grade math teachers, so that she could learn more about how they integrated algebra and geometry into their units, and she also could connected with team members who taught a common subject. As she became more familiar with the collaborative process with her team and more comfortable in the PBL school environment, she began to zoom out at see the connections between her subject and others. She grew into a more collaborative team member, and her initial misgivings about the PBL innovations turned to support of the model. When asked to reflect on her experience at the end of the zero year, she stated, "The real-world application is, in my opinion, the biggest advantage. In the real world students will be asked to work on multiple teams, solve many problems, be self-starters, know how to ask the right questions and where to find the answers. I love that I really feel like I am part of something preparing students for what they will really need."

Group SoCQ and LoU Data Analysis and Profile

Group SoCQ Data Analysis

October Data Analysis

Group SoCQ data were collected in October (see Figure 25) to analyze the collective group concerns and the beginning of the zero year.

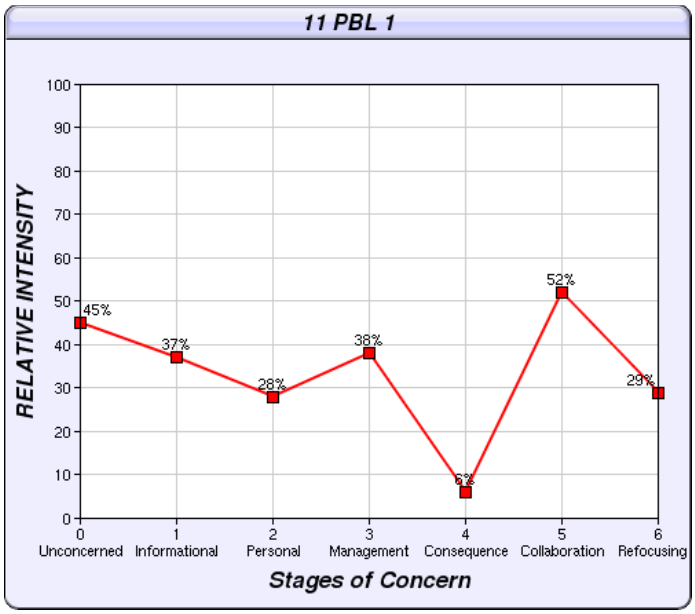

Figure 25. Group SoCQ October data (SEDL, 2014).

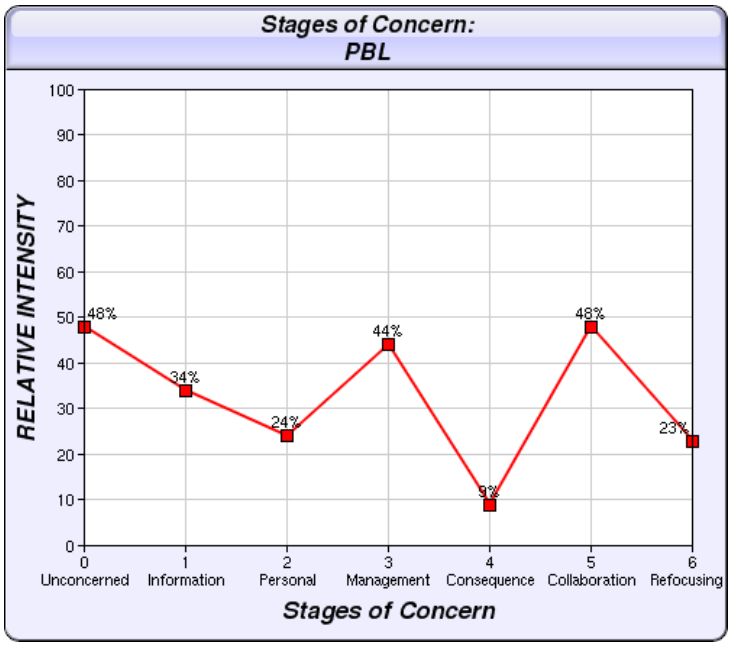

Figure 26. Group SoCQ April data (SEDL, 2014).

Self. The October data indicated that the 11th grade team had a moderately high stage 0 unconcerned (48%) score. The PBL innovation itself was not at the forefront of their concerns. The other stages in the impact domain were lower with stage 1 information at 37% and stage 2 personal at 28%. The group wanted information about the PBL initiative, which would be a goal

at this early stage of PBL curriculum planning. There were some personal concerns; however, 28% was among the lower percentages of all domains, so the group was not overall concerned about how the PBL innovation would impact them as individuals and they did not feel a personal thereat in relation to the innovation.

Task. The task domain is focused on the processes and tasks of using the innovation and the best use of the innovation. The 11th grade team had a moderate stage 3 management concern (38%), so issues that relate to use of the innovation such as organizing, managing, scheduling, or resources were somewhat of concern to the group.

Impact. The October SoCQ data indicated a peak concern at stage 5 collaboration (52%). Those with high collaboration concerns have begun to work with others and discuss the innovation, but may have feelings of uncertainty as they are learning about the innovation and their team. The greatest concern of the 11th grade team is that they are able to work together in the PBL innovation. The stage 6 refocusing was low at (29%). A low stage 6 indicates that the group was not interested in changing or refining the innovation, nor did they have something that they believed was better to replace the innovation. They were new to the innovation and perhaps did not have enough knowledge, or they had not created enough products to begin thinking about refining the processes or products. The lowest concern was stage 4 consequence (6%). This suggests she has minimal concerns about the effects of the PBL innovation on students.

April Data Analysis

Group SoCQ data were collected in April (see Figure 26) to analyze the collective group

concerns and the end of the zero year.

Self. The April SoCQ data revealed that the 11 the grade team had moderately high stage 0 unconcerned (48%). The other self domains remained lower with a stage 1 information at 34% and a stage 2 personal at 24%.

Task. The task concerns for the 11th grade team were moderately high as reflected in a stage 3 management score of 44%. This was the second highest area of concern, so elements of implementing the PBL initiative such as time, resources, and logistics were more pressing concerns as the zero year is ending and the new school year was imminent.

Impact. The greatest concerns of the 11th grade team were in the impact domain, with the highest score at stage 5 collaboration (48%). Team cohesiveness and working with others remained important to the team. The stage 4 consequence (9%) remained the lowest of concerns, which indicated few concerns about the consequences of use of the innovation for students. The stage 6 refocusing was low at 28%, which could indicate a level of comfort and little desire to make major changes with in the innovation.

Analysis of changes in concerns across time. The SoCQ data across time revealed the concerns of the 11th grade remained mostly consistent from October to April, with the largest changes in the management and collaboration stages of concern. As the year progressed and implementation was imminent in the fall, the task concerns increased from 38% to 44% as the group became focused on how the innovation would be implemented. They were making the transition from ideating in the war room during the zero year to working with students on the floor the following school year. Collaboration concerns remained the highest stage of concerns, however, the concerns decreased from 52% to 48%. This is not surprising given the

multidisciplinary construct of the PBL school and the PBL curriculum design process. Integrating each discipline into every PBL unit is the underlying STEAM philosophy and vision of the PBL school, so the collaboration process of the team is the core of PBL curriculum planning. The 11th grade team quickly realized the importance of the team collaboration in the process, and collaboration was continually at the forefront of their concerns. Self concerns remained constant overall. The moderately high stage 0 unconcerned can have several interpretations. If individuals are nonusers of the innovation, as indicated by LoU and IC map data, then the interpretation is that there is no interest or support of the innovation. If individuals with a high stage 0 are users of the innovation, then they are either focusing on certain aspects of the innovation, support the innovation, or both. The 11th grade team members were users of the innovation by October. LoU and interview data indicated that the team was supportive of the innovation and at various times may have been concerned about certain aspects of the innovation, but not the validity of the innovation itself. The low stage refocusing (29% in October and 23% in April) further support that the team supported the innovation in that they did not have alternative ideas to change the innovation. Consequence and impact on students remained the lowest area of concern for the team with 6% in October and 9% in April.

Group LoU and IC Map Data Analysis

Content integration. Interdisciplinary content integration was one of the supporting goals of the PBL innovation (see Figure 27). The October IC map group data indicated the teachers were clustered it either the orientation level of use or the mechanical level of use.

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation	Allison- Oct Jill- Oct	Sara-Oct					
	2 Preparation	Allison- Jan						
	3 Mechanical		Amber- Oct Jessica- Oct Robert- Oct Jill- Jan	Kate- Oct				
	4a Routine		Allison- Apr	Robert- Jan Sara- Jan Jill- Apr				
	4b Refinement			Amber- Jan Jessica- Jan Kate- Jan				
	5 Integration				Kate- Apr	Amber- Apr Sara- Apr	Jessica- Apr Robert- Apr	
	6 Renewal							

Figure 27. Group content integration IC map and LoU data.

October Data- Red
January Data- Blue
April Data- Green

Two of the three teachers who were at the orientation level of use were either new to teaching (Jill) or to teaching their content area (Sara). They were focused on learning their own content area standards. They were seeking descriptive information about the innovation, and seeking the opinions and knowledge of others through discussions and visits. The third teacher at the orientation level in October was an experienced teacher in her content area, but she was the most reluctant teacher in the PBL innovation on the team. Four teachers were experienced teachers in their content areas who had knowledge of their content area standards, so they quickly began making some content connections at the mechanical level of use. By January, all teachers were at the mechanical or above level of use, including the two teachers who were new to their content areas. Five teachers were sharing information at integrating content at either the routine or refinement level of use. The only teacher still at the preparation level was Allison, the most reluctant teacher on the team. At the end of the zero year in April, the IC map data revealed that Allison and Jill, the reluctant and new teacher respectively, had progressed to the routine level of use in content integration. They were comfortable with their content, and sharing and integrating their content with other disciplines had stabilized and was more routine. Five teachers on the team were at the integration level of use in content integration. They had an understanding of all five content areas and could make multiple connections. They were combining their own effort with that of their team members to create multidisciplinary PBL units and products.

Team collaboration. Team collaboration was one of the supporting goals of the PBL innovation (see Figure 28). The October IC map data for team collaboration revealed that three teachers were clustered at the orientation-knowledge level of use.

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation		Allison- Oct Jill- Oct Sara- Oct					
	2 Preparation			Allison- Jan				
	3 Mechanical		Jill- Jan	Amber- Oct Jessica- Oct Robert- Oct				
	4a Routine		Sara- Jan	Kate- Oct Allison- Apr Jill- Apr				
	4b Refinement				Kate- Jan	Amber- Jan Jessica- Jan Robert- Jan		
	5 Integration			Sara- Apr		Amber- Apr	Jessica- Apr Kate- Apr Robert- Apr	
	6 Renewal							

Figure 28. Group team collaboration IC map and LoU data.

October Data- Red
January Data- Blue
April Data- Green

Those at the orientation level were Teachers 1, 4, and 7. Jill was new to teaching and Sara was a former junior college teacher who was new to teaching high school. Allison was most unsure of the PBL model and the PBL school environment. All were the more quiet members of the team and spent more time working alone or with only one other person at the beginning of the year. All other teachers were either mechanical-sharing or routine-sharing level of use. They all had experience teaching in their subject area in traditional high school settings. Their experience with their content facilitated collaborative efforts and interdisciplinary content connections. By January, those teachers at the orientation level had all progressed in team collaboration. Allison had the least amount of progression to the preparation level of use. Jill had progressed to a mechanical level of use and Sara to a routine level of use. They were working with most team members and engaging in cognitive conflict. A pattern for collaboration around content integration had been established, but no changes were being made outside of that pattern. All other teachers were at the refinement level of use. They were working collaboratively with most team members for the purpose of increasing the PBL unit products impact on students. They were engaged with each other in developing immediate and long-range plans that anticipated possible and needed steps, resources, and events designed to enhance student outcomes. At the end of the zero year in April, Teachers 1 and 4 were at the routine-sharing level of use. They were routinely collaborating with team members and more comfortable with their roles and contributions in the team. The other five team members were at the integration level of use in team collaboration. They could work collaboratively with any configuration of team members and engage in cognitive conflict. They could initiate changes in their use of the PBL innovation processes based on input of and in coordination with what the team was doing,

and they could discuss the efforts to increase student outcomes through team collaboration.

Campus involvement. Teacher campus involvement was one of the supporting goals of the PBL innovation (see Figure 29). The October IC map data indicated that Teachers 1, 4, and 7 were at the orientation and preparation level of use for campus involvement. They were mainly engaged with the 11th grade team and spending little to no time on the floor. Teachers 2, 3, and 6 were all at the mechanical-assessing level of use, quickly feeling comfortable interacting with teachers and students on the floor. Their initial interactions were in an observation role as they took observation notes and asked questions about the PBL products in use in the 9th and 10th grade teams. Kate was at the routine level of use. She was comfortable being on the floor with the 9th and10th grade students and teachers. She used her time to assist students and teachers, but also evaluate the PBL practice and processes currently in use. By January all teachers were users of the campus involvement goal in the PBL innovation, with the exception of Allison, who was at the preparation-sharing level of use. She was beginning to engage in conversations with the 9th and 10th grade teachers on the floor. All other teachers were at various levels of use. Jill was at a mechanical level of use, beginning to work on the floor with the 9th and 10th grade teachers and students for the purpose of evaluating the strengths and weaknesses of the PBL innovation. Teachers 3 and 7 were routinely working on the floor and evaluating PBL units and products. Teachers 2, 5, and 6 were at the refinement level of use, using observations on the floor and their interactions with teachers and students to refine the 11th grade team products they were designing. At the end of the study in April, all teachers had progressed to users in the campus involvement goal. Allison was at the mechanical level and Jill had progressed to the routine level. All other teachers were at the integration level of use.

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation	Sara- Oct			Allison- Oct			
	2 Preparation	Jill- Oct		Allison- Jan				
	3 Mechanical				Jill- Jan Amber- Oct Jessica- Oct Robert- Oct Allison- Apr			
	4a Routine				Kate- Oct Sara- Jan		Jill- Apr	
	4b Refinement					Amber- Jan Kate- Jan Robert- Jan	Jessica- Jan	
	5 Integration						Sara- Apr	Amber- Apr Jessica-Apr Kate- Apr Robert- Apr
	6 Renewal							

Figure 29. Group campus involvement IC map and LoU data.

October Data- Red
January Data- Blue
April Data- Green

They were consistently working with various stakeholders on the campus. They were comfortable members of the PBL school community, leading student clubs, working with academic groups, reaching out to community resources, and building relationships with their future students. They used their experiences and observations of PBL in action on the floor to evaluate and refine the 11th grade PBL units and products. They also shared the 11th grade team's current processes with other stakeholders on the campus to improve management and logistics of the planning process.

PBL unit planning. PBL planning and product design was one of the overall innovation goals (see Figure 30). At the beginning of the study in October, IC map data indicated five teachers were at the orientation level of use and two teachers were at the mechanical level of use in the overall goal of PBL unit planning. While the teachers had a range of teaching experience and contents knowledge, few had any experience in teaching or planning in a PBL curriculum model. They began the zero year acquiring information about the innovation and exploring its value. The two teachers at the mechanical level of use had some experience teaching in a PBL model. Jessica was in her second year at the PBL school, having worked with the 9th and 10th grade teams in their zero year planning process. Robert had some PBL experience in school district in another state. The IC map data in January indicated that five teachers were at the mechanical level of use. Users at this level are soliciting information about an innovation in regards to such things as logistics, scheduling techniques, and ideas for reducing the amount of time and work for the user. They were beginning to use the PBL unit planning processes to plan PBL units and products.

LEVELS Of USE		Knowledge	Acquiring Info	Sharing	Assessing	Planning	Status Reporting	Performing
	0 Non-use							
	1 Orientation	Allison- Oct Amber- Oct Jill- Oct Sara- Oct Jill- Jan		Kate- Oct				
	2 Preparation							
	3 Mechanical	Robert- Oct Allison- Jan	Jessica- Oct Kate- Jan Sara- Jan		Amber- Jan Robert- Jan Allison- Apr		Jill- Apr	
	4a Routine				Jessica- Jan			
	4b Refinement				Amber- Apr Jessica- Apr Kate- Apr Robert- Apr Sara- Apr			
	5 Integration							
	6 Renewal							

Figure 30. Group PBL unit planning IC map and LoU data.

October Data- Red
January Data- Blue
April Data- Green

The April IC map data indicated five teachers were at the refinement-assessing level. Those at this level are assessing the use of the innovation for the purpose of changing current practices to achieve positive affect on student learning. By the end of the zero year the team had created all of their PBL units and products and were revising and refining their units as they neared implementation the following school year. Two teachers were at the mechanical level of use. Allison, the reluctant team member, was at the mechanical level of use in January and had not moved past this level in April, though she moved from a knowledge level to an assessment level. Jill, the first year teacher, remained in the orientation level through January, but by April she had progress to mechanical-status reporting level of use. She was able to evaluate and articulate the use of the PBL innovation, and was preparing to move to a routine level of use.

Summary of group LoU and IC map data analysis across time. The goal of the 11th grade team in the zero year was to create interdisciplinary PBL units. The IC map provided clear and specific descriptions of individual and team goals as the team progressed through the innovation in creating PBL units and products. Four goals were identified: teachers develop a deep understanding of each content area and how they are connected; teachers demonstrate a spirit of collaboration, including cooperation and cognitive/ collegial conflict; teachers engage in work happening on the entire campus, and; teachers consistently create units that honor PBL unit product goals. The PBL unit product goal was the overarching goal, and the other goals of content integration, team collaboration, and campus involvement were supporting goals to lead to the overarching PBL curriculum unit design. They were also the interventions of the CF to build skills and content knowledge so that the overall PBL goal could be met. Teachers moved more quickly through the supporting goals of content integration, team collaboration,

and campus involvement than they did the overarching goal of PBL innovation. They also moved to more complex levels of use. This progression supports the intentional design of the CF to use the three supporting goals to build towards the overall PBL innovation, and to build capacity in the teachers as they progressed through the PBL curriculum design process. The data shows the progression of teachers through the supporting goals, and this progression pulls them along in the overall PBL goal.

This quick progression in a short period of time is not the norm for change or implementing an innovation in an education setting. Hall and Hord (2006) identify several reasons why implementing change is often slow and goals of implementation may only be met at minimal standards, and sometimes even abandoned: one, an innovation is often viewed as an event that is implemented from the top down with more thought given to the actual event that to the necessary continued supports for implementation; two, individuals are the implementers of change, but often organizations adopt and implement change without the focus on the learning of the individuals involved in change; three, appropriate interventions for change are not implemented to aid change at the campus level and learning at the individual level, and; four, facilitating change is a team effort that involved district and school-based leadership that is long-term, but often change is mandated from district or even state agencies with an expectation of implementation on a short timeline, and with unclear or no distinction as to how leadership will facilitate change. As a result of poor change implementation, many innovations are met with resistance, frustration, or lack of acceptance from the individuals affected.

In this study, the teachers progressed through the levels of use on a timeline at a rate that was much more rapid than what is typical for implementation of an innovation in an educational setting. This rapid progression was a function of the teacher population studied and the Change facilitator that lead the PBL curriculum design process. The teachers began this innovation as users of the innovation. The LoU and SoCQ data indicated they were invested in the innovation from the beginning of the zero year. All teachers chose to apply to the PBL campus, knowing its unique PBL structure. This initial investment was supported by interview data. When asked why they applied to the PBL campus in interview one, some teachers responded as follows:

- Amber- I did some research on their vision and what they wanted to do, it sounded so ideal, it sounded like the school I wanted to go to when I was in high school because I learn by doing. I felt like it was really something like kids who were like me.

- Jill- I came from teaching AP studio and art history at (another district high school) and I became disillusioned with all the work I was doing. I felt like all the work I was putting in was way more than what the students were putting in. Everything I wasn't teaching for the learning itself. I was teaching to this test. I was playing these games, and this is not what education is about. I happened to see in the news a story on (the PBL school). As I started doing the research I was amazed. I did not realize this was a trend in education, that is how focused I was on my day to day. So, it just made me stop and think…this is what I need.

- Kate- I feel like this is a part of a change in in education. There is a swing happening, and it is radical change. The change for the most part is slow, but I wanted to dive in, and this is the place. I want to practice things I really believe in. I want to give kids who may not have reached their potential in a traditional environment a chance to do so here. I want to be part of this change in education, to share my experiences with other educators who want to improve their practice, not just an observer.

- Robert- I knew I wanted to do something radically different and on the forefront, and if I was going to have to restart my career in another state, I wanted to do something on the forefront of education, which is what we are doing here. It is one of the few jobs I actually considered, so I went hard for it.

The teacher population of this study chose to teach at the PBL school, open to the challenges of the innovation, and wanted to be part of change in education. The school district also invested in the teachers in the way of money, resources, and leadership through the change in the form of a CF.

Change Facilitator

The change facilitator (CF) sets the tone for campus level innovations. Hall and Hord (2006) identify three change facilitator styles in their concerns-based adoption model (CBAM):

- Initiator change facilitators. Initiator change facilitators have clear, decisive long-range goals and policies for the entire organization, not just the current innovations. They tend to have strong convictions about what constitutes good schools and effective teaching, and have high expectations for students, teachers, and administrative leadership. Decisions are always made through the filter of what is best for students, and such decisions are framed with current research and data on classroom practice. They are also master communicators throughout the process. Initiator principals make it happen.
- Manager change facilitators. Manager change facilitators focus on resources and organization of activities. They are responsive to situations and the needs of people. They tend to have good rapport with those involved in the innovation at all levels, and they serve as a bridge between the various levels. They keep teachers informed about expectations from district administrators and support changes that have been initiated. However, they are not typically the initiators of such change and do not move far beyond the basics of a proposed innovation. Manager principals help in happen.

- Responder change facilitators. Responder change facilitators place emphasis on teachers and others having the opportunity to take the lead. They view their role as keeping the day to day function of the school running smoothly. They believe that teachers are professionals and give them latitude to perform their job with minimal guidance. They solicit input and take into account feelings of others when decisions are being made. They tend to make decisions based on what is immediately in front of them rather than goals and a vision for the future. Responder principals let it happen.

Each leadership style has its merits and areas for growth, but studies have shown initiator change facilitators are the most successful in implementing innovations and leading change. It should be noted that effective change cannot be guided by only one individual. Hall and Hord (2006) refer to those who act in leadership roles as Change facilitators, and they take a broad perspective of facilitators beyond district administrators and building principals. "Everyone who is engaged in change has a responsibility to assist in facilitating the process" (p. 208). Facilitators may be teacher leaders, policy makers, or IT specialists. Whatever their title, facilitators "provide the interventions that can increase the potential for the success of change or allow it to fail" (p. 185).

Each CF style is centered around six aspects of leadership, all of which are the measurement domains on the CFSQ instrument that was administered to the six teacher participants.

The CF domains are:

I. Concern for people
    a. Social/ informal
        i. Sees the school as a family

ii. Begins staff meetings with celebrations
iii. Joins in attending ball game or concert
iv. Very sensitive to staff's and student's individual needs
v. Show empathy through listening skills

b. Formal meaningful
i. Checks on how implementation is going
ii. Uses data to guide actions
iii. Focus is on the work and tasks
iv. Explains what is needed
v. Provides needed resources without fanfare

II. Organizational efficiency
a. Trust in others
i. Allows others take the lead
ii. Does not have to control everything
iii. Development of new rules is done slowly

b. Administrative efficiency
i. Schedules are established and clear
ii. Attends to procedures
iii. Keeps policies, budgets, and requirements at the forefront
iv. Paperwork gets done on time and correctly

III. Strategic sense
a. Day to day
i. Focus is on now
ii. Today's problem is the one to attend to
iii. Limited, or little, view of the future

b. Vision and planning
i. Long-term vision
ii. Depth of knowledge about what is needed
iii. Anticipates possible future effects of today's interventions
iv. Maintains a systemic view

Research on CF style is sparse and tends to focus on school principals. Baglibel et al. (2014) studied the relationship between CF styles and implementing a new curriculum. They examined the styles of 27 elementary school principals and their impact on students' test scores. The study revealed that students' in schools with principals whose CF styles were manager and initiator were significantly higher than those whose CF style was responder. They found that schools with initiator leadership were more successful than those whose change facilitator styles were manager and responder leaders. Attitudes were more positive and change more successful with manager and initiator styles than with responder styles.

Change facilitators are focused on interventions that facilitate change. An intervention is anything that is needed to assist in the change process such as resources, training, a conversation, coaching, or even a party (Hall & Hord, 2006). "In the context of the change process, any action or event that influences the individuals involved or expected to be involved in the process is an intervention" (p. 186). The six functions of interventions are: developing, articulating, and communicating a shared vision of the intended change; planning and providing resources; investing in professional learning; checking on progress; providing continuous assistance, and; creating a context supportive of change. Interventions are both planned events that are part of an initial timeline and unplanned events that address needs as they arise. There must be a continual evaluation of the process as a whole, of the organization as a whole, and of individuals involved. Interventions facilitate the process based on continual evaluation, and facilitators will do well to remember that whatever the innovation, it is a learning process for all. If leaders view their role as facilitators of the learning process in which they provide tools and remove roadblocks, then their guidance of the process will be successful.

The focus of leaders in the vision and planning dimension exhibit long-term vision, possess depth of knowledge about what is needed, anticipate possible future effects of today's interventions, and maintain a systemic view.

Change Facilitator Data Results

Analysis of the CFSQ revealed that the CF in this study fit the Initiator CF style profile. Below are charts of the CFSQ data of the 11th grade CF compared against the initiator profile (see Figure 31), manager profile (see Figure 33), and responder profile (see Figure 33).

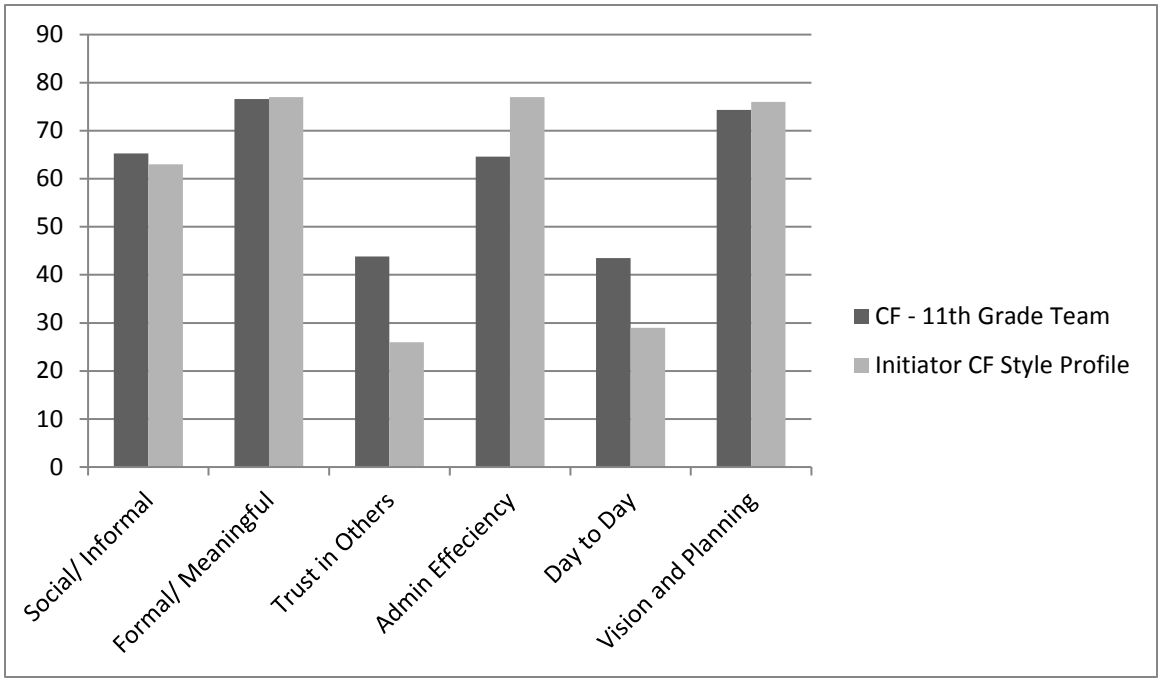

Figure 31. PBL school change facilitator CFSQ data compared to initiator CF style profile. Adapted from Hall & Hord (2006, p. 154).

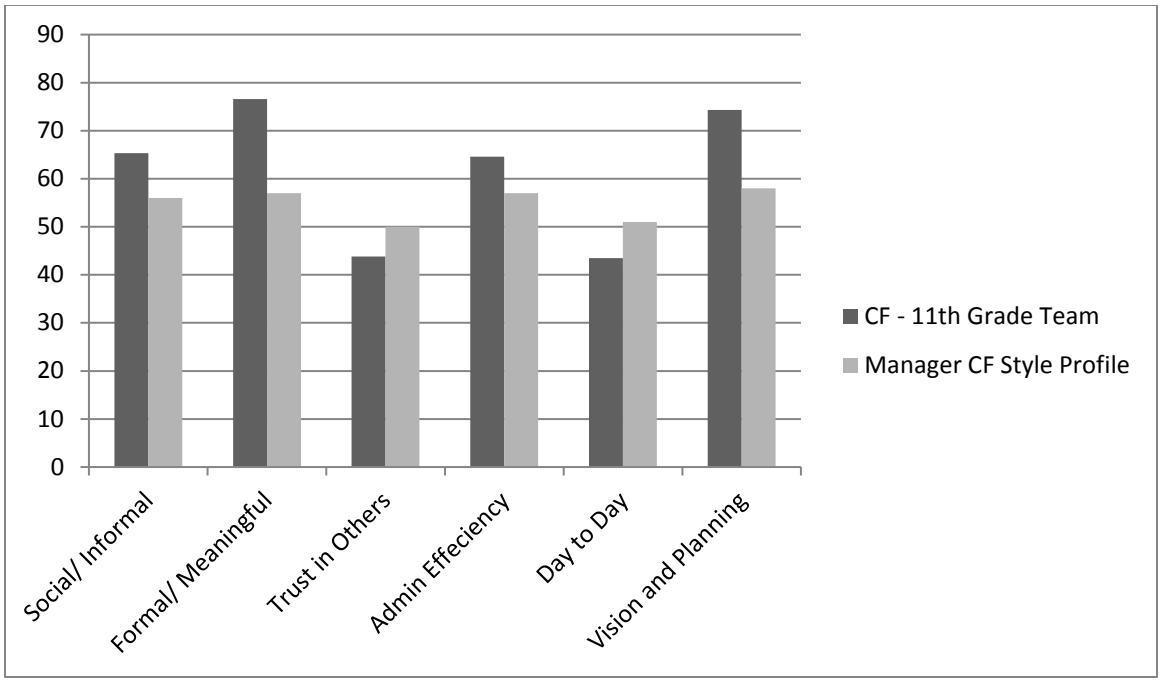

Figure 32. PBL school change facilitator CFSQ data compared to manager CF style profile. Adapted from Hall & Hord (2006, p. 154).

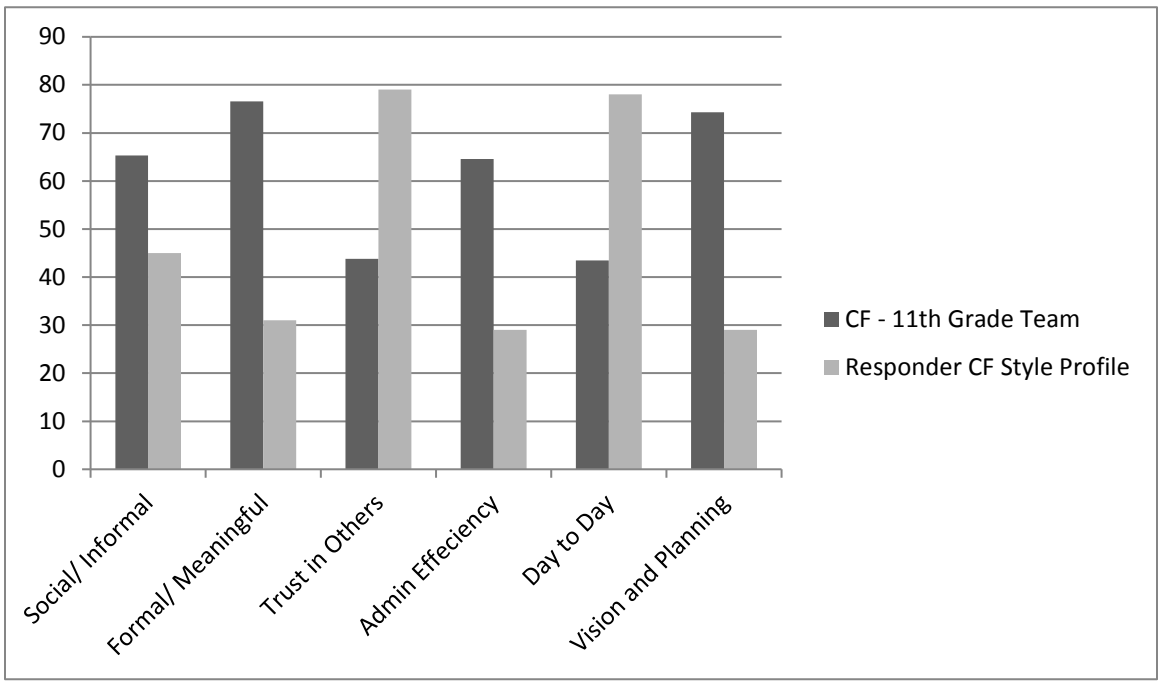

Figure 33. PBL school change facilitator CFSQ data compared to responder CF style profile. Adapted from Hall & Hord (2006, p. 154).

The PBL campus CF profile is most like the Initiator profile. Initiator CFs score high in the leadership domains of vision and planning strategic sense, administrative organizational efficiency, and formal/ meaningful concern for people. The CF scored high in all of these initiator CF domains on the CFSQ. NVivo coding of interviews from the 11th grade team corroborated this data.

Vision and Planning

The greatest number of NVivo strategic sense references from the CF interview fell into the vision and planning domain. The CF had a long-range plan for the zero year, with completion dates for each phase of progression. The team began planning together at the beginning of August with the first six weeks focused around team building, research, and professional development. The CF either led the team through team building activities or coordinated team building with district or outside professionals. The CF organized book studies/ research around the concepts of PBL. She also was the coordinator to send the team members to conferences in Boston and the Dallas area that focused on PBL and the science of learning for further professional development. Once teacher noted the value of attending conferences for professional development, "We have gone to Learning and the Brain conference up in Boston. It was fantastic. And then we also went to the Learning Forward, and that was in Grapevine. It was more geared towards leadership, but it helped us view projects from more than a 'teacher' side." The CF also coordinated team visit to PBL campuses in other states and locally to view a variety of PBL models and products.

After this intensive professional development, the team began analysis of their state standards, and started the process of overall connections. Once these connections were made by mid-October, the process began to create the PBLs that would anchor each unit. This process was repeated through the development of each unit, with the CF guiding the timeline of unit creation. An integral goal of the CF in the planning process was utilizing the experiences of the 9th and 10th grade teams already on the floor. The 11th grade team was in a unique position to study the first year of the PBL vision in progress, and the CF purposely used the knowledge and experience existing in their learning space. One teacher observed,

> Well just within the school we have had professional development in so far as having 9/10 facilitators teach us about the PBL. They put us through a mini-PBL academy and taught us the components and how to write a PBL. The best professional development has just been observing what is going on here with the teachers and students on the floor. I really like that they have it available to us, because there is nothing like seeing it in action.

Formal Meaningful

Formal meaningful concerns for people receive considerable acknowledgement by the teacher in the interviews, as categorized in NVivo. Leaders who lead in the dimension check on ho implementation is going, use data to guide actions, focus on the work and tasks, explain what is needed, and provide needed resources without fanfare. The CF in this study met these expectations in the following ways, First, Communication, collaboration, and group dynamics fall into this domain. The CF was with the group on a daily basis, so she had a very good idea of progress, effectiveness of implementation, and the "temperature" of the team. She would both push the team to maintain deadlines, but also take needed brain breaks when she felt the team was overloaded. The team might play a board game, have a long lunch outside, or just have

"free" time to read or take care of their individual needs. Second, she viewed her role as that of removing any road blocks for the teachers. When describing her role the CF said,

> I try to be the person that gets anything out of the way that is stopping their progress. I try to be the person who listens and hopefully keeps them from going down too many rabbit holes and try to be the person helps them ask the right questions. So instead of giving them directives, it's more an inquiry style.

When the teachers were feeling deficient in their knowledge of the processes of producing quality products, the CF arranged seminars from business leaders on project management and design. This aided the teachers, not only in their own product design, but it helped them develop a model to coach students in project management and product design. If the team needed specific resources for a project, the CF would organize the process to secure those resources including learning opportunities, supplies, and technology. Third, she was the bridge between district administration and the team, securing resources, asking for feedback, advocating for the team and their needs, and tapping the expertise of district personnel. The CF arranged a "critical friends" circle with the team and district personnel such as curriculum coordinators who would critique PBL unit and products that were in production. Once teacher observed,

> We do the 'critical friends' where we build a project then go in front of the district coordinators, then they let us know their thoughts and a lot of times they will also give us some directions based on constraints regarding a particular project. Then we can easily make it fit within those constructs. But honestly, they are usually truing to say yes and problem-solve the constructs. We have had almost no 'nos'. It is clear the CF and admin work to get us what we need.

It is worth noting that the 11th grade team CF was also high in the social/ informal concern for people. The CF led the team as a coach on the side, not as the team leader. She would ask questions, listen to responses, and gather information from the team to guide next

steps. This process allowed the team to feel a great deal of ownership in the process, and they treated each other as equals. One teacher commented on the resulting collaborative group feeling saying,

> It is collaborative in every sense of the word. Everyone participates, we strike no ideas-some just move further along than others, leadership is shared, or sometimes one person is being more in the lead, and then on the next PBL, or next day, someone else is leading more. We do have the CF, who has guided our process, but that's what she does-guide. So since she has never taken the role as the group leader, but facilitator, we all step in at different times.

Administrative Efficiency

The third domain of strength for initiator CFs is administrative organizational efficiency. The CF scored high in administrative efficiency. The schedule and procedures established by the CF were integral to the PBL initiative. The CF established the processes for creating units and for team collaboration. In describing the process she stated,

> Every time we start the ideation process, a different thing is more challenging. We hit this thing in a different way kind of every time. Do we pick a set of standards and then ideate around those standards? Do we pick an intriguing idea and see what standards fit within that idea? Every time we go about this there is a different thing that's the challenge. Making sure that everybody has a real place to play within the problem. Is there enough real work that can happen there?

One teacher described the process saying,

> The CF led us through an extensive sharing of our TEKS process. As we did this we kept notes making all the connections we can think of. It was tedious work, but worthwhile in the end because once we started zooming out and thinking about overarching connecting themes, skills, and PBLs. Next, we looked at a workable timeline for both the planning and unit progression.

The CF kept the team on schedule to plan their curriculum in the zero year, and she established processes and procedures that allowed for the content integration and team collaboration that kept the PBL initiative moving forward.

Summary of CFSQ Analysis

Hall and Hord (2006) postulate that well-meaning educational initiatives are not successful because of a top-down implementation in which leaders do not take time to guide participants in the change process, listen to the needs of participants, respond to the needs of participants, and continually evaluate effectiveness of the initiative. Educational initiatives are viewed and implemented as directives, and there is a wide range of compliance from participants who feel such directive have been imposed on them. For these reasons, progress in the levels of use of educational initiatives is limited. Hall and Hord argue initiatives would be more successful if the change facilitators were Initiators who work continually with the participants as they are guided through the change process. In this study, the PBL initiative was guided on a daily basis by a CF. The CF had a vision for the zero year that included team building, professional development, PBL unit and product design, access to needed resources, and tending to the needs of the individuals on the team. She had a vision for the criteria of a PBL unit and outlined three goals of content integration, team collaboration, and campus involvement that led the 11th grade team through the process of creating PBL products. She set deadlines, monitored progress, and evaluated products and processes. She viewed herself as a team member whose unique role was to both create constructs and removed roadblocks for PBL development. These are all characteristics of an Initiator CF. The CFSQ data analysis in this study showed the CF to be an Initiator, and her role as an Initiator CF contributed to the highly unusual progression in the levels of use of the participants in this study.

CHAPTER 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Research Purpose

Facilitating the design of a PBL program is a large task and one that requires paradigm shifts, training, and growth among the participants. This study sought to understand concerns and levels of use of a group of teachers in the process of developing a PBL program, and the effect of a Change facilitator (CF) on these processes and on the development of the teachers as designers of PBL curriculum.

Research Questions

The research was guided by the following research questions:

1. What are the concerns of teachers regarding the planning of a PBL curriculum?
2. What are the levels of use of teachers in the processes of planning the PBL curriculum?
3. How does a change facilitator affect the process of change in the planning of a PBL curriculum?

Summary of Findings

Planned organizational change continues to be a neglected area in practice, training, and research in schools (Zins & Illback, 1995). Change in education is more often reactive than proactive, and often executed piecemeal instead of systematic planned change. While few models address the change processes in an educational setting, the Concern-Based Adoption Model was developed specifically for implementing change in education.

The purpose of this study was to understand concerns and levels of use of a group of teachers in the change process of developing a PBL curriculum, and the impact of a change facilitator (CF) on these processes and on the development of the teachers as designers of PBL curriculum. The concerns-based adoption model is a conceptual framework that describes, explains, and predicts teachers' concerns and behaviors throughout the educational change process (Hall & Hord, 2006). This study used instruments in the CBAM model to examine the innovation of the PBL design process.

The Stages of Concern instrument measured concerns participants had about the innovation. SoCQ data across time revealed the concerns of the 11th grade remained mostly consistent from October to Apr, with the largest changes in the management and collaboration stages of concern. As the year progressed and implementation was imminent in the fall, the task concerns increased as the group became focused on how the innovation would be implemented. The management of time, resources, and scheduling became more important at the end of the zero year as the team was on the verge of turning their ideas into instruction with students. Collaboration concerns remained the highest stage of concerns, as team collaboration was crucial to design a multidisciplinary PBL curriculum. However, the collaboration concerns decreased slightly from the beginning of the year as the team became comfortable with each other. The CF provided a process for integrating content, understanding the learning space, team building, and knowledge of PBL throughout the year that fostered a collegial and productive atmosphere among the team members.

The Levels of Use determined how participants were using the innovation. The Innovation Configuration map informed the change facilitator on the progression of individual

and group progression through innovation goals. The IC map data was charted on the LoU matrix. The 11th grade team members were users of the innovation by October. LoU and interview data indicated that the team was supportive of the innovation and at various times may have been concerned about certain aspects of the innovation, but not the validity of the innovation itself. The IC map provided clear and specific descriptions of individual and team goals as the team progressed through the innovation in creating PBL units and products.

Four goals were identified by the CF that led to the successful creation of PBL units and products: teachers develop a deep understanding of each content area and how they are connected; teachers demonstrate a spirit of collaboration, including cooperation and cognitive/ collegial conflict; teachers engage in work happening on the entire campus, and; teachers consistently create units that honor PBL unit product goals. The PBL unit product goal was the overarching goal, and the other goals of content integration, team collaboration, and campus involvement were supporting goals to lead to the overarching PBL curriculum unit design. They were also the interventions of the CF to build skills and content knowledge so that the overall PBL goal could be met. Teachers moved more quickly through the supporting goals of content integration, team collaboration, and campus involvement than they did the overarching goal of PBL innovation. They also moved to more complex levels of use. This progression supports the intentional design of the CF to use the three supporting goals to build towards the overall PBL innovation, and to build capacity in the teachers as they progressed through the PBL curriculum design process. The data shows the progression of teachers through the supporting goals, and this progression pulled them along in the overall PBL goal.

The Change facilitator Style Questionnaire instrument provided data on the participants' perceptions of the Change facilitator's leadership style as she facilitated the process of designing integrated PBL curriculum. It was assumed that any innovation will be more successful when there is effective leadership managing the change. Hall and Hord (2006) refer to those who act in leadership roles as CF. A CF can be district administrators and building principals, but that role is not limited to these leadership positions. A CF is anyone in a position to manage change. Therefore, it was assumed that a teacher in their zero year at the PBL campus would grow as a collaborative team member, who can integrate a PBL unit, with the help of a CF. This study tested the theory that participants would exceed standard growth pattern due to the influence of the change facilitator.

A basic theoretical tenet of CBAM is change or implementation of an innovation will be more successful when: the implementation phase of the change process is given resources, time, and consideration; both the feelings and behaviors the individuals involved in the innovation are considered, and; a change facilitator guides the process. This study showed how the SoCQ, LoU, and IC Map tools of CBAM can illicit data on teacher growth at both the affective and behavioral levels. This study also showed how teacher growth can progress further across the implementation bridge with the initiator leadership of a change facilitator (see Figure 34).

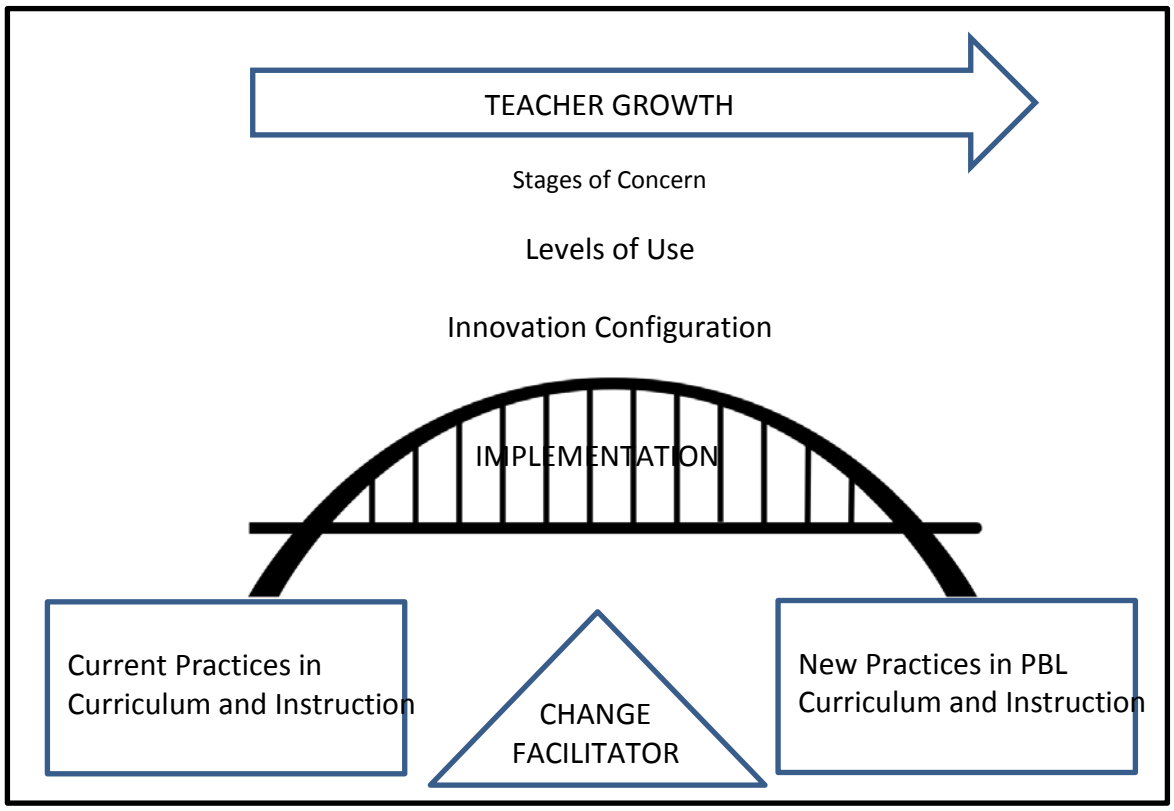

Figure 34. Facilitating implementation of a PBL curriculum innovation.

Discussion and Theoretical Implications

Change is necessary in any organization that desires to be responsive to the exponentially changing global world of the 21st century. While the organizational change demands of the 21st century are unique to today's increasingly technical and globalized world, there are some basic tenets of change that span the decades (Vinger, 2008). Change is challenging, uncomfortable, requires resources, and involves people in both leader and follower roles. The concerns-based adoption model (CBAM) provided the theoretical framework of this study. CBAM was used in this study because it provides a framework for change in education. CBAM was developed at the University of Texas Research and Development Center for Teacher

Education (Hall, George, & Rutherford, 1978). The focus of that work was on the individual teacher in the change process and what administrators or change agents can do to make the change less difficult and more effective. CBAM operates on twelve defining principles of change (Hall & Hord, 2006). The twelve are examined in relationship to the implementation of the PBL innovation, the PBL 11th grade curriculum development.

Principle 1

Change is a process, not an event. Business change models that emerged in the 1970s began viewing change as a cyclical process (Vinger, 2008). CBAM operates with this same process theory, where most lasting change in education takes three to five years. In this study, the participants progressed in the PBL innovation, as measured by their level of use, at a much more rapid rate. The team was provided dedicated time in the zero year to create interdisciplinary PBL units and products. They also had a dedicated CF working with them daily who had a vision for the curriculum development process which resulted in four goals- content integration, team collaboration, campus involvement, creation of PBL products- that guided the process of PBL curriculum development. The investment of time and the initiator leadership of the CF resulted in unusual growth in a relatively short amount of time.

Principle 2

There are significant differences between the development and implementation of an innovation. Often, much effort is given to the development of an innovation and little to the implementation. Both must be given equal time and resources, for any idea that has been

developed is doomed to fail without proper implementation. More attention was given to implementation in the 1980s with the “innovation-focused" approach to educational change, when the dominant strategy for school improvement hinged on facilitating the implementation of discrete innovations in curriculum and instruction, innovations that were intended to result in improved teaching and student learning in affected curriculum areas and classrooms (Fullan, 1985). The school district in this study spent three years in both the development and implementation phase of the PBL campus. During this time, focus groups were formed to explore the need and type of school. Next, a visioning committee was formed that included district curriculum and administrative personnel and district principals. The members of the visioning committee researched PBL in general and PBL curriculum as it applied to their individual departments. The group visited a number of PBL schools and researched various models. One of the members of the visioning committee was the CF in this study, who was eventually chosen to lead the team through the implementation phase, which was development of a multidisciplinary PBL curriculum. The district invested considerable time and resources towards the implementation phase by implementing the zero year, a dedicated year of grade-level planning prior to opening the school with students, or their advancement to the next grade level. The CF worked on a daily basis as part of each zero year team, designing the curriculum planning processes, organizing training and professional development, building teams, and providing needed resources. This dedication to the PBL innovation implementation process ensured that each team had a year-long PBL curriculum in place before students arrived in their grade level the following academic year.

Principle 3

An organization will not change unless the individuals within the organization change. Individuals will progress through change at different rates and in varying degrees. Ajzen (2011) postulated that progress will be greater when individuals have intention for change, and when they feel they possess a measure of control in the change process. In this study, the design and goals of the PBL innovation that were developed by the CF focused on the growth and learning of the individuals on the 11th grade team. However, the creation of the PBL products was a collaborative process where all team members were equal participants. The CF guided the team members through a process in which they deepened their understanding of their own subject area and the other core subjects so that they could make the content connections that would become the basis of the interdisciplinary PBL units. The team members arrived at the zero year with varying levels of teaching experience and expertise. Some progressed quickly through content integration. The English and U.S. history teachers were well versed in their content areas, so they began some initial content connections before others. The chemistry teacher was a first year teacher, so the CF paired her with an experienced biology teacher to grow her expertise and help her make the content connections. By February, the entire team was at a place that they could begin making the multidisciplinary content connections, but they all progressed at their individual pace with interventions from the CF that kept all moving forward.

Principle 4

Innovations come in different sizes. Most innovations occur in a bundle in which several seemingly small innovations are part of a much larger picture. In this study these smaller

innovation became the supporting goals of the larger PBL innovation. They were designed by the CF and captured on the IC map. The zero year planning process began with each individual deeply studying their course through analysis of the state standards. Each participant's course was its own standing innovation that would eventually weave into the larger multidisciplinary PBL innovation. The second smaller innovation was team collaboration, which was achieved through intentional team-building at the beginning of the zero year, and time was given throughout the year to take care of the team. Team collaboration was essential for creating the multidisciplinary PBL units. Campus involvement was the third smaller innovation. The CF wanted the team to understand the campus culture, be invested in the campus, and use the PBL experiences of the teams on the floor to guide their process.

Principle 5

Interventions must continually guide the change process. Interventions help implementers of change keep a pulse on the organization and individuals, and allow adjustments to be made accordingly. In this study, the CF worked with the 11th grade team on a daily basis, so she was able to assess the needs of the team. When the team struggled with a PBL product designed around a business plan, she brought in experts with experience in creating business plans and project management. When the team seemed tired and out of ideas, she changed the daily process and environment by having the team spend time on the floor, take a walk outside, play games, or read. She began each day asking the team where they were, how they were feeling, and what goals seemed manageable for the next few days. She

created a balance of a timeline for moving the team forward while also attending to their needs in the highly brain-intensive environment.

Principle 6

There will be no change in outcomes until new practices are implemented. Kurt Lewin's (1947) change model viewed the change process as one of "unfreezing" former attitudes, changing attitudes with new learning, and then "freezing" the new attitude. CBAM seeks implement change by changing former attitudes and practice to the new and desired attitudes and practice. Hall and Hord use an implementation bridge as a metaphor for this change. The goal of implementation is to provide individuals with the tools, skills, and support necessary to move over the bridge and toward the proposed change. In this study, the CF designed clear goals to lead the team through the innovation. The overall goal was create PBL units and products, so the CF designed supporting goals of content integration, team collaboration, and campus involvement that were the cornerstone practices of creating PBL units. She also designed multiple opportunities for professional development and advocated for team needs at the district level.

Principle 7

Leadership and administration plays a vital role in change. In the Principal/ Teacher Interaction Study (Hord & Huling-Austin, 1986) found that interventions most related to innovation implementation took place in schools with initiator principal leadership, whereas the fewest occurred in the schools with responder principals. In this instance, the role of

administrators is to support change from the bottom up, rather than to dictate a top-down change. Lasting innovation is more successful in a bottom up model where the stakeholders at the "bottom" are integral agents of the change process, and they are supported and guided by administrators through the process. The CF in this study fit the initiator leadership style profile, defined by a clear, passionate, and strongly held vision about the innovation. She had high expectations for teachers, and pushed teachers to be engaged in the PBL curriculum development processes and collaborative within the overall community. She viewed her role as providing any resources and removing any roadblocks in the curriculum development process.

Principle 8

Mandates can work. Roach, Kratochwill, & Frank (2009) argued that in this day of top-down mandates such as No Child Left Behind, it is becoming imperative for districts and teachers to embrace the necessity of implementing scientific validated practices in the classroom. When a mandate is made with a plan and expectation that involves continual communication, professional development, collegial coaching, and necessary time for individuals to cross over the implementation bridge, then a mandate can be very successful. The design and building of the PBL school in this study was a mandate from the school district. The plan to build the school began three years before the first class attended the school. The first year included planning and discussion at the district administration level. The next year a visioning committee that included a broader spectrum of district and community personnel studied PBL and visited model PBL educational sites. The third year of planning was the first zero year with the CF and the 9th and 10th grade teachers, where they developed the curriculum

framework and unit products. This process carried to the 11th grade team that was the subject of this study in their zero year. The team was in constant communication with the CF, who acted as their collegial coach, and district administrative personnel. The district invested money in professional development that was orchestrated by the CF. This investment of time, money, communication, personnel, and training resulted in the 11th grade team moving through implementation of the PBL innovation at an unusually rapid rate. Integral in this process was the CF, who was the bridge between the district mandates and expectations and the PBL campus curriculum team. The CF provided professional development, materials, and any support that guided the team through the first stages of implementation of PBL curriculum design.

Principle 9

The school is the primary unit of change, for it is at the school level that most innovations are implemented. In this study, the CF was assigned to the PBL campus to guide the 11th grade team through the PBL curriculum design process that was implemented for that singular campus. This was the only responsibility of the CF, and she was on the campus daily to guide this campus-level change.

Principle 10

Innovations are more successful when principals and teachers at the campus-level are involved in the implementation process. Werkman and Boonstra (2014) presented a case study in which barriers to organizational change were studied and discussed with all organizational

members, which resulted in more effective problem-solving. In this study, the teachers were involved in the day to day planning and design of the PBL units and products from the beginning of the zero year. They created the PBL units and products they would be teaching the following year. The sense of ownership and desire for quality products that deepened student learning was apparent in observation and interview data.

Principle 11

Resistance is certain. Leaders of an innovation must continually take the pulse of individuals involved, determine why there may be resistance, and provide coaching, resources, training, or other interventions to guide individuals over the implementation bridge. While the team progressed in their level of use of the PBL innovation at an unusually rapid rate, the progression was not always smooth. Almost all teachers had periods of struggle or resistance. The technology teacher was resistant from the beginning, often questioning if the campus environment was a fit for her. She hesitated making content connections, collaborating with the team, and spending time on the floor. The CF provided support from the Instructional Technology department in the district to help with brainstorming ways technology could fit into the PBL products. While the teacher became more comfortable working through the PBL goals, and while she supported the PBL campus as something that was cutting-edge and needed, she eventually chose to return to a traditional campus because she could not find resolution between the unique environment and her teaching style. The first year chemistry teacher struggled at the beginning of the zero year. All beginning teachers have a learning curve, but this first year teacher's learning curve was unusual because of the unique nature of the PBL

campus. Not only was she learning about the teaching profession, but also PBL. She often felt overwhelmed by this unusually large task for a first year teacher. The CF paired the new teacher with an experienced mentor teacher to help her first year teacher transition.

Principle 12

The context of the school influences the change process. The culture and school environment must be considered when implementing a change process. School cultures with a climate of professional learning communities in place will most likely have a staff that is more accepting of change and new innovations. The participants in this study choose to teach in a unique PBL learning environment. The very nature of creating the entire curriculum constructs of the PBL campus was, in essence, a PBL process for the CF and teachers. The participants sought such an environment that was grounded in change from traditional education. However, change can still be difficult at times even for those who are seeking it. The CF provided a community of professional learning and support to guide the team through all levels of change.

Implications for Education

This study elicits several implications in the field of education, particularly the use of CBAM in such areas as teacher education, professional development, instructional practice, and educational leadership. One strength of CBAM is the focus on the individual in the change process, and the tools of CBAM allow change facilitators to target individual growth. Pre-service teachers enter teacher education from many different paths. The pre-service teacher who

enters the field having always worked with kids and with the knowledge that education is their first career path has different needs than a pre-service teacher who enters the field later in life from a corporate background. A change facilitator can use the tools of CBAM to individualize interventions that meet their individual needs and target individual goals for growth. The same is true for in-service teachers in their continued professional development. Instead of the "one size fits all" approach to professional development where the same in-service training is delivered to all in a six-hour session, campus change facilitators could individualize goals for growth for each teacher and track their progress using the CBAM tools. Teachers would improve their instructional practice as they grow and meet their professional development goals. This bottom up approach to professional development and instructional practice changes the paradigm of educational leadership. Administrators and other leaders who are change facilitators will grow towards initiator leadership as they use the CBAM tools. The SoCQ will allow change facilitators to address affective needs of teachers and the IC map/ LoU matrix will address actual practice. Perhaps the most important use of these tools, however, is that they are implemented with continual dialogue and communication between change facilitators and teachers. Therefore, a leader who commits to using the CBAM model is growing towards initiator leadership.

One tenet of CBAM is the focus on the individual, but ultimately, the use of CBAM will provide positive organizational change. The CBAM tools can be used to evaluate and chart growth goals for teams and even larger organizational constructs, such as a campus. Campus change facilitators can provide professional development for a content area department or grade level team by using the CBAM tools for group analysis, as was done in this study. A

principal can provide campus-wide interventions based on data from the CBAM tools. They can address the collective concerns of teachers regarding any particular innovation, or they could set a campus instructional goal and track the progress of use in practice. When change facilitators address both the affective needs and practice of teachers and individuals, and when they address the affective needs of practice of the larger organization, the process of change has the potential to be more rapid and growth in the level of use has the potential to be greater, as was demonstrated in this study.

A final implication for education is that 21st century authentic learning models, such as PBL, are models worth studying and can be successfully implemented. Critical attributes of 21st century education include integrated and interdisciplinary curriculum planning, technologies and multimedia, global classrooms, project and problem-based research, student-centered learning, and relevant and rigorous instruction (Shaw, 2009). The concept of school, teacher, and learner must change to meet the needs of 21st century learning. School must transform from buildings with small boxes to nerve centers where walls have a "transparency" that foster a community of learners. Teachers will move from dispensers of knowledge to orchestrators of learning where learners are participants in their own learning process and set goals for their own learning collaborate with students and teachers, and reflect in all processes. The 11th grade team in this study, under the guidance of a change facilitator, successfully created a multidisciplinary PBL curriculum with authentic learning experiences that could move the PBL school forward in its 21st century model of education.

Conclusion

In this study, the school district created a mandate for a PBL school of choice, and the participants in this study chose to participate in the PBL innovation. While the individuals had choice in their participation of the innovation, the implementation was still a sizeable undertaking and a change process that had measures of difficulty at both the organizational and individual levels. Ultimately, the goals of the innovation were realized, and the team created a PBL curriculum with multidisciplinary PBL products that could be implemented after the zero year development phase. The innovation was successful because the district supported the change by providing a district level change facilitator who worked with the team daily and guided the implementation of the innovation.

In this study, the teachers progressed through the levels of use on a timeline at a rate that was much more rapid than what is typical for implementation of an innovation in an educational setting. This rapid progression was a function of the teacher population studied and the CF that led the PBL curriculum design process.

Recommendations

This study yields several recommendations for practice in an educational setting. The field of education is one of constant change. Ideally, educators are communities of learners who continually seek methods to strengthen curriculum and instructional practice that have a positive affect on students. While this is an ideal, often change in education is not easy. Mandates from national, state, and local levels place top-down change on educators, and often educators have little support in implementing change that is seen as forced.

It is recommended that schools use the components of CBAM to guide change and innovation implementation in an educational setting for several reasons. First, CBAM recognizes the importance of the individual in successful change (Hall & Hord, 2006). Change will not happen unless the individuals in the organization change, and CBAM provides tools that create an implementation bridge between the individual and the larger organizational change or innovation. These tools are the second reason for recommending CBAM. The SoCQ focuses on the affective needs of individuals in a change process. It informs CFs about the feelings individuals are experiencing regarding an innovation so that the CF can provide interventions to address their concerns. The LoU and IC maps allow CFs to observe the practice of individuals as they are implementing an innovation. One strength of the LoU and IC map tools lies in the communication between the CF and the individual. Both formal and informal interviews allow individuals to communicate with the CF, which further informs the level of use and possible interventions. The final reason for recommending CBAM for change implementation is the recognition of the importance of strong leadership in guiding change. CBAM provides the CFSQ to identify initiator CFs who are integral in leading individuals across the implementation bridge towards successful change.

It is, therefore, recommended that researchers study more settings where the full use of the CBAM change model is in place. Many studies of the CBAM model only focus on the use of the SoCQ as a tool for implementing an innovation (Christou, et al., 2004; Slough & Chamblee, 2007; Leung 2008). The strength of the CBAM model is that it recognizes the importance of both the feelings, measured by the SoCQ, and practice, measured by the LoU and IC map, of individuals in a change processes. It also recognizes the importance of effective leadership,

measured by the CFSQ, and the communication and relationship between the individuals and leaders in the change process.

APPENDIX A

DEMOGRAPHIC SURVEY

https://www.surveymonkey.com/r/228NQVD

1. What is your name?
2. How many years have you worked in education?
3. Describe your teaching/ administrative experience in education by listing grades and subjects taught, any administrative experience, and corresponding schools/ school districts.
4. Have you been a campus level team leader or department chair?
5. Do you have prior experience in curriculum writing/ design?
6. What is your position, role, or teaching assignment on the 11th grade PBL design team?
7. Do you have prior experience in problem-based learning curriculum design or classroom instruction?
8. What are the reasons you chose to be involved in a PBL education experience?
9. What are the main concerns you have regarding PBL learning or PBL curriculum design?
   What is your definition/ concept of problem-based learning?

APPENDIX B

CODING FROM INTERVIEW PROTOCOL

Level 0:- Non-Use

No references at this level.

Level 1: Orientation

Knowledge- “Students are given a result or end or something and they have to figure out how to get to that end result. Whatever that means. Whether an answer or solution or a product they make, which in all of ours it is both of those… forcing the kids to actually work to their desired goal is what I see PBL is.”

Acquiring Information- “We went to three conferences in Boston Learning and the Brain, and one in Dallas. We went to one in Grapevine as well. Oh, and within just our group we have had our own little case studies, learning profiles, and book studies.”

Sharing- “Most of it seems easy now that we have the basis of our project. But now that we are working on our content stories and where we are taking the project… like Apr is talking about white-flight and racism and integration, but for me it’s more chemical spill, are we coming back to biology and talk about viruses?”

Level 2: Preparation

Acquiring Information- “We do the ‘critical friends’ where we build a project then go in front of the district coordinators, then they let us know their thoughts and a lot of times higher-ups will also give us some directions based on constraints regarding a particular project.”

Assessing- “At one of the conference the point was brought up that when students walk up to get their diploma, they are getting a letter… and A, B, C, D… what does this letter mean? What are they actually getting? Why do we care about the letter? I think that PBL has to be less about

the letter because we have such a culture of this fear of failure, and in PBL it is designed for them to fail. They will run into walls and hurdles and must figure ways over and around."

Level 3: Mechanical

Knowledge- "It has been a very intense process. Our first step was make posters of each subject's TEKS. We studied our own over about two days, making notes with the knowledge that we would be explaining our TEKS to the group."

Acquiring Information- "We then began explaining our TEKS- what is important about each TEK? What does it mean? So for me, as an example, "why is the Gilded Age?" "What trends in history happened during this time?" So others are taking notes, right—so Russell may be making connections with literature from the time period, Jacie the art, Kim and Julia science, etc."

Assessing- "Some of these connections are forced, but that is not the point—it is just to process others TEKS. And it changes with the lens of who is presenting. So Russell is looking at my history talk through that lens, literature that connects historically. But when Kim is talking about the scientific process, his focus switches to technical or process ELA writing skills. That make sense?"

Level 4: Routine

Knowledge- "We also want balanced projects, though some may be more of a social studies aspect or science. We don't want it to feel like project number 1 is social studies; project 2 is English, etc. All elements should be present and needed to complete project though some do

have a slight bend- for example “Ka-Ching” is based in economics, but it is not purely an economics project.”

Performing- “We are solid. We have always said that we are pleasantly surprised how this team came together so easily, and often joked about what will happen when the honeymoon is over. So far, we are all still rocking it out. No one gets their feelings hurt, though we do get emotional and passionate about what we are doing, but we tend to keep everything work related above board, yet we do like each other as people and take care of each other.”

Level 5: Refinement

Acquiring Information- “We are all involved with multiple aspects of the campus. Our admin was very clear that they did not want us just up here removed from the reality of (the PBL school). And they want us to already be invested, know the kids who will come to us, the community, and be aware of what is great and the challenges. Also, we have two grade levels and their zero year teachers on the floor, so we would be foolish not to gain from their experience and knowledge. It helps us adjust our projects. All of us go on the floor to work with kids, maybe for only an hour, but we know all the kids in our building already.”\

Assessing- “A key part of our process when planning a unit is asking questions surrounding all aspects of a PBL. Those questions are much deeper as we all learn more about our subject and the others, so our process has improved and so have our connections.”

Level 6: Integration

Knowledge- “Establish norms early in the process and hold each other accountable. Write down EVERY SINGLE idea during brainstorming sessions. Do not be judgy. Play to the strengths of each individual on the team. Honor and respect each other's differences. If something is

bothering you, bring it up right away. Know when to hold 'em and know when to fold 'em. Write in learner reflection time at the end of each PBL. Realize that there are not just "engineers to be" at the school and honor the liberal arts in the PBLs."

Assessing- "The facilitators on this campus are really good. We have been chosen because we are very strong teachers. However, I would tell the next group to remember that we do not know it all. Do not think that you are this campus because you have "arrived" and do not need to change, learn, and grow. Listen, be humble, and be open to learning. Plus I have become a stronger team member. I have enjoyed seeing the connections made to other subjects. I have become more expert in math, mainly because I have been forced to look at math from different vantage points. Know your subject is one thing, but stretching and seeing how it fits with others is a different way of thinking about what you already know."

Level 7: Renewal

No references at this level.

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