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Problem Based Learning: the Impact on Classroom Environment and Student Engagement

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PROBLEM BASED LEARNING: THE IMPACT ON CLASSROOM ENVIRONMENT AND STUDENT ENGAGEMENT

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Abstract

This literature review will look at the implications of Problem Based Learning and its effects on student's engagement in their learning. The research shows that students need to have a good foundation in the content information for Problem Based Learning to be successful. Along with this much of the research takes place at the collegiate level. The studies show that Problem Based Learning does have a positive impact on students learning and engagement compared to Lecture Based Learning. The structure of Problem Based Learning lends to the educational flexibility and gives students the ability to apply real world strategies to solve the problems that are presented.

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CHAPTER I: INTRODUCTION

What is the foundational element of education? Is it to have students graduate from high school with a set of skills to aid them in their future? Or is it to teach students to be better people who can bring a positive impact to society? The answer is both! The world of education is a world that is ever changing and one that strives to draw the best out of every student. For decades, teachers have been driven to find a method in which to engage their students and to have a finished product that shows understanding, if not mastery, of a subject. The question we need to be asking as educators is how are we giving our students the skills to show mastery of a specific content and will those skills support them for the rest of their lives?

Over my limited years of teaching I have learned that there is no one magical way to teach students. However, a method that has been influential in the education of thousands of learners is Problem Based Learning. Problem Based Learning or PBL's foundations are found in the teachings of Confucius and Aristotle, strong supporters of learning by doing. The great philosopher Socrates used PBL strategies by learning through questioning, inquiry and critical thinking. These strategies still remain relevant to today's students over two thousand years later.

The focus of this literature review is on how Problem Based Learning affects a variety of learners and more importantly how it can increase motivation and engagement for students in the learning process within our classrooms. But first, to understand the direct impact of Problem Based Learning, there is a need to understand the history and vocabulary behind it.

The one name that is synonymous with Project Based Learning is 20th century American educational theorist and philosopher John Dewey. John Dewey challenges the educational structure of the time where students are placed in rows and sit through long lectures. In this structure students are passively receiving knowledge and teachers statically giving facts. Dewey believes that students should be actively engaged in their learning and have an active say in what they learn. Dewey believes that education is preparing students for ongoing learning in an ever changing world (Carver & Enfield, 2006).

Dewey's basis for education inspired Maria Montessori to continue to look at methods in which she believes that education is best through doing and experiencing not by listening. The focus of her educational practices are with early childhood. Her theories inspire the school system that holds her name. There are over twenty-two thousand Montessori schools across the world.

From these great philosophers and educational minds came Problem Based Learning, but in today's literature there are many definitions and PBL has been described in a variety of ways. PBL is used to refer to a vast number of concepts and approaches to instruction that have anchors in student focused concrete problems (Evenson & Hmelo, 2000). This focus on "answer a specific problem" as the beginning of the learning process is a core in many of the definitions of PBL. R.W. Marx states that learning taking place in project based classrooms allows students to investigate an essential question to find answers (Marx, Blumenfeld, Karjcick, & Soloway, 2004). Within Project Based Learning the question or problem is encountered in the beginning stage of the PBL process.

Vernon and Blake (1993, p. 550) defined PBL by its instructional design components, student's mental process and the teacher's' role: "a method of learning (or teaching) that emphasizes (1) the study of clinical cases, either real or hypothetical, (2) small discussion groups, (3) collaborative independent study, (4) hypothetical deductive reasoning, and (5) a style of faculty direction that concentrates on group progress rather than imparting information." This diverse range of aspects for PBL makes it very hard to have a specific definition. Barrow's (1996) model of PBL is focused on six core characteristics:

1. Learning is student-centered.
2. Learning occurs in small student groups.
3. A tutor (educator) is present as facilitator or guide.
4. Authentic problems are presented at the beginning of the learning sequence, before any preparation or study has occurred.
5. The problems encountered are used as tools to achieve the required knowledge and the problem-solving skills necessary to eventually solve the problems.
6. New information is acquired through self-directed learning.

Looking at Hmelo-Silver's (2004) structure of PBL, it follows a similar pattern. In the six steps the educator is evaluating during steps 2 through step 6. At all points in time students are taking part in self-directed learning.

1. Problem/Scenario
2. Identify Facts
3. Generate Hypotheses

4. Identify knowledge deficiencies
5. Apply new knowledge
6. Demonstrate findings

Mergendoller, Markham, Ravitz, and Larmer (2006) also provide a reasoning that they have determined captures the many integral parts of PBL to create a definition. They explain PBL as such, "a systemic teaching method that engages students in learning essential knowledge and life-enhancing skills through extended, student-influenced inquiry process that is structured around complex, authentic questions and carefully designed products and tasks" (p.587).

Like the definition of Problem Based Learning, so too is the broad definition of what defines an atypical Lecture Based classroom. From basic research, lecture based instruction is defined as a large group of students observing an instructor and that instructor is providing the learning targets and assignments (Albanese & Mitchell, 1993).

Main Goals of Problem Based Learning

Research suggests that use of PBL methods can increased 21st century skills in students. What is a 21st century skill? The West Virginia Board of Education (2008, p.5) defines a 21st century skill as "the student will access, analyze, manage, integrate, evaluate, and create information in a variety of forms using appropriate technology skills and communicate that information in an appropriate oral, written or multimedia format. Along with this it is expected that the student will demonstrate the ability to explore and develop new ideas, to intentionally apply sound reasoning process and to frame, analyze and solve complex problems using appropriate technological tools."

Problem Based Learning has a goal to increase the student's understanding of concepts and an increase in their ability to apply that knowledge (Finkelstein, Hanson, Huang, Hirschman, & Huang, 2010; Walker & Leary, 2008). Following this goal, PBL also enables students to engrain what they have learned and remember it longer and use that knowledge in new situations (Schwartz & Martin, 2004). Included in the 21st century skills, Problem Based Learning strives to have students engage in learning as part of a group, solve problems within that group, and have positive communication skills within the group, while also being able to share what each student has learned in the group (Hmelo, 1998). Finally, Project Based Learning has a goal to improve student attitudes and motivation to participate in their learning (Boaler, 2002).

Definition of Terms

A brief definition of some terms seems in order here. Although most terms are defined in the context of the book, these few could seem mystifying or misinterpreted without comment at the outset on our specific use. The teacher/tutor; this refers to anyone responsible for the education of students, for example, full-time faculty, part-time faculty, practicing physicians, other health professionals, or other students. Problem Based Learning (PBL) - is a student-centered pedagogy in which students learn about a subject through the experience of solving an open-ended problem found in trigger material. In comparison there is Lecture Based Learning (LBL) - is an oral presentation intended to present information or teach people about a particular subject within a classroom or another setting.

Research Questions

This literature review will look into how the structure of Problem Based Learning and the methodology behind Problem Based Learning increases the engagement of students in their learning. It will also address how there are different levels of Problem Based Learning. Finally, it will also bring into question should Problem Based Learning replace Lecture Based Learning?

CHAPTER II: LITERATURE REVIEW

Research Strategies

The literature for this thesis, searches of Educator's Reference Complete, Expanded Academic ASAP, Education Journals, ERIC, JSTOR Arts & Sciences VI Archive Collection, ECO, Academic Search Complete, and EBSCO MegaFILE were conducted for publications from 1980 to 2018. This list was narrowed by only reviewing published empirical studies articles from peer-reviewed journals that focused on Problem Based Learning, student engagement, and effects of PBL. The key words that were used in these searches were "Problem Based Learning," "increasing student engagement," "effects of Problem Based Learning," "Does PBL increase GPA," and "PBL's effect on students learning".

This review of literature surrounding Problem-Based Learning (PBL) will seek to answer: How does Problem-Based Learning increase classroom differentiation and adaptation which creates an environment where students have increased engagement by taking ownership of their learning? This question will be assessed by looking at the relationship between Problem Based Learning and the implementation of Problem Based Learning. Along with theories behind PBL, the teacher's exposure, acceptance, and training involved in using project-based learning methods within the classroom can determine the effectiveness of PBL. Within PBL, the building blocks and the method's behind Problem-Based Learning are functional and adaptable to the modern student in contemporary educational outcomes. The literature reviewed will also focus on the impact that PBL has on the classroom environment.

Relationship between the Theory and the Implementation

As the educational landscape continues to focus on how to make education relevant to today's students, teachers are stretched to continue to grow and implement nontraditional methods of teaching. Understanding the theory and the implementation process is pivotal to having success when using Problem Based Learning.

Theories behind Problem Based Learning

In Neville's (2009) review of Problem Based Learning he concludes that the educational field of medicine became intertwined with the concepts of PBL long before there was evidence available to back up its education effects. This by itself does not imply that PBL is suitable, progressive, or perfect. However, it does show that PBL is supported within the medical community as a positive method of education. Along with this it reveals that the theories of PBL fit within a model that reflects the experiences and demands within the modern workplace.

Over time there many have researched and addressed the theories behind PBL. Barrows and Tamblyn (1980) state that PBL is based on an information process model, cognitive theories, and constructivist theories. The study was developed over the years through work with faculty and students across North America, Holland, England and Japan. They looked into two major assumptions within problem-based learning. The first states that learning through Problem Based Learning is much more effective for creating a student's body of usable knowledge for the future rather than traditional memory-based learning. The second is that the physician's skills most important for patients are problem-solving skills, not memory skills.

During their research they worked with students who were moving into the medical fields studying to become physicians. Their decision to do this was determined because “The physician should be able to evaluate and manage patients with medical problems effectively, efficiently, and humanely” (Borrows et al., 1996, p. 8). A pilot for problem-based learning might occur within a departmental group that has a block of time in the curriculum long enough (six to eight weeks) to attempt problem-based learning. This could be in a basic science course, an integrated course (neuroscience), a departmental course (pathology or pediatrics), or in a special interdepartmental course (introduction to clinical medicine). An undesirable effect of a single block of problem-based learning is that as soon as the students develop the ability to carry out problem-based/self-directed learning and accept responsibility for their own education, the block is finished and they plunge back into their regular curriculum. The positive effects of the experience soon may be lost unless the students carry on with problem-based learning on their own. The desirable effect is that the students will, if it is done well, become enthusiastic about the experience and other faculty may be encouraged to try similar approaches. This allows all faculty and students to see such a teaching-learning approach in action.

Barrows and Tamblyn (1980) determined that the key to becoming successful vocationally in both the medical field along with other lines of both real world work and educational study is to be problem solvers and have the ability to think critically. Barrows and Tamblyn developed their book as a resource to support the building of problem-based learning units that focus around medical classrooms.

The conclusions written in Barrows and Tamblyn's *Problem-based Learning: An Approach to Medical Education*, written in 1980, is also supported by De Grave, Boshuizen, and Schmidt's research in 1996. The purpose of De Grave et al.'s study is twofold. First, it investigates whether PBL indeed leads to conceptual change of the learner and secondly, it works to develop a method of teaching that is sensitive to the experiences that the students go through.

In this study, De Grave et al. (2004) use a small group consisting of five medical students from the University of Limberg who were already well versed in PBL. Leading up to the study, the students participated in analyzing problems in a PBL method bi-weekly for two years. Third and fourth year medical students operated as moderators for the study and had all required relevant background information for the sessions. "The problem (case) they had to analyze was a case taken from the block "Pain" which is part of the third curriculum year. It was a difficult enough problem to stimulate the students' cognitive processes. On the other hand, the students also had sufficient prior knowledge for analysis of the problem" (De Grave et al., 2004, p, 4).

The group of students analyzed the problem for twenty minutes before they began discussion lead by one of the medical students. Following the discussion, participants were moved to separate rooms to take part in the stimulated recall. The task of the interviewer was to stimulate the students' ability to recall what was discussed during the twenty minutes of discussion. The results of the study show that PBL stimulated the student's ability to recall information from the group's discussion and increase the cognitive process for students in a short period of time.

As De Grave et al. (2004) shows this learning experience through discussion and the solving of a problem is a foundational building block to how students learn and is fundamental in Hmelo-Silver's study on what and how students learn. Hmelo-Silver (2004) focuses on the five core components that make the structural foundation of problem-based learning. She states the goals of PBL as flexible knowledge, effective problem-solving skills, self-directed learning skills (SDL), effective collaboration skills, and intrinsic motivation.

Hmelo-Silver's (2007) writing supports that within the PBL community there has been a great deal of study looking at the first three aspects of PBL (i.e. flexible knowledge, effective problem solving skills and SDL skills) but little to no studies on the the last two (ie. effective collaboration skills and intrinsic motivation). She believes that a review of PBL is timely as the progression of the educational system and today's learner has influenced educators to place further emphasis on active, transferable learning and its potential for motivating students (Hmelo-Silver, 2004). To understand Hmelo-Silver's position on the subject, one must first understand the difference in PBL and other experiential approaches. Problem Based Learning follows a learning cycle such as this: Step one, teacher presents problem scenario; Step two, students then identify known facts; Step three, learners generate a hypothesis; Step four, learners identify knowledge deficiencies (self-directed learning-this is where problems can be solved in groups or as individuals); Step five, apply new knowledge gained and final abstraction. After a student or group of students reaches the point of abstraction they may need to revisit either steps two or three (Hmelo-Silver, 2004).

The purpose behind this step method of PBL is to allow for the teacher to become a facilitator of the education experience rather than the focal point as in a lecture based classroom. Hmelo-Silver also references Barrow's lesson design here by ensuring that students need to work in a setting that nurtures social interaction and team problem solving. The following table is from Hmelo-Silver's comparison of approaches to learning situated in problem-solving experiences.

	PBL	Anchored Instruction	Project-Base Science
Problem	Realistic ill-structured problem	Video-based narrative ending with complex problem	Driving question
Role of Problem	Focus for learning information and reasoning strategies	Provide shared experience so students can understand how knowledge can support problem solving Video supports problem comprehension	Focus for scientific inquiry process leading to artifacts production
Process	Identify facts, generated ideas and learning issues, SDL, revisit, and reflect	Guided planning and goal generation	Prediction, observation, explanation cycles
Role of Teacher	Facilitate learning process and model reasoning	Engage students' prior knowledge, model problem-solving strategies, provide content instruction when needed by students	Introduce relevant content before and during inquiry Guides inquiry process

Collaboration	Negotiation of ideas Individual students bring knowledge to group application to problem	Negotiation of ideas and strategies within small groups and whole class	Negotiation of ideas with peers and local community members
Tools	Structured whiteboard Student-identified learning resources	Video controller Problem-specific tools (e.g., maps, compasses)	Computer-based tools that support planning, data collection and analysis, modeling, and information-gathering

Figure 1. Comparison of PBL

Because all of these methods start with a query to some degree, the step that separates and distinguishes PBL from the other methods is its foundation in student directed learning. This foundation is the driving force in which the students become responsible for their own learning which causes them to reflect, engage, and think critically in the learning process (Bereiter & Scardamalia, 1989). When considering the theory of PBL and the goals of student engagement and reflective learning, Hmelo-Silver calls into question the lack of research beyond the medical field and gifted learners in higher education. Hmelo-Silver states that it is important to continue to grow research in the areas where struggling learners can affect the outcomes and that this will allow for a broader spectrum of PBL and how it supports education. Looking at the discussion portion of her research, Hmelo-Silver examines the fact that the majority of research is in knowledge construction and does not address motivation and collaboration. Due to these both being major contributing factors to the use of PBL, Hmelo-Silver explains this will need further research to allow for further effective implementation in the classroom.

Hmelo-Silver does recognize that due to the level of learning that will take place, particular learners will struggle with PBL and they will need more guidance. In K-12 classrooms, teachers must assess students in specific subject areas and problems that often do not map neatly onto these subject area divisions. To support this, each teacher will need to use careful planning to engage in a PBL classroom to accommodate into a stereotypical fifty minute class.

Implementation of Problem Based Learning

PBL is a focused experiential learning organized around the investigation, explanation, and solving of student focused meaningful problems (Barrow, 2000; Torp & Sage, 2002). With a focus on meaningful problems as Borrow, Torp and Sage state in their research, educators must look at how to practically implement Problem Based Learning within their classroom. The success and the soundness of the theories of Problem Based Learning are important but the key to success for students and the further engagement of the class is found in the implementation of Problem Based Learning. Implementation starts and ends with the teacher. Therefore, teachers need to have a high level of exposure, accept the methods, and receive training to be successful in a PBL environment.

Woei Hung's research and literature looks into PBL beyond just the theories and addresses how to make it a reality in the classroom. Hung's initial point in her writing is substantial; she asks the question, is PBL effective? Her research, much like this literature review, has found that most theorists and researchers (i.e. Albanese& Mitchell 1993; Berkson, 1993; Colliver, 2000; Neville, 2009; Norman & Schmidt, 1992; Vernon & Blake, 1993) results are inconclusive at best and at times can even be conflicting. So

Hung probes the question, if PBL is so effective and the theories are able to support students' learning of soft skills that can support their development for post academic life, why are there inconsistencies.

In a more recent study done by Kirschner, Sweller, and Clark (2006), they criticize PBL for its inability to adhere to human cognitive architecture and cognitive load theory. Cognitive load theory is a theory developed by John Sweller in 1988. It states that the best learning takes place under conditions aligned with human cognitive architecture. This is countered by Hmelo-Silver et al. (2007) where they produce evidence that supports the soundness of PBL and its effectiveness in all areas of learning. In asking why PBL research has produced so many inconsistent and conflicting results, Hung digs deeper into what PBL implementation looks like and how that can help answer the question of Problem Based Learning effectiveness in the classroom.

When introducing the implementation of PBL, Hung states, "In reality, implementation of PBL at both the course and curriculum levels requires facing a number of challenges that may infuse confounding variables into the process and skew the end results. When examining the PBL literature it finds that some probable confounding variables may derive from how PBL is implemented, how the curriculum or problems are designed, and other 'human factors'" (Hung, 2009 p. 532).

A Comparison between a Traditional and Problem Based Learning

PBL environments are designed to help students construct an extensive and flexible knowledge base, become effective collaborators, develop self-directed learning skills, develop effective problem solving skills and become intrinsically motivated to learn (Hmelo-Silver, 2004). Many studies reveal a great deal around the positive impacts

of PBL on a student's' skill but not the measure of factual knowledge (Vernon & Blake, 1993). There have been others who question the superiority of PBL simply because of the financial burden it puts on the classroom (Albanese & Mitchell, 1993). There have been a number of explanations as to why PBL does not always appear to fulfill its promise of increase motivation along with increased student ability (Delva, Woodhouse, Hains, Birtwhistle, Knapper, & Kirby, 2000).

Loyens, Rikers and Schmidt (2007) look at the effects of PBL and demonstrates how they differ according to the levels of knowledge structure that are measured with various types of exams evaluating different types of knowledge levels. The method in which the study was conducted involved one hundred and eighty-six first year students enrolled in a PBL psychology curriculum and one hundred and seven first-year students enrolled in a lecture-based curriculum. Within the PBL group, one hundred and thirty were female and fifty six were male. The mean age of this group of students was 19.94 and the response rate was 74.4% of all first-year students. Eighty-eight participants of the lecture-based learning group were female and nineteen were male. The mean age of this group was 19.02 and the response rate was 49.6% of the first-year student population.

The PBL curriculum is structured as follows. Students worked in small groups, with the maximum being 12, on authentic problems, under the guidance of a tutor. First, students discussed a problem and possible explanations or solutions were proposed. The groups then participated in self-study, students shared findings, elaborated on knowledge acquired, and had the opportunity to correct misconceptions (Hmelo-Silver, 2004). The PBL course consisted of eight problems that lasted five weeks each. At the end of the course a comprehensive test was administered. The conventional, lecture-based

curriculum consisted of two semesters of 22 weeks each. Each semester was divided in two periods of ten weeks, followed by an examination week. Students attended lectures for two hours each, twice a week. For some of the sessions an additional two-hour practice session was needed as well.

To determine the effects of PBL compared to lecture based learning, a questionnaire was distributed twice during the semester. Once at the beginning and once at the end. The areas in which the questionnaire assessed were: knowledge construction, cooperative learning, self-regulation, authentic problems, self-perceived inability to learn, and motivation to learn. Loyens et al. chose to use The Tucker-Lewis Index (TLI, Tucker & Lewis, 1973) and the Comparative Fit Index (CFI, Bentler, 1990) as the measure of the student's fit. Both indices ranged from zero to 1, with the higher the values indicating the better fit. Values greater than 0.90 are traditionally associated with well-fitting models.

The results of Lyons et al.'s study conclude as follows: the PBL student population resulted in a CFI of 0.90 and a TLI of 0.87 while the results of the lecture-based curriculum showed a CFI of 0.91 and a TLI of 0.89 showing that both of the curriculum were well fitting for the student groups that attended these courses. The areas in which the PBL curriculum was considered far superior to lecture-based curriculum were in areas such as cooperative learning, authentic problems, and motivation to learn.

Continuing to look at the effects of PBL vs LB (lecture-based) learning environments, Winjina, Loyens and Derous look at how two different learning environments had effects on undergraduates' study motivation. In Winjina et al. first study, the group studied students in PBL environment compared to conventional lecture based students on motivation and self-regulated learning. The participants in the first

study were undergraduates in psychology that were either enrolled in a PBL environment or a lecture-based environment. The group enrolled in the PBL course consisted of a hundred and seventeen students. Twenty-seven of them were male and ninety of them were female. The lecture-based classroom was made up of thirty-eight males and eighty-eight females. The mean age of the PBL group was 21.29 while the mean age of the lecture-based group was 19.12. The great majority of students had roughly the same amount of secondary education. Winjia does note that there is a significant difference in age between the two groups with the PBL group being older but upon further analysis did not see the age difference as a contributing factor.

Much like Lyens et al.'s study, Winjia et al.'s study consisted of small groups made up of twelve students. Students were presented the problem by a tutor at the beginning of the semester. The PBL course then followed "Seven Jump method". Step one, clarification of unknown concepts; Step two, formulation of a problem definition; Step three, brainstorming on the problem; Step four, problem analysis; and Step five, formulation of learning issues for further self-directed study. To conclude each session of self-directed study, groups would move to Step six, which was studying relevant research followed by Step seven, where they shared what was found during independent study time. The PBL curriculum consisted of eight 5-week periods, each period dealt with a particular psychological discipline. A course test was given at the end of each five week section. The progress test consisted of one hundred and ninety True/False questions that covered the complete knowledge domain of the first two years of studying psychology (Winjia, 2011, p. 109).

The stereotypical lecture-based curriculum consisted of two semesters lasting thirteen weeks. During these weeks students took part in the same psychological subdisciplines as the problem-based course. Following the thirteen weeks of lecture there were three weeks of study where no lectures took place. After the completion of the three weeks of study, assessments were given.

The scales used by Winjia (2011) to measure the motivation and self-regulated learning were given through surveys. The measures were on a scale of 1, not at all true, to 7, very true. The questionnaire for motivation was the Learning Self-Regulation Questionnaire (SRQ-L) which measures a person's perceived control. Along with this the Learning and Study Strategy Inventory (LASSI; Weinstein, 1987) was used to measure self-regulated learning. The overall mark on this first study shows that there was a discrepancy between PBL and LB in the measure of motivation. The result of the study indicates that the PBL group scored significantly higher on competence in comparison to LB students. This partially supported Wijnia et al.'s hypothesis.

To test the second hypothesis the use of the Learning and Study Strategy Inventory (Weinstein, 1987) shows significant differences between PBL and LB students in affective strategies and goal strategies. The results indicate that the students from the PBL group seem to work with more effort within their courses. The PBL group also showed that they were able to use strategies to cope with examinations and anxiety more effectively than their LB counterparts.

The second study done by Winjina et al. was a focus group study that investigated specific aspects that can motivate students to a further extent compared to the first study. Focus groups were used because they are particularly useful in generating different

opinions and experiences of students in order to investigate the survey results more in depth (Kitzinger, 1995). One area that needs further research according to Wijnia et al.'s group is to investigate the results between PBL and LB in autonomous motivation. There is little discrepancy between the two in the first study.

Winjina et al. stated that due to the lack of discrepancy between the PBL students and the LB students, a second study was conducted by the same team of researchers as a follow up. The two groups used within the follow up study were focus groups from the first study, thus allowing for more in-depth focus on what was perceived as being motivating or demotivating for the studies in the PBL group. The participants consisted of seven first-year students of which three were male and four were female. The second group was made up of second year psychology students and consisted of one male and six females Winjina et al. (2011).

The focus groups met following the end of group meetings and lasted roughly 45 minutes. One of interviewers operated as the author of the notes and so both focus groups had the same interviewers. During the interview the question that was asked was "Which aspects of PBL do you find motivating and which ones not?" The students were given liberty to answer freely and were asked not to hold back on both positives and negatives in the use of PBL. The guidelines of motivation were determined by the aspects of PBL; this being guiding role of instructors, use of problems, the evaluation system that both courses in the previous study used, collaboration, and self-directed learning. If one of the subjects was not naturally covered in discussion, the facilitator asked directly about one of those topics (Winjina et al. 2011, p. 109). All conversations were recorded.

The data from the focus group was analyzed in line with Kitzinger (1995). Audio tapes were transcribed and statements made within the conversations were grouped into five categories. These categories were: autonomy-supportive teachers, meaningful and challenging tasks, feedback, collaboration, and self-regulated learning. These categories were each based on the motivation literature. Where there was a great deal of difference within the statements could not be directly placed within a category, they were placed into a rest category.

The results of the focus group study were segmented into the aforementioned groupings where many of the students agreed that some aspects of PBL were perceived as motivating while some were considered detrimental to their motivation.

Within the two focus groups were slightly differing opinions on the role and motivation factor in the supportive teacher. The first year students felt that the guiding role of a tutor was useful but overall was not motivating. While the second year students found an enthusiastic teacher to be very motivating due to the teacher sharing their perspective and personal experiences. Both groups felt that a teacher should be stimulating and should follow group discussions carefully. When teachers asked questions that covered topics that were considered covered and closed, it was perceived as demotivating for the students. Second year students found it to be demotivating when teachers could not clarify misconceptions and uncertainties that groups encountered during discussions. Between the two focus groups it was agreed that the tutors gave an unsatisfied feeling about what they learned in the group meeting (Winjnia et al., 2011).

There was a general consensus that the students liked the way subject matter was introduced to them through problems. The focus group reported that it stimulated their

willingness to engage and learn. Students did emphasize the need to have a quality problem and to have the problem adequately presented to the students. Students found that if there was a large discrepancy between the problem and current research it was seen as detrimental to their motivation to continue studying the problem. A few of the first year students mentioned that motivation was found during the initial problem when the problem was found to be something that was experienced in everyday life.

When looking at the feedback portion of the PBL process Winjia et al. (2011) states that many students felt the assessment system used in the first study to be demotivating. To recall, there were two types of assessments: course tests and progress tests. The perception of the progress tests was that many students felt it to be detrimental to their motivation because many of the credits that were associated with the progress tests, while no course credit was associated with the course tests. Because the cut-off between passing and failing is norm-referenced, there was always a portion of the class that failed the tests. A number of the students would not prepare for the curriculum tests and would fail but would prepare for the progress tests and only pass that portion of the course. The focus group felt this was hindering to the PBL process.

All of the students in both focus groups found that the collaboration with other students to be extremely motivating. Wijnia et al. (2011) writes that social interaction and sociability are perceived as very important and motivating. Students felt that they experienced more pressure to study because of the socially shared responsibility to succeed. More accurately they did not want to embarrass themselves in the eyes of others by having a lack of knowledge on the subject. The focus groups agreed that it was imperative that everyone attend and prepare for the group meetings and when one or

more students was not prepared for the meetings, it demotivated students to continue putting forth effort.

The fifth topic of the focus group was self-regulated learning. Wijnia et al. (2011) states that some first-year students mentioned they sometimes could easily formulate learning issues, without first analyzing and discussing the problem in a tutorial meeting, because problems did not always elicit sufficient group discussion. Contradictory to this, some of the students felt that the discussions developed collaborative learning. This was affected by students who did not have sufficient prior knowledge of the topic.

Both first and second years student focus groups felt that there were times when self-directed learning made them feel insecure about their search for relevant learning material. Most of the focus group wished that the facilitator would give more direction. An example was a wish for the facilitator to give some basic articles to read to initiate student learning. First year students wished there was a predetermined course book to refer to instead of needing to research to find relevant articles on a given problem.

The final category by Wijnia was called “rest category” but focuses on mandatory presence. Wijnia et al. states that all students need to be present at every tutorial meeting to ensure the group process. The subject, mandatory presence, elicits a good deal of discussion in both focus groups. All of the students felt that the mandatory presence as too restrictive, because no exceptions were made. When a student missed a mandatory meeting there was a compensation assignment and this was viewed as a punishment, which negatively impacted student engagement through that portion of the course.

In the discussion portion of Wijnia et al. research there was a focus on the effects of learning environments on student motivation. Wijnia’s findings are in contrast to the

expectations of the group. The findings show that no major differences were found between PBL and LB learning environments under the parameters formed in the study. Because of this, they created focus groups and a second study to determine why this would be. The findings show that students had external motivating factors rather than internal motivating factors, i.e. avoiding punishment or ensuring having a higher GPA. The second focus group also mentions that many of the students felt uncertain through the PBL experience and lacked direction during the self-learning portion. This caused many of the students to struggle with motivation.

Motivational Aspects of Learning Environments

PBL has many dimensions in which it is able to enhance student motivation; autonomy-supportive teachers; meaningful and challenging tasks; positive feedback; collaboration; and scaffolding (Wijnia et al., 2010). Along with Wijnia, Hmelo-Silver found that the leading aspects that supported the ability to motivate students were autonomy-supportive teachers, meaningful and challenging tasks and positive feedback.

Autonomy-Supportive Teachers

There are many aspects that influence a learner's environment but many times it can be broken into two categories for the teacher's influence: autonomy-supportive or controlling, but among the most important aspects are a students' perception of their teacher (Deci & Ryan 2008). Teachers can achieve autonomy support by taking the perspective of their students. Along with offering opportunities of choice, being receptive to student's questions or ideas, and making learning relevant to today's learners (Assor, Kaplan, & Roth, 2002) students have more autonomy with the teacher. In addition to this, the type of language a teacher uses can influence the amount of autonomy a student will

experience in the classroom (Vansteenkiste, Simons, Lens, & Soenens, 2004). Studies show that specific controlling instructions such as “you must” or “you have to” have a negative impact on deeper learning, understanding, and overall performance of students. Whereas language such as “you can” or “you might” had positive impacts on student learning. Black and Deci (2000) discuss that a student centered focus learning environment could be considered autonomy supportive. In a PBL style classroom, teachers guide and encourage students to perform learning tasks their own way. When an educator or tutor facilitates instead of dictates a student’s learning process, it will allow for the classroom to be an autonomous learning environment.

Meaningful and Challenging tasks

Designing meaningful tasks and activities for students to participate in can increase their intrinsic motivation (Ames, 1992; Blumenfeld, 1992; Wigfield & Eccles, 2000). To promote meaningfulness for students, tasks need to take on a personally relevant aspect. The problems used in PBL often describe a question or issue that can be seen in daily life. Because of this, students can therefore perceive the problem/learning task as meaningful (Schmidt & Moust, 2000). Meaningful tasks are associated with an increase in student interest and create a deeper level of learning (Pintrich & Schunk, 2002).

Along with creating meaningful tasks, another way in which to increase motivation is by creating a challenging task. Within PBL, creating a challenging task is through the creation of a complex and ill-structured problem. These problems do not need to have one solution. The discussion that the students participate in help the students develop understanding of the subject matter at hand and allow for the students to have a

grasp of complex levels of thinking. Noordzij and Te Lindert (2010) demonstrate that the interest level of the problem is positivity related to intrinsic motivation.

Positive Motivation and Feedback

The evaluation of a student's performance in a classroom can have a large effect on their motivation when it is perceived as pressuring or controlling (Blumenfeld, 1992). Blumenfeld writes in *Classroom Learning and Motivation: Clarifying and Expanding Goal Theory* (1992, p. 272) that there are three classroom structures that affect goal orientation and a student's desire to succeed in the classroom. Blumenfeld states that they are: the influence of tasks, evaluation, authority (1992, p. 272).

Breaking down tasks and how they influence student engagement Blumenfeld says that teachers need to create variety. There are many ways in which to create it but students need to have different avenues in which to master what they are learning rather than simply garner short-term attention on a topic. Within that variety Blumenfeld states that educators and researchers need to know more about how to select appropriately challenging tasks and sustain student motivation to engage in cognitively complex tasks over time (Blumenfeld 1992, p 273). To support the growth of a student within the tasks there needs to be impactful meaning in which the students can understand the importance of the classwork. Blumenfeld recommends that tasks given to students need to reflect meaning to the students and this is at the center of Problem Based Learning.

The second area of influence in a student's motivation according to Blumenfeld (1992) is evaluation. He states that by stressing correct answers, grades, and social comparison promotes a performance orientation. Even if students perceive grades as controlling this need not be the case when grades are accompanied by the opportunity for

improvement (Blumenfeld, 1992, p 273). Because Problem Based Learning focuses on individual improvement it allows for students to have more success and empowered to continue to improve. The issue that arises is how do teachers sustain a mastery orientation and reward improvement at the same time? Blumenfeld expresses this a major area of concern within the Problem Based Learning model.

The final area in which Blumenfeld sees effects in student's motivation is authority or the student, teacher relationship. Blumenfeld states that evidence shows that classrooms that allow for students autonomy and decision making lead to a great success in mastery of a topic (Blumenfeld, 1992, p. 274). Within, a Problem Based Learning classroom students are allowed opportunities to develop self-regulatory learning and benefit from having choice and control of the learning. He later argues that the best method in which teachers can guide students while they are exercising choice is through positive feedback.

The research shows that when students are given positive feedback and the opportunity to improve on their work, there are positive effects on the student's future performance (Deci & Ryan, 2000). In addition, positive feedback will have a positive impact on the motivation of a student as they feel they can be creative in a safe environment. PBL gives students the opportunity to try, fail or succeed without worry that it will negatively impact their final grade.

Collaboration

Most research on relatedness focuses on the influence and connection between student and teacher or between parent and student. But it is equally important to consider the influence that students' peers have on one another. This peer interaction can have a

significant impact on students' engagement, motivation and achievement within the classroom (Ryan, 2000). Collaborative learning could help students feel more connected to their peers and as a result influence their effort (Wentzel, 1999). Because PBL is student centered with students discussing real-life problems, this allows for students to work in a collaborative environment, with no more than 12 students, where students work towards a common goal (Barrow, 1996). This demonstrates an example of how PBL can therefore be expected to have a positive outcome on a student's motivation and learning.

Scaffolding

Some researchers argue that PBL and the responsibility that is placed on the learner could distract or confuse the learner and lead to more stress and anxiety in the learning process (Berkson, 1993). Zimmeran and Campillo, 2003 states that PBL believed that due to the unsystematic stance of PBL it could negatively affect self-efficacy. But it should be pointed out that PBL should not be an unguided or minimally guided instructional approach when the correct amount of scaffolding is applied (Schmidt et al. 2007). For instance, facilitators of the PBL environment need to have a deep knowledge of scaffolding (Schmidt et al. 2007).

Characteristics: The method of Problem Based Learning

The basic foundation of Problem-Based Learning is made up of six parts. Of those six parts, students and facilitators of Problem-Based Learning will find that the steps do not need to go in sequential order (Hmelo-Silver, 2009). All students will begin at Step One but due to the nature of background knowledge and ability to apply what is learned will affect the sequence in which they will complete the problem. The following list is how Hmelo-Silver outlined Problem-Based Learning in 2009.

1. The problem is encountered first in the learning sequence, before any preparation or study has occurred.
2. The problem situation is presented to the student in the same way it would present in reality.
3. The student works with the problem in-a manner that permits his ability to reason and apply knowledge to be challenged and evaluated, appropriate to his/her level of learning.
4. Needed areas of learning are identified in the process of work with the problem and used as a guide to individualized study.
5. The skills and knowledge acquired by this study are applied back to the problem, to evaluate the effectiveness of learning and to reinforce learning.
6. The learning that has occurred in work with the problem and in individualized study is summarized and integrated into the student's existing knowledge and skills.

Levels in PBL- from instruction led and well-structured to full problem simulation and self-led. (Hung, 2009, p. 534). For educators to begin to understand the functionality of problem-based learning they must first understand the method in which it is carried out. Looking into the steps in which PBL is carried out, one must understand that learning is continuous and at times a rational one, two, three etc. step process is not how PBL will operate. There will be times when PBL will move from learners being given a problem before any learning has taken place, hoping they have a solution, and finding out that it does not work and needing to start over.

Looking at the most recent development of PBL the West Virginia Department of Education created the Teacher Leadership Institute which was to focus solely on the development of PBL. Because teachers lacked the training, they looked at Hung's steps of PB (Figure 1). Though there are many ways to set a PBL focused classroom, many authors agree that true PBL is in line with Boud and Feletti (1997, p.15) "Problem based learning is an approach to structuring the curriculum which involves confronting students with problems from practice which provide a stimulus for learning."

When shifting to PBL it is important that the problem that is introduced is simplistic in nature to begin and then as the students become more and more comfortable with the PBL process, allow for more complicated problems to be used. Vernon and Blake (1993) explain that the first step in PBL needs to be giving a scenario/problem. Once this is given to the class as a whole, students need to be separated into groups where they are given assignment expectations, rubrics, and timelines. Zwall and Otting believe that the first step of PBL is to introduce terms and concepts to students that would not be readily available to the students before introducing the problem.

Step two listed by Hung (Figure 1) is similar to Vernon and Blake's sequencing of PBL, where each problem needed to be given or presented in the most realistic way possible or at least as close to a problem that would take place in the real world. Within this step, the instructor would first need to give the scenario and problem followed by the classroom expectations. This includes discussing the rubrics and classroom timelines for due dates. Once students grasp the expectations, Hung et al. (2009) agree you move to Step three. Zwall and Otting believe Step two should be as follows: that by sharing ideas, understandings, and knowledge about the problem and its interrelated phenomena,

students construct a common understanding of the problem. The students define the exact nature of the problem and agree upon the phenomena that has to be explained.

Moving to Step Three, Zwall et al. state: that based on the often incomplete information in the problem description, students activate their prior knowledge and use their thinking and problem solving skills to elaborate on the contents of the task. In a round of free association they can express ideas, thoughts, questions, opinions, concepts, and hypotheses about the problem and its underlying mechanisms. Brainstorming techniques are often used for the generation of ideas. Students are encouraged to freely express themselves and to avoid criticism and discussion about the quality of ideas while brainstorming.

They believe that this achieves two major objectives within this phase of PBL. The first being that students engage in the creative process of gaining facts and information around the problem. The second is after ideas have been generated, students explain and discuss the ideas and ask critical questions to assess the quality of ideas. Inadequate execution of Step three results in poor and superficial problem analysis with little elaboration on prior knowledge. This step is the same approach that is used by De Grave et al. (1996).

Step Four is to gather information learned from Step Three. This is where collaboration becomes an integral part of PBL. The group comes to a common understanding of the problem, not only on an individual level but also on a group level. Different viewpoints and interpretations must be discussed and common understanding must be achieved (Akkerman et al. 2007, p. 36-40). Once all information is gathered and the group has a common understanding, all information is placed within a systematic log.

From Step Four, the group of learners have the pieces of information that they have a clear understanding of. Step five is to discover the group's learning issues. Then compiling a list of information that needs to be learned outside of the PBL model. Van den Hurk, Dolmans, Wolfhagen, and Van der Vleuten (1998) have formulated three criteria for student generated learning issues in Step five of the seven-step procedure. A proper learning issue: 1. should contain keywords; 2. include a concise description of the main aspects of the learning topics; 3. should be understood regarding purpose and content by all members of the PBL-group.

After the learning issues are identified by the group, Step Six is to gather relevant outside information outside of the group setting. The students select and study literature that they consider worthwhile for attaining their learning goals. It is important to note that facilitators and teachers emphasize the importance of self-study. Within this, they need to dictate the norms of studying and effort in which the students need to devote to their self-study. Nuutila, Törmä, and Malmi (2005) indicated that during this time there needs to be a steady stream of feedback about the level of learning and knowledge obtained.

When looking at medical students, Musal, Gursel, Taskiran, Ozan, and Tuna (2004) find that first-year medical students spend more time on self-study than third-year students. First-year students generally restrict themselves to the learning issues that were agreed upon in step five, while senior students use the guidelines in a more flexible manner and tend to follow their own learning interests. Students who study beyond the learning objectives spend more time on self-study and gain better results on knowledge tests (Van den Hurk et al., 1999; 2001).

Once individual research and self-study is concluded, teams need to come back together and share the newly acquired knowledge. Step seven is synthesizing and testing newly acquired data against the problem. The students relate the acquired knowledge to the problem and evaluate what they have learned from the problem, which helps them to apply their knowledge to other problems the individual study of relevant information in preparation to the reporting phase, influences the breadth and depth of discussion in the reporting phase (Van den Hurk et al. 1999). When students do not spend enough time and effort on the self-study phase and they restrict themselves to the most basic of studying, there will be little to discuss when synthesizing the newly acquired data. During this phase, students, with the support of the facilitator/instructor, will determine if the students have solved the problem or they will need to revisit steps two through six.

Comparing Problem-Based Learning Methods

To fully understand how PBL curriculum is organized, a teacher must first determine the level of PBL they wish to undertake. Moving from highly instructor led/complete case to self-led/full problem stimulation, Barrow's PBL taxonomy is defined with the following: lecture-based with problem solving activities, case-based learning, project-based learning, anchored instruction, hybrid PBL, and lastly, pure PBL. Of these classifications, problem solving activities and case-based learning both have the highest, most defined classroom structure. Barrow places the classifications of project-based learning and anchored instruction into the subsections of partially self/instructor led and partial problem simulation. Finally, the hybrid and pure PBL are two styles shown to be the most self-directed and involve full problem simulations.

Hmelo-Silver et al. (2007) break down all of these PBL teaching methods further to allow for educators to understand the effects and outcomes each has on the students they are working with. It is important to note that each method does not guarantee a specific outcome but rather increases the chances of learning outcomes. The model of pure PBL is learning initiated by a need to solve a real world problem. Within this, there are no whole class lectures. The PBL process is led by the learner, and the content knowledge is acquired by the learner through his or her own research. The timing of the learning and application of what is learned is a simultaneously learned and applied through the inquiry process. The overall structure of pure PBL is very ill-structured. Hmelo-Silver et al. states that the impacts on student learning are as follows: the efficiency of content knowledge and acquisition is medium to high; knowledge application and transfer to everyday life is very high; problem solving and reasoning skills affected are very high; self-directed learning is very high; ability to cope with uncertainty is very high.

Continuing down Barrows' (1996) PBL taxonomy would bring one to hybrid PBL. Hybrid PBL is similar to pure PBL but is supplemented with a few lectures. The PBL process follows the same structure, meaning that the problem solving is learner directed. The change is in how the content knowledge is acquired. In hybrid PBL the learner is completing the research and completing the inquiries into unknown knowledge to solve the problem but is given minimal assistance by the instructor on how to integrate knowledge gained. These two types of PBL are considered to be the least structured and most student led methods.

Anchored instruction follows the format in which students possess basic content knowledge before they are given the problem solving portion of the class. According to Barrow (1996) the PBL process in which anchored instruction takes place is partially led by both instructor and learner. The content knowledge that students need to complete the problem is mainly given by the instructor rather than the learner directed like pure or hybrid PBL. The timing of how students acquire knowledge and its application follows the flow of first learning material then applying the learned material. Learners may then learn more as additional content knowledge may be needed to solve problem given. The problem solving process is an inquiry process with the support of previously taught material. The structure of this type of PBL classroom is considered moderately structured. Its impact on learning outcomes shows knowledge application and transfer to real world application is very high; the effect on problem solving skills and reasoning skills is very high; while its effects on students' ability to cope with uncertainty is considered moderate by Hmelo-Silver et al..

Stepping up in structure of format, the next level of PBL in Barrow's (1996) structure is Project Based Learning. The format behind Project Based Learning is learning started by lecture or by students already having basic content knowledge before engaging in the project. The majority of this class would be filled with time to take part and complete the project. Project Based Learning has the same impact on educational outcomes as anchored learning but at the end of Project Based Learning there is a tangible creation by the student.

Barrow (1996) states third and most structured portions of PBL are Case Based Learning and lecture-based learning with problem solving activities. The format in Case

Based Learning is started with a lecture and is completed by studying or analyzing a problem that has already been solved. The process in which case-based learning takes place is led by the instructor and all knowledge is given to the students by the instructor. Knowledge is gained by the students, then it is applied where the problem solving process is the realization of the content knowledge prior to analyzing the already completed problem. The overall structure is considered to be moderate to well structured. The knowledge application of this style of learning is theoretically seen as high to moderate for students. Impact on a students' learning outcomes are much more mild than those that are closer to pure PBL. The knowledge application and ability to transfer to the real world are considered medium whereas self-directed learning is low.

Like Case Based Learning, Lecture Based Learning with problem solving activities is highly structured. Lecture Based Learning with some problem solving activities is just that, the knowledge is gained through teacher taught lectures with few hands on practice problems where students can practice gained knowledge at the end of a course. It is highly structured and leaves little space for self-directed learning. Its impact on a students' learning outcomes are important to note, for when knowledge is gained and applied, it is considered to have low transfer to the real world. Lecture Based Learnings effects on a student's problem solving skills and reasoning skills are also very low.

Within each model of PBL it is imperative to consider many factors when deciding which to use. First, each teacher needs to consider which model they are most familiar with and one that they are able to complete the learning process. Additionally, there will need to be scaffolding based on the needs of the students. Finally, the instructor

must consider the way in which they are going to measure the students' learning. Each teacher must address what type of assessment is going to be used and it will require a different set of teacher expectations.

Curriculum and Classroom Concerns in PBL

Barrows and Tamblyn (1980, p. 18) define PBL as "the learning that results from the process of working toward the understanding or resolution of a problem. The problem is encountered first in the learning process and serves as a focus or stimulus for the application of problem solving or reasoning skills, as well as for the search for or study of information or knowledge needed to understand the mechanisms responsible for the problem and how it might be resolved," and this is now considered by many experts to be "pure" PBL. With this definition Hung brings up many issues within today's educational system when looking to implement problem-based learning. To begin with, one must look at the different aspects an educator may need to vary within PBL to meet required educational outcomes. These factors include nature of the discipline being taught, the learning goals, and the cognitive readiness of self-directed learning skills of the students within the classroom.

The wide variety in methods (three given within the theory section) and educational outcomes in which PBL is used can attest for the very large discrepancy in data from various studies on PBL. This puts a strain on educators on which PBL is the "real" PBL and how to know if PBL is having a positive effect on their classroom. This can be the reasoning in which there has been a lower demand on the students to assume an active role in the problem solving and learning process within PBL. If a PBL course is

following Kirschner's hybrid PBL style, then the classroom may have produced something similar to that of a traditional learning style classroom.

With that line of reasoning Hung (2009) states that a case-based learning course or a lecture based learning course with some problems embedded within the curriculum could look very similar to a PBL course because the cognitive requirements placed on the students would be the same.

Another area of concern when looking at using PBL in the classroom is the design of the PBL problem. Angeli (2002) and Hung (2009) point out that many curricula in medical schools have used this method, but within medical schools there is the chance of fewer challenges for faculty or those that are a part of the problem design process than an educator within a typical K-12 classroom. Both of their research and accompanying literature points to this because of the time consuming a research heavy process that goes into creating a problem within a PBL environment.

Gijselaers and Schmidt (1990) stated that ineffective Problem Based Learning problems and curriculum could be what undermine the effectiveness of PBL in a K-12 student's ability to apply prior knowledge and the student's group educational process. This too would have dramatic effects on the students' self-directed learning. Because of the major shortcomings located within the problem of PBL, there would be negative effects on the student's learning outcomes and will affect most reports within the studies seen in PBL.

Two other areas that need to be addressed when looking at issues within the PBL environment are the parties that are actively involved in making the PBL process take shape. These would be the students and the instructors. Dolmans & Schmidt (1994)

studied what drives the student in problem based learning. Within their research they observe some PBL students' behaviors that they call "ritual behaviors;" this refers to students maintaining superficial and minimum work to have the appearance of being actively engaged in the learning process. Dolmans and Schmidt explain that these behaviors not only degraded the students' learning of content knowledge but would go so far as to point out that it can at times defeat the instructional methods in which students obtain self-directed learning skills. This finding Dolmans et al. will also have negative effects on the facilitators of PBL.

Due to the nature of PBL and its self-directed nature, many educators are misinformed about the role and responsibilities of the facilitator. Even though the learning is supposed to be self-directed by the students that does not diminish the role of the educator in the classroom. Depending on the level and comfort of the students within the classroom, the educator still needs to model both the problem solving and reasoning process of PBL to the students. In Glew's (2003) analysis of why PBL fails to live up to its promises, it highlights that many times the facilitator did not follow tutoring guidelines of the PBL curriculum from the curriculum designers. If the facilitators fail to provide the correct modeling and guidance for the students to follow, then the students are unable to complete PBL's learning process.

The issue of facilitator guidance may be less of an issue when the use of PBL is done within a unit of a class rather than a whole department shift to PBL. But teachers may face a struggle in having a lack of resources and training with PBL to be effective with the strategies behind it. This tends to lead to a second issue for facilitators and educators with PBL, over guidance and micromanaging within the PBL process.

In an article by Moust, Berkel, and Schmidt (2005), they report that the fear of not giving enough guidance and content for the students to work from has led to facilitators giving too much direct instruction. Moust et al. even finds that some teachers gave the students a list of specific learning resources to use instead of possible places to begin research. From interviews within their research Moust et al. states that even teachers who have been conducting PBL practices can fall victim to this fear of not giving the students enough guidance or resources.

CHAPTER III: DISCUSSION AND CONCLUSION

Summary of the Research

To summarize the findings on Problem Based Learning and its effects on motivating students to engage more deeply in the learning process, one must look back on the research one can see that Problem Based Learning has gone through some changes in structure but the basis of Problem Based Learning remains largely the same since 20th century American educational theorist and philosopher John Dewey began to use Problem Based Learning to change America's educational system (Carver & Enfield, 2006).

Both Neville's study (2009) along with Barrows and Tamblyn's study (1980) agree that Problem Based Learning builds a students' useable knowledge base rather than just rot memory base. Both studies focused on students moving towards the medical field. Other researchers that have agreed with Barrows and Tamblyn are Albanese and Mitchell (1993), Akkerman, Van den Bossche, Admiraal (2007), and De Grave, Boshuizen, and Schmidt's *Problem Based Learning: Cognitive and Metacognitive Processes during Problem Analysis* (1996). Within these studies all students were upper level college students and had some background in Problem Based Learning.

Hmelo-Silver (2004), Ames (1992), and Angeli (2002) agreed with De Grave et al. (2004) study that the discussion portion of Problem Based Learning is a foundational building block that supports both students' motivation and their ability to retain usable knowledge. Both groups agree that students learning from students supports both groups. When one student teaches another the teacher and the peer receiving the learning gain a deeper understanding and ownership of the content. Blumenfeld (1992) and Boud (1997)

questioned this portion of learning as he struggled with the direction in which learners will be assessed and how students will be measured during this learning phase. Assor, Kaplan and Roth (2002) expanded on Blumenfeld's thoughts by looking at the impact of a teacher in the self-directed learning portion of Problem Based Learning.

Blumenfeld (1992), Albanese and Mitchell (1993), Berkson 1993, Colliver (2000); Neville (2009), Norman and Schmidt (1992), and Vernon and Blake (1993) all agreed that within Problem Based Learning there is conflicting evidence on whether Problem Based Learning is successfully engaging students in learning. Because of this Wei Hung (2009, p. 532) established that the reason for conflicting evidence is due to the human element within teaching. Hmelo-Silver (2007) also stated that without positive feedback and relationships between teacher/tutor and students there will be discrepancies in learning.

Blumenfeld (1992), Black & Deci (2000) and Boaler (2002) expressed that one of the foundational blocks of being successful within the classroom was the relationship between teacher and student and the best way to bridge the gap of learning is through positive feedback. This allows for teachers guide students while allowing students to have the freedom of choice.

This freedom of choice is agree to have a positive impact on students learning. According to Dolmans & Schmidt (1994); Finkelstein, Hanson, Huang, Hirschman, and Huang (2010) this can be a driving force for students having better engagement in their learning. Evenson and Hmelo (2000) agree but believe it needs to be taken further with having uniquire real world problems being presented. Colliver (2000), Deci and Ryan (2000) Furrer and Skinner (2003), Gijselaers and Schmidt (1995), Marx et al. (2004), and

Mergendoller et al. (2006) find the most important piece is the real world problems. This lends them to agree with Musal et al. (2004), Neville (2009), and Noordzij et al. (2010) agree that the methodology lends itself to guide students to have stronger problem solving skills as adults.

Limitations of the Research

When researching Problem Based Learning there is a great deal of information regarding its influence in today's educational field. When looking to narrow my research I focused on three major aspects of the current scientific articles. First and foremost I needed to have a clear understanding of the basis of Problem Based Learning and the many different types of learning that have stemmed from this method of education. Being able to sort out what was pure Problem Based Learning and what was not showed me that there is a great deal of research on the effects of Problem Based Learning at the collegiate level. This led me to look at the levels of education in which Problem Based Learning has been used whether it is has been successful or not.

When gathering research on the effects of Problem Based Learning I tried to limit myself to learning that was taking place in either undergraduate studies or high school. What I found was there is a lack of research for students under the collegiate level. Many studies were conducted at both the undergraduate level and at the graduate level in the fields of medicine. Many times the studies focused on how a group of medical students were able to conduct understanding issues related to patiences. Which is great, but I felt was not applicable to what I needed in my current state. What I did find is that in order for students to feel successful in a Problem Based Learning classroom they need to have a solid foundation in their learning.

Because students needed to have a solid foundation in their learning I found that studies also looked to compare the success of students in a Problem Based classroom vs. students in a Lecture Based classroom. Within this subcategory of research there was minimal information that depicted a great deal of difference in the success rate of students. What it did show was that there was a difference in the motivation behind the students learning. The questions that this led me to ask were; how does the facilitator affect the student's motivation? Can students who are used to a Lecture Base style of learning easily transition to Problem Based Learning or does there need to be a gradual change in learning styles?

Implications for Future Research

Because the research in areas around PBL in high schools are insufficient to support teachers moving to a PBL style classroom in all academic areas, I think being able to compare choose two classes in the same academic area comparing students testing ability between a pure PBL format and a typical lecture based classroom may show an interesting relationship between how students learn best and how they present the knowledge they learned best. As an example let us look at an elementary classroom.

If the educational outcomes were based on the fourth grade Minnesota State Standards it would be interesting to see how PBL would affect one group of learners verses the other group of learners being taught in a traditional lecture based learning environment. Areas of comprehension could be: student engagement, growth of understanding mathematical concepts, problem solving skills, and finally standardized testing scores.

Using standardized testing scores would be an important addition because this is a standardized measure that shows if a student is able to meet grade level standards. Along with using a standardized measure to demonstrate learning, it allows the researcher to see if PBL has a positive outcome on the student's ability to test. I feel this is not as important as being able to problem solve but in today's educational system being able to pass the test is pivotal for student's success.

Professional Application

Looking back through the research on PBL it is clear to see that even though PBL in it many forms (true PBL to lecture based with some problems to solve) is still a relatively under-used method of educating students in the formative years of school, from Kindergarten through Grade 12. You do see some use of PBL is in the areas of science classes but often these are lecture based classes. The students are solving some problems once they receive all of the knowledge they need to solve the problem given by the instructor, rather than using the problem as a guide for the students learning process.

Along with this, there has been little to no research showing that PBL is in fact more conducive to students' learning. Some studies show that students have enjoyed PBL more than a typical lecture base but the research does not indicate that students actually test better overall. Because of this shortcoming, it is difficult for teachers and districts to a desire to move to this potentially more engaging and active learning style.

Another reason some teachers/districts will struggle to consider bringing more true PBL into the classroom is that there is little available training and curriculum for the staff that would be involved in teaching the PBL course. The lack of curriculum that could support teachers in moving to a more authentic PBL formant simply is either not

very good or does not exist. With that being said it is also quite difficult to use a true PBL format in classrooms that are not based in either science or math. There is very little research that shows PBL being used in an English or social studies classroom.

Learning the foundations of Problem Based Learning in its many dimensions and levels has profoundly changed my view of the educational world. I look back into my educational experience where many teachers stood at the front of the classroom and lectured at students rather than getting into the learning process with students. The purpose of PBL is to bring the student into a new realm of learning and affect the metacognition within learning. The point of learning becomes the process of learning as much as the outcome of the learning process. I believe as educators we are called to understand that not every student is going to be earn a perfect 4.0 in every class and not every student is going to be able to absorb every detail and remember it for the next few decades, but what we can teach our students is the importance of being able to solve a problem and how to research methods in which to solve those problems. The desire to work in education is a calling to more than to just be an administrator of a curriculum. It imperative to teach students how to be lifelong learners. Teachers need to educate students on the process and methods used to think for themselves.

The effects of studying PBL have shown me that I need to understand the why behind what I teach. Why is this important and how is this building my students to be modern thinkers in an ever changing world. Looking at PBL has shown me that as an educator, it is much more effective to come alongside a learner and support the journey. While working in special education it is challenging to encourage students with learning disabilities to engage in material that they have struggled with throughout their

educational careers. By using PBL I can support student learning through meaningful engaging questions that may impact their lives. These engaging questions give students ownership in their learning. With that ownership, it may impact them on a level that lecture and testing cannot accomplish. When students take ownership, they begin to change the way in which they interact with the class material. An example can be given within my math class. My demographic of students will need math that can use throughout their lives such as computing hourly wage, shopping, and most importantly budgeting for life. By building PSL in these areas, students can see the effects math has on their lives.

When students leaves the world of academics and move into the workforce, they are given problems in which they need to complete or solve. It is no longer a world of input to output. It is a world of complex competing ideas where companies want professionals that can work as a team to solve complex company problems. This causes me to question how we are teaching and preparing our youth for life after high school. Are we as educators providing the best education by sticking with what we know as teachers or are we continuing our own education that allows us to aid our students in the ever changing world? I plan to advocate that my students will be lifelong learners that can meet the demands of today's world.

Conclusion

Looking back at the direct influence Problem Based Learning has on students' engagement it is clear that it has a positive impact when presented to students with real world application. Through the structure of Problem Based Learning both educators and students have the ability to take ownership of learning and allows for students to use

information and skills gathered in future presented problems compared to the rot knowledge learned in Lecture Based Learning. Overall, Problem Based Learning garners greater depth of understanding and application for students.

References

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

Albanese, M. A., & Mitchell, S. (1993). Problem-based learning: A review of literature on its outcomes and implementation issues. Medical Education, 34, 729-738.

Akkerman, S., Van den Bossche, P., Admiraal, W., Gijselaers, W., Segers, M., Simons, R-J., & Kirschner, P. (2007). Reconsidering group cognition: from conceptual confusion to a boundary area between cognitive and socio-cultural perspectives? Educational Research Review, 2, 39- 63.

Ames, C (1992). Classroom: Goals, structures, and student motivation. Journal of Educational Psychology, 84, 261-271.

Angeli, C. (2002). Teacher's practical theories for the design and implementation of problem-based learning. Science Education International, 12(3), 9-15

Assor, A., Kaplan, H., & Roth, G. (2002). Choice is good, but relevance is excellent: Autonomy-enhancing and suppressing teacher behaviours predicting students' engagement in schoolwork. British Journal of Educational Psychology, 72(2), 261. https://doi-org.ezproxy.bethel.edu/10.1348/000709902158883

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

Barrows, H.S. (1996). Problem-based learning in medicine and beyond. In L. Wilkerson & W. H. Gijselaers (Eds.). Bringing problem-based learning to high education: Theory and practice. New directions in teaching and learning (Vol. 68, pp. 3-12). San Francisco: Jossey-Bass.

Bereiter, C. & Scardamalia, M. (1989). Intentional learning as a goal of instruction. In Resnick, L.B. (ed.) *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser,* Erlbaum, Hillsdale, NJ, 361-392.

Berkson, L. (1993). Problem-based learning: Have the expectations been met? *Academic Medicine,* 68 (Supple. October), 79-88.

Boud, D., & Feletti, G. (1997). Changing problem-based learning [introduction]. IN D. Boud & G. Feletti (Eds), The challenge of problem-based learning (2nd ed.; pp.1-14) London: Kogan Page.

Black, A.E. & Deci, E. L. (2000). The effects of instructor's autonomy support and students' autonomous motivation on learning and organic chemistry: a self determination theory perspective. *Science Education, 84*, 740-756.

Blumberg, P. (2000). Evaluating the evidence that problem-based learners are self-directed learners: A review of the literature. In D. H. Evensen & C. E. Hmelo (Eds.), Problem-based learning: A research perspective on learning interactions (pp. 199-226). Mahwah, NJ: Lawrence Erlbaum.

Blumenfeld, P. C. (1992). Classroom Learning and motivation: Clarifying and expanding goal theory. *Journal of Educational Psychology, 84*, 272-281.

Boaler, J. (2002). Learning from teaching: Exploring the relationship between reform curriculum and equity. *Journal for Research in Mathematics Education, 33*(4), 239-258. Retrieved from http://tnl.esd113.org/cms/lib3/WA01001093/Centricity/ModuleInstance/276/BoalerReformCurriculumandequity.pdf

Cindy E. Hmelo-Silver (2005). Problem-Based Learning: What and How Do Students Learn? *Educational Psychology Review*, *16*., 235-266.

Colliver, J. A. (2000). Effectiveness of problem-based learning curricula: Research and theory. *Academic Medicine, 75*(3), 259-266.

Deci, E. L. & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and self-determination of behavior. *Psychology Inquiry, 11*, 227-268.

Deci, E. L. & Ryan, R. M. (2008a). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology, 49*, 14-23.

De Grave, W., Boshuizen, H., & Schmidt, H. (1996). Problem based learning: Cognitive and metacognitive processes during problem analysis. *Instructional Science, 24*(5), 321-341. Retrieved from http://www.jstor.org.ezproxy.bethel.edu/stable/23371327

Dolmans, D. H. J. M., & Schmidt, H. G. (1994). What drives the student in problem-based learning? *Education,* 28, 372-889.

Evenson, D.H., Hmelo, C.E. (Eds.). (2000). Problem-based learning: A research perspective on learning interactions. Mahwah, NJ: Lawrence Erlbaum.

Finkelstein, N., Hanson T., Huang, C. W., Hirschman, B., & Huang, M. (2010). Effects of problem based economics on high school economics instruction. (NCEE 2010-4002). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retriueved from http://www.bie.org/research/study/experimental_study_of_bie_project_based_economics_units

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology, 95*, 148-162.

Gijselaers, W. H., & Schmidt, H. G. (1990). Development and evaluation of a causal model of problem-based learning. In Z. H. Nooman, H. G. Schmidt, & E. S. Ezzat (Eds.), *Innovation in medical education, an evaluation of its present status* (pp. 95-113). New York; Springer Publishing.

Gijselaers, W. H., & Schmidt, H. G. (1995). Effects of quantity of instruction on time spent on learning and achievement. *Educational Research and Evaluation, 1*(2), 183-201.

Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and achievement in problem-based and inquiry learning: A response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist*, 42(2), 99-107.

Hmelo-Silver, C. (2004). Problem-Based Learning: What and how do students learn? *Educational Psychology Review*, Vol. 16. Pp. 235-266.

Hmelo, C. (1998). Problem-based learning: Effects on the early acquisition of cognitive skill in medicine. *Journal of the Learning Sciences, 7*, 173-208.

Hung, W. (2011). Theory to reality: a few issues in implementing problem-based learning. *Educational Technology Research and Development. 59*(4), 529-552.

Hung, W. (2009), The 9-step process for designing PBL problems: Application of the 3C3R model. *Educational Research Review, 4*(2), 118-141.

Kischner, P.A., Sweller, J., & Clark, R. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery,

problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75-86.

Marx, R.W., Blumenfeld, P.C., Krajcik, J.S., Fishman, B. Soloway, E., Geier, R., & Revital T. T. (2004). Inquiry-based science in the middle grades: Assessment of learning in urban systemic reform. *Journal of Research in Science Teaching, 41*(10), 1063-10180

Mergendoller, J. R. Markham, T., Ravitz, J., & Larmer, J. (2006). Pervasive management of project based learning: Teachers as guides and facilitators. In C. M. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management*: Research, practice, and contemporary issues, Mahwah, NJ: Lawrence Erlbaum inc.

Moust, J. H. C., van Berkel, H. J. M., & Schmidt, H. G. (2005). Signs of erosion: Reflections on three decades of problem-based learning at Maastricht University. *Higher Education*, 50, 665-683.

Musal, B., Gursel, Y., Taskiran, H. C., Ozan, S., & Tuna, A. (2004). Perceptions of first and third year medical students on self-study and reporting processes of problem-based learning. *BMC Medical Education, 4*(16).

Neville, A.J. (2009). Problem-based learning and medical education forth years on. *Medical Principles and Practices, 18*, 1-9.

Norman, G., & Schmidt, H. G. (1992). The psychological basis of problem-solving learning clinical curriculum. *Medical Education, 34*, 608-613.

Noordzij, G. & Te Lindert, A. (2010). The effects of goal orientations and quality of problems on students' motivation in a problem based learning environment.

Poster presented at the self-determination theory conference, Gent, Belgium (May).

Pedersen, S. & Liu, M. (2002-2003). *The Transfer of Problem-Solving Skills from a Problem-Based Learning Environment: The Effect of Modeling an Expert's Cognitive Processes*, Winter 2002-2003: 35(2) 303-320.

Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education: Theory, research and applications.* Upper Saddle River, NJ: Prentice Hall Merrill.

Ryan, A. M. (2000). Peer groups as context for the socialization of adolescents' motivation, engagement, and achievement in school. *Educational Psychologist, 35*, 101-111.

Schmidt, H. G., Loyens, S. M. Van Gog. T., & Paas, F. (2007). Problem-based learning is compatible with human architecture: Commentary on Kirschner, Sweller, and Clark (2006*). Educational Psychologist, 42*, 91-97.

Schmidt, H. G., Van der Molen, H. T., Te Winkel, W. W. R., & Wijnen, W. H. F. W. (2009). Constructivist, problem-based learning does work: A meta-analysis of curricular comparisons involving a single medical school. *Educational Psychologist, 44*, 227-249.

Schwartz, D. & Martin, T. 2004. Inventing to prepare for future learning: The hidden efficiency of encouraging original student production in statistics instruction. *Cognition and Instruction, 22*, 129–184.

Torp, L. & Sage, S (2002). *Problems as Possibilities: Problem-Based Learning for K-12 Education*, 2nd Edn., ASCD, Alexandria, VA.

Van den Hurk, M. M., Dolmans, D. H. J. M., Wolfhagen, I. H. A. P., & Van der Vleuten, C. P. M. (1998). Essential characteristics of student-generated learning issues in a problem-based curriculum. *Medical Teacher, 20*(4), 307-309.

Van den Hurk, M. M., Dolmans, D. H. J. M., Wolfhagen, I. H. A. P., Muijtjens, A. M. M., & Van der Vleuten, C. P. M. (1999). Impact of individual study on tutorial group discussion. *Teaching and Learning in Medicine, 11*(4), 196-201.

Van den Hurk, M. M., Dolmans, D. H. J. M., Wolfhagen, I. H. A. P., & Van der Vleuten, C. P. M. (2001). Quality of student-generated learning issues in a problem-based curriculum. *Medical Teacher, 23*(6), 567-571.

Van den Hurk, M. M., Wolfhagen, I. H. A. P., Dolmans, D. H. J. M., & Van der Vleuten, C. P. M. (1999). The impact of student-generated learning issues on individual study time and academic achievement. *Medical Education, 33*, 808-814.

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

Walker, A. & Leary, H. (2008). A problem based learning meta analysis: Differences across problem types, implementation types, disciplines, and assessment levels, *Interdisciplinary Journal of Problem-based Learning, 3*(1), 12-43. Retrieved from http://docs.lib.purdue.edu/ijpbl/vol3/iss1/3

West Virginia Board of Education (2008). *21st century learning skills and technology tools content standards and objectives for West Virginia schools* (Policy 2520.14). Charleston, WV: Author. Retrieved from http://wvde.state.wv.us/policies/p2520.14.pdf

Wentzel, K. R., Jablansky, S., & Scalise, N. R. (2018). Do Friendships Afford Academic Benefits? A Meta-analytic Study. *Educational Psychology Review, 30*(4), 1241–1267. https://doi-org.ezproxy.bethel.edu/10.1007/s10648-018-9447-5

Wijnia, L., Loyens, S. M. M., & Derous, E. (2011). Investigating effects of problem-based versus lecture-based learning environments on student motivation. *Contemporary Educational Psychology, 36*(2), 101–113. https://doi-org.ezproxy.bethel.edu/10.1016/j.cedpsych.2010.11.003

Zwaal, W., & Otting, H. (2016). Performance of the Seven-Step Procedure in Problem-Based Hospitality Management Education. *Journal of Problem Based Learning in Higher Education, 4*(1), 1–15. Retrieved from http://ezproxy.bethel.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1124227&site=ehost-live&scope=site