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Is Problem-Based Learning (PBL) An Effective Teaching Method?

A Study Based on Existing Research


Är PBL en Effektiv Undervisningsmetod?

En Studie Baserad På Existerande Forskning

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<p>Titel</p> <p style="text-align: center;">Är PBL en Effektiv Undervisningsmetod? En Studie Baserad På Existerande Forskning</p> <p>Title</p> <p style="text-align: center;">Is Problem-Based Learning (PBL) An Effective Teaching Method? A Study Based on Existing Research</p> <p>Författare Lisa Pagander & Jason Read</p> <p>Abstract</p> <p>The purpose of this paper is to examine the empirical research supporting the effectiveness, or ineffectiveness of PBL as a teaching method. Secondly, if PBL is an effective method, what does research say about the relevance of PBL in connection to the Swedish secondary school curriculum. We took an in-depth, critical look at the existing research to find any commonalities or any major contradictory findings.</p> <p>Results show that there is contradictory evidence regarding the effectiveness of PBL as a teaching method with the majority of support for PBL coming from the educational medicine field. Results also show that very little research exists concerning how PBL relates to the guidelines set out in the Swedish School curriculum (GY11).</p> <p>After presenting the results we discuss the implications that PBL present as a teaching method, as well as major problems encountered, and how these findings relate to the teaching profession in Sweden.</p> <p>Lastly, we discuss how further research could be beneficial to support the use of PBL.</p>

<p>Nyckelord PBL, Problem-based learning, PBL effectiveness, PBL in Swedish Schools</p>

Abstract

The purpose of this paper is to examine the empirical research supporting the effectiveness, or ineffectiveness, of PBL as a teaching method. Secondly, if PBL is an effective method, what does research say about the relevance of PBL in connection to the Swedish secondary school curriculum. We took an in-depth, critical look at the existing research to find any commonalities or any major contradictory findings.

Results show that there is contradictory evidence regarding the effectiveness of PBL as a teaching method with the majority of support for PBL coming from the educational medicine field. Results also show that very little research exists concerning how PBL relates to the guidelines set out in the Swedish School curriculum (GY11).

After presenting the results we discuss the implications that PBL presents as a teaching method, as well as major problems encountered, and how these findings relate to the teaching profession in Sweden.

Lastly, we discuss how further research could be beneficial to support the use of PBL.

Contents

1. Introduction	4
1.1 Objective	4
1.2 Questions	5
1.3 Definitions or What is PBL?.....	5
1.4 Background (Development of PBL).....	7
2. Literature review.....	10
2.1 Pro PBL.....	10
2.2 Neutral PBL.....	11
2.3 Against PBL.....	12
2.4 Factors affecting the effectiveness and implementation	12
2.5 Literature regarding “Ethical concerns”	13
2.6 SLA and Pedagogical literature	14
3. Method	14
3.1 Implementation	14
3.2 Data Collection.....	14
3.3 Processing the literature.....	15
3.4 Ethical concerns of the research.....	17
3.5 Problems encountered	18
4. Results.....	19
4.1 The Advantages of PBL.....	19
4.1.1 Effectiveness	19
4.1.2 Implementation / Curriculum	23
4.1.3 Assessment	23
4.1.4 Role of the Teacher	24
4.2 The Disadvantages of PBL	24
4.2.1 Effectiveness	24
4.2.2 Implementation/Curriculum.....	27

4.2.3 Assessment	28
4.2.4 Role of the teacher	29
5 Conclusion.....	30
6 Discussion/ professional relevance.....	32
7 Suggestions for Further Research.....	34
Works Cited.....	35
Appendix 1	39
Appendix 2	40

1. Introduction

It cannot be denied that being a teacher today requires a vast and extensive toolbox of disciplines; from pseudo-parents fostering societal values, to psychologists who understand the individual needs of the student. To reach all of our students we need to be equipped with the ability to modify our teaching methods to match their learning abilities. Teaching methods change, are disputed, and new methods are suggested as the pendulum swings between operant conditioning and constructivist theories of education.

The Problem-Based Learning (PBL) method is of special interest to us as it seems to be a “popular” method for teaching. Through exposure to varying degrees of PBL in our practical training to hearing high praise for the method from more experienced teachers, we thought a closer, more critical look at it was necessary. We cannot, in clear conscience, just accept new methods as “the best” without closer examination; our standing as professionals counts on this. As mentioned above, the popularity of methods changes as new research is conducted. As future teachers we owe it to our future students to be not only proficient in our chosen subjects, but also proficient in our pedagogical methods. If PBL is “the best” method, and is applicable to second language acquisition (SLA), we are obliged to use it in our classrooms.

The constructivist method of PBL is the focus of this paper as PBL has been promoted by many as the best method to foster learning through discovery. We will use the most current research possible in the field of pedagogy and, although heavily biased towards medical schools, discover what current research says about the effectiveness of PBL.

We will take a closer look at both the positive and negative aspects of PBL and the success and failure rates of PBL as an inductive method. We will take into consideration such factors as; frequency, whole school vs. one class, role of the teacher, assessment, and group size influence the effectiveness of PBL. Finally, if the effectiveness of PBL is established, how does PBL relate to the requirements set in the guidelines of the Swedish Secondary School curriculum (GY11).

1.1 Objective

The main focus of this paper is to take an impartial look at PBL as a teaching method and the empirical evidence which backs up its effectiveness and if it is then appropriate for use according to the goals and guidelines set out in section 2 of GY11.

Quite simply, does the evidence provided in PBL research support the supposed effectiveness of the method?

1.2 Questions

With the above-mentioned objective in mind, we formulated two research questions which we considered paramount in the field of PBL.

- What is the empirical evidence regarding the advantages and disadvantages of PBL in the classroom?
- If PBL is effective, what does research say about the relation to the GY11 goals and guidelines for English?

1.3 Definitions or What is PBL?

PBL is defined by Howard Barrows, American physician and medical educator, (1996) as a learning method which involves student centered learning in small groups lead by a tutor or “expert”, rather than teaching using traditional lecture teaching. The role of the tutor is to guide the students toward discovering answers on their own rather than to simply provide the correct answer. Through the guiding process the tutor will stimulate the students’ cognitive learning process and problem-solving skills with self-directed learning (SDL), also known as auto didacticism. Auto didacticism, which is commonplace in higher learning, is the idea that the teacher does not need to schedule learners’ private time. Students are expected to be able to organize their lives, studies and learning in a manner which prepares them for their chosen profession (Armstrong, 2012).

However, the tutor needs to lay out the curriculum/plan according to the concrete seven-jump method which is to be followed when working with PBL. These seven “steps” are, according to Dejan Bokonjic, (2009) and Henry Egidius (1999b), as follows:

1. **Clarifying terms** – First, the group of participating students draw a table on the board in the classroom, consisting of four columns: Facts in the text, Problem, Hypotheses about cause and effect, and Learning objectives. The text with the problem to be identified and solved is then introduced to the students, and unknown terminology

is explained and clarified. After this the facts presented in the text are listed in the “facts in the text” column on the board.

2. **Defining the problem** – The second step consists of group discussions of what the problem is and which methods can be used to find the solution. The identified problem is then written down in the “problem” column on the board.

3. **Brainstorming** – Another group discussion is held where the students use their prior knowledge to come up with ideas for different hypotheses to explain the problem. During this step all students are encouraged to speak their mind and all ideas are valued and noted.

4. **Structuring and hypothesis** – A review of step 2 and 3 is carried out and different possible explanations of the problem are given, eventually leading up to one final structured hypothesis, which is then written down in the “hypotheses about cause and effect” column.

5. **Learning objectives** – When the hypothesis is chosen and formulated the students must agree on achievable and comprehensible learning objectives for the task. These objectives will be the necessary knowledge the students need to acquire before they will be able to continue on working with their hypothesis. These learning objectives are written down in the “Learning objectives” column on the board.

6. **Searching for information** – The search for information is done individually and with emphasis on mutual learning objectives. This will provide the students with a more profound knowledge regarding the problem they are working on. The minimum time for this research is two days, but can preferably go on for a longer amount of time, since the students are given the opportunity to find their own resources and might need the extra time to research their credibility.

7. **Synthesis** – During the final step the members of the group share the results of their individual findings, including structures, functions, causes etc. with each other. With this new information they analyze the stated problem and, hopefully, they come to an understanding of, and solution to the identified problem.

8. **(Feedback)** – Feedback is given both from the students and the teacher, regarding their individual and group process, the organization of the task, and the teacher’s guidance. This is done with the aim of improving the work process for the next session.

1.4 Background (Development of PBL)

Throughout the history of teaching, there has been a debate concerning the most efficient and effective way for teachers to teach their students as well as how the students learn and acquire new knowledge. This debate has led to the development of several different methods, whose founders all state that their method is the most efficient and suitable one. These methods are all based upon different theories about how we learn and acquire new information.

Barrows writes that students attending medical school felt bored and unmotivated by their studies as a result of the “the vast amounts of information they had to absorb, much of which was perceived to have little relevance to medical practice” (1996, p. 4). As there is a general consensus that motivation is critical for students’ learning (Moskovsky, Alrabi, Paolini, & Ratcheva, 2013) this was of major concern for medical schools. As a result of this discontentment among students a new medical school was established at the McMaster University Faculty of Health Sciences. This school used a new and innovative method for teaching their students, which today is known and used worldwide. The name of this method is Problem-Based Learning, PBL.

However, the use of PBL within medical schools did not spread until it was introduced at Harvard Medical School in 1987. The introduction of this problem-based method brought with it several consequences; such as a new curriculum, fewer lectures, and focus on small-group work designed to ensure that the students understood and searched for information necessary for solving a certain problem with relevance for their future profession within medical care (Egidius, 1999a).

As we suggested, existing learning methods are all based on different theories focusing on how we acquire new information and how we learn. PBL is no exception to this and similarities can be found in, as well as parts borrowed from, Donald Schön’s “reflective practitioner”, John Dewey’s “learning by doing”, David Kolb’s learning

circle, Piaget's cognitive development theory, Krashen's input hypothesis, and Vygotsky's concept of the Zone of Proximal Development and scaffolding.

In 1983, Donald Schön, an American educational theorist, published *The Reflective Practitioner*, a book which caused a lot of commotion as it questioned the established idea of researching facts as the basis for more practical professions, such as medicine. Schön believed the previous methods excessively controlled what students had to know and that they consequently did not get a chance to develop and broaden their knowledge sufficiently. Schön described the idea and process of the Reflective Practitioner as a situation where;

The students were confronted with puzzles and problems that did not fit their known categories, yet they had a sense of the kinds of theories that might explain these phenomena. They used their theoretical hunches to guide experiment, but on several occasions their moves led to puzzling outcomes – a process that worked, a stubborn defect – on which they then reflected. Each reflection period gave rise to new experiments and to new phenomena, either troublesome or desirable, which led to further reflection and experiment (Schön, 1983, p. 176).

The PBL-method has adopted the very basis of the reflective practitioner where the students are faced with situations and problems that to be solved acquire, for the students, new and previously unknown knowledge. To help the students reach these premises the teachers will “challenge the prevailing knowledge structure” and “conflicts and dilemmas would surface and move to center stage” (Schön, 1983, p. 335).

The American philosopher John Dewey introduced the concept of “learning by doing”, which is a pedagogical method based on problem solving. John R. Savery (2006) describes Dewey as a man “who believed that education begins with the curiosity of the learner” (p 16). Dewey reckoned that a student will not learn or understand much if he/she does not actively experiment with those phenomena that he/she wishes to acquire knowledge about. Egidius' (1999b) comparison of “learning by doing” and PBL shows that both are methods where theory, practice, reflection, and acting are interconnected (p.35ff). A student's knowledge must be useful and have a connection to real life. The students should be engaged in the assignment, observe facts, and they must come up with ideas for how to solve the problem. The search for a solution starts with the students imagining different scenarios for solving the problem,

the potential outcomes, and choosing the hypothesis they decide will most likely be successful.

The American psychologist David Kolb introduced the theory of experiential learning during the 1970s to 80s. This is a theory which has its foundation in concrete experience: an experience that is both emotional and intellectual (Egidius, 1999b). This experiential learning is based on the interplay between 1) active experimentation which leads to a concrete experience 2) a creative reflection regarding the experience 3) which in turn leads to a formation of concepts and theory 4) and lastly an ability to apply these concepts on practical assignments (Egidius, 2008). This interplay is commonly known as Kolb's learning circle and it shows how important it is to get familiarized with the situation and its different aspects before one starts acting.

Egidius continues to describe the similarities between the seven jump of PBL and the four parts of Kolb's learning cycle, emphasizing that even though one can start anywhere in the learning circle, it is preferred to start with the active experimentation, which is similar to the first step in PBL's seven jump program. While doing this, the learner will "follow the same steps and cycle leading up to the new knowledge" (1999, p. 37).

One of the first to study the thinking patterns of children was the Swiss developmental psychologist, Jean Piaget. Piaget observed the activities of children and later developed tasks to test developmental growth in the children. From this observation came Piaget's idea that cognitive development occurs in stages and that this development progresses through active interaction with the environment and the development of "schemes". This "active interaction" is one of the major components of PBL. Piaget suggests that these schemes are built through self-directed, active interaction and when a new situation, or problem, arises we try to apply our scheme to a new situation (Qayumi, 2001).

Lev Vygotsky, a social constructivist, suggested the idea of the zone of proximal development (ZPD) which is the difference between what a learner can do on their own and what they can achieve with teacher help or scaffolding. He suggests that learning is achieved by imitating and modeling more experienced learners and that social context is required for learning and development (Gebhard, 2008, p. 948). He further suggests that learning and development require authentic tasks to achieve the learner's full potential.

Authentic activities must be relevant to the learner, in other words a “real world” activity. Lastly, Vygotsky suggests that learning is a personal process and in coordination with real-world activities motivation of the student is increased as disinterest decreases (Gebhard, 2008). These factors can be seen in the underlying principles of PBL. Real-world, relevant, authentic situational learning is of core importance to PBL in the medical classroom and the role of the tutor fulfills the need for experienced scaffolding and imitation while peers provide the social learning aspect.

According to the American constructivist Stephen Krashen, the distinction between learning and acquisition is fundamental. Acquisition is how we learn our native tongue as small children whereas learning is a conscious process involving a “teacher” or formal instruction. Acquisition is a subconscious process involving meaningful interaction with the target activity (in this case language) which requires a +1 difficulty level that is just beyond the student’s current ability, similar to Vygotsky’s ZPD. In terms of language acquisition Krashen suggests that natural communicative input is paramount to learning (Krashen, 1981). Real-world situations and natural communication between students are also major components of PBL.

For a visual representation of the connections to PBL please see appendix 1.

2. Literature review

This chapter will provide an introduction of all the literature that we have chosen to use as our sources in this paper. They are divided into different themes, which are common in the different works, to provide a general idea of the literature used and facilitate the understanding of what we have been searching for. The themes are also designed in a way to follow our questions stated in the objective of this paper. Finally, some of our chosen literature lacks publication location and date but we deemed these articles reliable following research of the author(s) in question. The following sections are divided into pro PBL, neutral PBL, against PBL, factors affecting the effectiveness and implementation of PBL, and literature concerning the ethical considerations of PBL research.

2.1 Pro PBL

According to Barrows & Tamblyn (1980) and Egidius (1999a), PBL is a full system (holistic approach) requiring an intensive curriculum shift as well as cooperation

and full support from both teaching staff and administration. Barrows' implementation at McMaster University was a paradigm shift in the way the school operated in response to student's disenchantment and boredom with the current course load which they also felt "had little relevance to medical practice" (Barrows & Tamblyn, 1980). Barrows & Tamblyn point out that PBL is not simply presenting problems to students but a rigorous, structured approach to learning. Victor Forrester & Juliana Chau (1999, p. 10) also suggest that PBL represents a paradigm shift in the way that teachers teach, creating "active questioners" instead of "passive acceptors". It is further suggested by Sandra Kemp (2011) that the adaptation of PBL requires implicit and explicit commitments to the method in terms of stages, roles and assessment methods. The first of these stages requires the teacher (tutor) to accept, or have faith, in the social constructivist theoretical base on which PBL is based and an understanding of constructivism, which is essential to implementation (p 48f).

Woei Hung, David Jonassen & Rude Liu (2008, p. 493) further emphasize the need for a "dogmatic" approach to the tutors' roles, knowledge and assessment. Mark J. Newman's (2005) article, *Problem Based Learning: An Introduction and Overview of the Key Features of the Approach*, provides empirical research into both the effectiveness of the approach as well as a concise summary of the necessity of the key features. Antonia Scholkman & Bianca Roters' (2009) study shows that the use of an inductive method, such as PBL, has a positive influence on students' self-assessment abilities. Lastly, Gaétan Breton (2010) provides empirical data based on the implementation of PBL using very strict parameters which follow the "core values" of the method and reflect the necessity of adhesion to the core elements.

2.2 Neutral PBL

Egidius (1999a) is one of the few advocates of the view that PBL must not be the only teaching method used in the classroom, but it may also be used as a complement to lectures and lessons on condition that it is used consistently. Bokonjic, (2009) has also mentioned this view and the possibility to modify "the seven jumps" according to one's will and learning aim. However, Egidius argues for the importance of using PBL as a complement consistently throughout the school year (1999a).

2.3 Against PBL

Problem based learning is a method that has been highly commended but at the same time criticized. The main criticism raised against PBL is that it is not suitable or applicable for all types of education and that there is a lack of evidence supporting the effectiveness of this theory.

John Sweller (1988) argues in his article, *Cognitive Load During Problem Solving: Effects on Learning*, that the sole use of problem solving methods will interfere with the students learning and not allowing them to analyze and solve newly introduced problems. Woei Hung (2008, p. 530) argues that there are a too great a number of variables affecting the students learning outcome in experiments that are supposed to prove the effectiveness to give a trustworthy result. Newman (2005) and Graham Parton & Richard Bailey (2008) argue that one of the more crucial problems with PBL is that there does not exist one “single unanimous position about the theoretical basis for, or practice of, Problem Based Learning”, and that “there is not even agreement about whether there is or should be one type of Problem Based Learning or many variants” (Newman, s. 12).

Paul Kirschner, John Sweller & Richard Clark (2006) criticize the concept of the tutor as a facilitator and argue that it is in direct conflict with the foundations of what we as humans need to be able to acquire knowledge. Maggi Savin-Baden & Kay Wilkie (2004) point out that Barrows in his article *A taxonomy of problem-based learning methods* (1986) expressed concern “that inadequate tutoring of Problem-Based learning groups would affect the effectiveness of Problem-Based Learning as a strategy” (p 65). Furthermore, Savin-Baden & Wilkie state that there are no results presented in regards to the effectiveness of the role of the tutor. It is further argued by Alan Neville (1999) that the present role of the teacher needs to be revised and redesigned for a teacher to be able to function as a facilitator. Without the needed teacher competences the expected learning outcome of the implementation of PBL will not be realized.

2.4 Factors affecting the effectiveness and implementation

When using a teaching method as PBL one of the most crucial aspects to consider is the method’s effectiveness and how suitable it is for all students, both weaker and stronger. The evidence of the effectiveness in regards to weaker and stronger students is conflicting. Lisa-Angelique Lim & Magdeleine Lew (2012) state, in

their article *Does Academic Performance Affect the Challenges Faced by Students in their Initial Adaptation to a Problem-Based Learning Environment?*, that two studies made by Samsonov in 2006 and Klein in 2007, have reached the same conclusion: the prior academic studies result is crucial for how students will perform in a PBL assignment. The study by Chi Ho Henry Wong, Mei Chu Evelyn Wong & Siu Lun Terence Tang (2011) examined the effects of introducing an inductive PBL teaching method in the classroom with interesting results. The findings show that brighter students benefit more from the inductive approach than the average students. This is further supported by the findings by Michael J. Prince & Richard M Fender (2006), who have been investigating the effectiveness of different inductive approaches. However, the findings of V.C Burch, C.N.T Sikakana, N Yeld, J. L Seggie & H.G Schmidt (2007) also examine the same phenomenon and their findings showed opposing results.

When planning a lesson the goal and preferred outcome are always based on the curriculum; it is the curriculum which “determines how the learning environment is organized” (Poikela & Poikela, 2005, p. 12). Poikela & Poikela (2005) thus argue for the importance of a PBL-focused curriculum. Joseph Tiangco, an associate professor at the Shu-Te University, states that the manner of assessing an assignment is based on the goals stated in the curriculum and Gillian Xiao-Lian Tai & May Chan Yuen (2007) describe in their article the different manners used to assess a PBL assignment correctly. Wim H Gijsselaers & Henk G Schmidt (1990), address the issue of how to evaluate students’ learning outcomes when using PBL as a teaching method, since the methods available today are not suitable for the PBL classroom.

2.5 Literature regarding “Ethical concerns”

For ethical concerns and guidelines we turned to the guidelines from *God Forskningsset* (Good Research Ethics) published by The Research Council of Sweden (2011). These guidelines first and foremost state that “the challenge is to optimize the possibilities to take advantage of the positive effects of the research while minimizing the negative.” As we are Swedish students, in Sweden, we used these guidelines primarily. Further, as most of the research guidelines are based on, and agree with the ethical principles and guidelines set out by the Department of Health, Education and Welfare, we have included it as a cited source.

2.6 SLA and Pedagogical literature

As this paper concerns second language acquisition (SLA) and English as a foreign language (EFL), it requires literature to tie it to our professional relevance. Once again the research is divided between which methods work best for the acquisition of a second language (L2). In a further attempt to keep the paper unbiased we have used SLA literature for definition and explanation purposes. Yule (2010) and Crystal (2011) have provided us with the most current definitions and ideas concerning SLA.

Roger Säljö (2000) concerns the sociocultural perspective of learning through social interaction and interpersonal communication. We chose to use Säljö (2000) to connect our paper to current, relevant, Swedish pedagogical theory.

3. Method

The following chapter gives an account of the strategy used to gather the information that we needed to answer our questions stated in the objective of this paper. A detailed overview of the data gathering process and the data analysis is also given to provide a clearer view of our working process. The chapter presents the ethical concerns and problems encountered during the working process as well as a discussion concerning weaknesses and strengths of the method chosen.

3.1 Implementation

The first purpose of our paper is to take an impartial and critical look at PBL and our data collection needed to reflect this impartiality. We discovered that it is easy to find data using keywords such as “problems with PBL” or “Is PBL effective in today’s classroom” which would create a biased literature base. A further issue is that the definition of PBL in itself is biased as Barrows’ own research and theories led to his creation and dogmatic implementation requirements of Problem-Based learning. Therefore, we are basing our paper on his definition of PBL and his implementation requirements of the method; we refer to this as “dogmatic” implementation. In an attempt to further reduce the biased nature of the research we also took a critical look at the methodology of the selected research.

3.2 Data Collection

The Linköping University general search engine, Libris, was our primary source which gives us access to publications, reports, and books available either in the Hum-

Sam library or online. Within the Libris search option; we narrowed down the list further by using DiVA for published and unpublished student papers and ERIC which is a database with a pedagogical and teaching focused database. One issue which was immediately apparent was the vast majority of information is available in English but Swedish research material and books are limited. We solved this issue by dividing up the search between us because we are both stronger in our native language. Therefore Lisa searched for Swedish material and Jason searched for English material. We conducted our impartial literature search using basic keywords, in both Swedish and English such as; PBL, elements of PBL, PBL in the classroom, PBL in higher education, teaching methods, learning theories, PBL and Second-Language Acquisition, PBL and ESL/EFL, and Problem-Based Learning. These general search terms provide an extensive list of general literature which provided a basic starting point for the definitions and researchers involved in both current PBL research and the background of PBL theory.

3.3 Processing the literature

The general search led to an extensive list of research articles, journals and books which we further narrowed down using more specific search words but continuing to attempt to hold to impartiality. We narrowed down the search to the central figures in PBL and learning theories including; Barrows, Piaget, Chomsky, Dewey, Vygotsky, Schön, Kolb, and Krashen. We then created a matrix of the learning theories (appendix 1) to confirm our assumption that PBL is an amalgamation of elements taken from other learning theories.

Perhaps the most difficult literature to sift through was regarding our “neutral” stance of PBL. As most research is biased, in one way or another, we tried to limit our neutral PBL research search to the originators of the method or those referring to them. Neutral PBL research was searched for using neutral search terms such as “PBL theory”, “PBL in the classroom”, “the implementation of PBL”, and “Problem-Based Learning”. Using the criteria of date written (as close to the original research as possible), references (to the original theories), institution (established research centers such as Harvard), research methods, and critical discourse analysis (register) we tried further to limit the bias our neutral literature collection.

We then narrowed the list further with a quality appraisal. This involved evaluating the methodological quality, precision, and external validity of the articles or books. External validity is of special concern for us as we are looking for PBL research as it pertains to our teaching field, English. The majority of PBL research is conducted in “hands-on” and “problem-solving” type environments; in particular math and medicine.

As laid out by Vetenskapsrådet (The Research Council) (2011) in Sweden, strict guidelines and regulations apply to human subject research. In concurrence, the Belmont Report on Research Ethics in Medicine (1979) lists autonomy, beneficence, and justice as the three major concerns. Autonomy means that the researcher must treat the research subjects as individuals with the ability to make informed decisions and be given informed information about the study as well as full disclosure of the risks involved, benefits, alternatives and the opportunity to ask questions. This asks the question “given the choice of two teaching methods, would I choose to be in the control group or would I prefer the new, better method?” Autonomy also refers to the independence of the researcher and the freedom from influence by parties with other interests in mind. For example, PBL “packages” can be purchased from various suppliers who tout the benefits of the model and the results but do not cite research or sources of their claims. We next needed to find unbiased literature highlighting the benefits or problems with Problem-Based Learning. This limitation affected both the methodological quality and precision checks. As mentioned above, it is easy to search for “problems with PBL/ Advantages of PBL” but this returns biased literature so to avoid this we chose articles and books using those search words, and examined them using the following criteria; Date written, references, institution, research methods, and critical discourse analysis (register) to minimize the biases. We then created another matrix to discover the commonalities of the pros and cons to form a loose generalization of the largest influential factors.

The next step was to find literature and research regarding the use of PBL in the Swedish school system, but this proved somewhat difficult. Using several different combinations of words, both in English and in Swedish, such as “PBL in Sweden”, “PBL i svenska skolor”, and “PBL and the Swedish school system” we still came up with nothing. Considering that the Swedish school system states goals and guidelines

for grading and grades but no reference to methods, or even standard textbooks to use, this was not unexpected.

3.4 Ethical concerns of the research

First and foremost, this research deals with student's lives and futures so one cannot use quantitative research methods. One cannot create a "control" group and teach them using a certain teaching method while testing another group with another method. The ability to control the variables in this situation, and then generalize the results, is next to impossible.

Beneficence refers to the need to maximize the benefits of the research while minimizing the risk of harm (Vetenskapsrådet, 2011). This again prevents a researcher from using real-time students as test subjects because the hypothesis of "one method is better" automatically gives one group an inferior education, or at least suggests that one group must get an "inferior" method of teaching to test if the second method is superior.

Lastly, justice refers to the selection of test subjects. Test subjects must be chosen equally from a population to distribute the proposed benefits and burdens. And again we come to the problem of using real-time students as test subjects. All students are different with different needs, backgrounds, personal situations, study habits and on and on. Neither can all of these variables be accounted for nor can the results be generalized to apply to anything larger than the test class itself.

Another concern we encountered is the application of the method itself in Swedish schools. What we consider here is that this method, theorized by Barrows initially for application in North American medical schools, might not be suitable for the Swedish education system. In particular we are referring to "every person's equal value and solidarity between people" (Skolverket, 2011). For example, Harvard Medical School has strict admission requirements which do not treat people as equals nor does it promote solidarity in its admission process rather it concentrates on the personal life experiences, academic records, applicant's essay, as well as a long list of individual qualities necessary for admission (Harvard Medical School - Requirements for Admission, 2014).

In the final analysis, however, it is not the number of years in college or hours in a course, but the quality of education and the maturity of the student which determine readiness for medical school. At

least three years of college work and a baccalaureate degree are required prior to matriculation. (Harvard Medical School - Requirements for Admission, 2014)

With this in mind, it can be said that people who are accepted into medical school already have exceptional study motivation and self-directed learning abilities, so how can one assume that this method can be generalized to apply to the average secondary student in Sweden where the State curriculum requires that “varje elev” (every student) is given the opportunity to succeed (Skolverket, 2011).

3.5 Problems encountered

One of the major problems we encountered when writing this paper was the lack of research concerning the effectiveness of this method. The studies found that concerned the use and effectiveness of PBL were few and the information given about them vague and to some extent incomplete. In most cases the research method was not mentioned and research was based on previous research or their own, resulting in a biased result. We could only find one source dealing with the use of PBL and its implementation in Swedish schools. The source presented various examples of real-life situations in which PBL had been used, but gave no empirical evidence for why, or even if, PBL gave better result than any other method used. Another reason for the lack of research and reliable empirical evidence is due to the ethical concerns mentioned above.

When writing a thesis paper based on research done by others, it is not possible to have a final result that is 100% unbiased. In every paper and book written, traces of the author’s personal feelings for the subject will be found. We have, as a result of this issue, tried to find as many sources of research arguing for PBL as a teaching method as arguing against it, in an attempt to make this paper as unbiased as possible.

One of the criteria for determining whether or not a source was reliable was the discourse analysis mentioned above. However, a full discourse analysis of the language used in the research we used was not achievable within the time and context of this paper, thus leading up to a very basic and not as detailed analysis as we had hoped for. Because of this, the reliability of some of our sources may to some extent be questionable, but we do argue that the analysis still provided us with the help needed to sort the sources according to relevance and reliability.

During our search for sources we understood that our findings to a great extent depended on what search words we used, resulting in the possibility that we might have missed out on some important sources because we did not use the search words corresponding with the source keywords. We tried to vary our search words, but it was impossible to go through all the different possibilities of combinations as well as going through all of the results from the searches. Furthermore, we decided to read the abstract of the sources found to make a first selection concerning their relevance for our paper. However, some of the abstracts we went through were poorly written and we decided not to include them as sources in our paper, even though there is a possibility that these abstract were parts of articles and books that, potentially, could have been reliable and relevant sources.

Lastly, because PBL was designed for the medical profession, the vast majority of the research concerns the medical field. This, of course, caused a major bias toward the method as students entering medical school are already the upper-achievers, if not the very top of their class. This generalization problem is perhaps one of the most difficult to overcome.

4. Results

In this section we will present the findings of our research regarding the effectiveness of PBL as a teaching method. The result is presented in the same order as our questions were stated, and under headings corresponding to the themes in the literature review.

4.1 The Advantages of PBL

The limited quantitative research shows that there are advantages to using the PBL method, which is based on elements of the inductive and constructivist learning theory.

4.1.1 Effectiveness

Wong, Wong and Tang (2011) studied the effectiveness of adopting an inductive approach, such as PBL, in the classroom. This study was conducted on a sample of students chosen from the class to represent the strongest, middle and weakest students using the results of the English admissions test. The teacher introduced an inductive method covering the English topic of “wh-” questions; who, what, where,

when, which, how and why. They were then tested on their retention of knowledge with a short test concerning grammatical accuracy. The results were compared to examine the efficiency of adopting an inductive approach as well as how varied ability of the students affects the efficiency of an inductive approach.

The quantitative findings show that brighter students, who achieved a mean score of 6 out of 7 benefited more from the inductive approach than the average (mean score: 3.5) or weaker (mean score: 2.5) students (p 177). The study also examined qualitative data in the form of an interview with the same students to take a more in-depth look at the effectiveness of an inductive approach. The interview posed questions from a more personal angle and was conducted in their L1 to illicit free and clear responses. The interview asked the following questions:

1. Which approach did you find more interesting?
2. Which approach did you find more useful?
3. Would you like to learn grammar using an inductive approach or a deductive approach? Why?
4. What were the difficulties encountered when learning grammar using an inductive approach? How did you overcome the difficulties?
5. What kinds of students do you think are suitable for an inductive approach to learning grammar? Why?
6. Do you have any other comments or suggestions regarding the two approaches to grammar learning?

The results of this interview demonstrated that from the students' perspective an inductive approach was more interesting and allows them to think more freely and contributed to their problem solving skills. The students further cited peer interaction and independent thinking as positive aspects of the approach. Lastly, the students remarked that the inductive approach led to exploration and meaningful interaction with English which did not interfere or conflict with their L1 as compared to the grammar translation, or deductive, approach (p 188).

Lim & Lew's (2012) article, *Does Academic Performance Affect the Challenges Faced by Students in their Initial Adaptation to a Problem-Based Learning Environment?*, follows 1019 students in their first year at an unnamed local polytechnic school which uses PBL as its sole method in diploma programs. A quantitative survey conducted at the end of the first year (see appendix 2) questioned the challenges they

faced in adapting to PBL pedagogy. The first result demonstrated that previous academic performance had no significant effect on the challenges faced by students and that PBL was not detrimental to weaker students but did show that weaker students outperformed stronger students in problem-solving skills (2012, p 7). The second result demonstrated a strong correlation between teamwork and performance supporting the claim that good, positive interaction with others in the team leads to better performance, which is one of the core concepts of PBL pedagogy (Lim & Lew, 2012).

Burch, Sikakana, Yeld, Seggie & Schmidt's (2007) study in South Africa examines the outcomes of PBL pedagogy in at-risk students in medical school. This study was done at the end of the seven year MB ChB program at the University of Cape Town with at-risk students who had been accepted into the Medical program as part of the rebuilding after Apartheid. These students are considered "educationally disadvantaged" due to the unequal, educational standards in Black South African schools and "academically at risk" status was created from matriculation of final high schools test scores. A comparative study between the standard Academic Development Program (ADP) and the newly formed PBL program looked at retention and dropout rates plus academic performance of these "at-risk" students. The analysis of PBL implementation suggests that PBL improves academic performance and may reduce dropout rates of disadvantaged students compared to the disadvantaged students in the regular ADP (Burch et al, 2007, p.354). Results concluded that PBL retention rates and academic performance are significantly better for at-risk students compared to the ADP program (Burch et al. 2007, p 354).

The PBL method requires the students to develop self-directed learning skills as well as team skills which are necessary to become independent learners in the medical field. The author cites a 20-year study (Albanese and Mitchell, 1993; Vernon and Blake, 1993) which shows that PBL may increase problem-solving skills and that students are stimulated and motivated by the method (Barrows, 1996, p. 10). Lastly, Barrows & Kelson (1995) have been working at the high school level and have positive results from teachers who see PBL as a way to engage and stimulate students.

A study by Scholkmann & Roters at the Technische Universität of Dortmund (2009) measured the effects of PBL and the professional development of teachers in Germany, Sweden, and the Netherlands. This study concludes that there is no negative effect on the acquisition of knowledge but positive effects on self-assessment abilities, better performance in problem solving and in practical tests (2009, p 5). They cite

positive mood alongside problem-based testing, formative evaluation, and portfolios as keys to success (Scholkmann and Roters, 2009).

Egidius (1999b) suggests that working with PBL prepares the student for work life and focuses on group processes between peers instead of the individual, which is advocated in today's modern workplace. PBL teaches from reality to knowledge, not the opposite which is common in lecture teaching, and solves the problem of connecting facts and issues associated with theory as well as assisting in long-term retention. In today's results-driven workplace, the ability to problem solve is a requirement for students entering the workforce and PBL has been shown to develop these essential skills. Egidius (1999b) further suggests that the teacher's role is to provide the students not only with knowledge but to ensure that they have the ability to acquire it on their own. "We can thus very roughly distinguish between two types of training. One follows the PBL philosophy fully. / ... / The second type is a course where PBL is used as one of many forms of work in a teacher-guided instruction where PBL exercises can be a valuable complement to the teachers 'teaching'" (p. 16).

Breton's (2010) article *Some empirical evidence on the superiority of the problem-based learning (PBL) method* supports the claim that PBL produces better results than lecturing in terms of students' perceptions of acquisition and retained knowledge, long-term problem-solving skills and grades (Breton, 2010, p. 10). This study compares these parameters between traditional lecturing, exams, and assignments with a class taught using an approach. The case study material involved two accounting classes at the University of Montreal over a period of 15 weeks taught by the same teacher using the two different methods. This study shows that students from the experimental group have significantly better results in case-study questions as well as theory-based questions and considered the method to be useful over time (Breton, 2010, p. 11).

Lastly, Kuruganti, Needham & Zundel (2012) suggest in their article *Patterns and Rates of Learning in Two Problem-Based Learning Courses Using Outcome Based Assessment and Elaboration Theory* that, although there are differences in the learning curve, two different courses, Math/Econ and Forestry, benefited from a problem-based method. This study suggests further that the problem-solving skills acquired in the first attempt at a problem are carried on to, and improve, the next attempt. Although this article does not imply that PBL improves knowledge retention, it does suggest that the

problem-solving skill is developed through repeated use of the method (Kuruganti, Needham, & Zundel, 2012).

4.1.2 Implementation / Curriculum

The guidelines set out in GY11 require that students be given the tools to be able to “formulate, analyze and solve problems, reflect over their experiences and their learning, and to solve practical problems and assignments” (Skolverket, 2011, p. 8). As the above results show, PBL is a method which contributes to the development of all of these abilities.

The ideal, most successful, PBL situation is whole-school implementation. Barrows (1996, p. 6) suggests that with a shift, not only the shift of teaching method by one teacher but a department-wide or institutional shift, many advantages can be reached. PBL allows the teacher to see what the students are thinking, what they know and how they are learning and allows teachers to intervene early if any students have difficulties. Barrows further suggests that the students will be alert and motivated instead of being bored or passive (1996, p. 4). Barrows (1996, p. 9) further suggests that by not providing the students with the learning objectives they may pursue areas of study outside of the curriculum.

4.1.3 Assessment

PBL incorporates many forms of assessment, such as portfolios, self-reflection, and peer evaluation. According to Tai and Yung, these forms are all needed to reflect the various facets of self-assessment. For example, a portfolio allows the student to not only see the learning outcome but the learning progress as well (Tai & Yuen, 2007, p. 992).

As stated in Hung, Jonassen & Liu (2008), the ultimate goal of PBL is for students to be self-motivated, independent learners. By using peer review and self-assessment from group interaction students build independence and problem-solving skills on their own. Studies of the long-term benefits of PBL have shown that these skills follow students into their professional lives and give them the tools to be better prepared in terms of inter-personal skills, professional skills, and the ability to plan efficiently and independently (Hung, Jonassen, & Liu, Problem-Based Learning, 2008).

These findings are supported by research showing that authentic self-assessment leads the students to be able to identify their own deficiencies and progress which further builds on the ideas of independent learning (Tai & Yuen, 2007).

Finally, in traditional classroom settings, narrow assessment focuses on rote memory rather than true understanding. PBL assessment incorporates the larger concepts involved and concentrates on thinking and reasoning skills (Waters & McCracken, 1997).

4.1.4 Role of the Teacher

GY11 guidelines state that learning should be student centered, and as teachers we need to convey the societal values of Swedish society (Skolverket, 2011). The teacher is not just facilitating knowledge but guiding students to discover and learn on their own.

Forester and Chau (1999) conducted research to explore the idea that PBL represents a fundamental paradigm shift in pedagogy. This paradigm shift means that students who are free from internal limitations, such as fear of being incorrect, can achieve a confidence boost from an interactive facilitator of knowledge (1999). Further, Forester and Chau suggest that with this paradigm shift to PBL creates an atmosphere in which social competence, sharing feelings and establishing relationships, is developed not only by the students but also by the facilitators or teachers (1999).

4.2 The Disadvantages of PBL

As in the previous section, we will present the disadvantages of PBL in the same order as our initial questions.

4.2.1 Effectiveness

During its' relatively short lifespan, the teaching method PBL has faced both praise and criticism, and one of the strongest proposed criticism is that PBL is not suitable for everyone.

There are not many studies with focus on the suitability of PBL to be found, but those we have encountered have all come to the same conclusion: PBL benefits the stronger students, and not the weaker. Even though the study conducted by Wong, Wong & Tang (2011), as mentioned above, demonstrated that students did prefer inductive teaching rather than deductive, and PBL is considered to be an inductive teaching method, it also demonstrated that the weaker students' development did not

benefit from an inductive method of teaching. This is further agreed upon by Lim & Lew (2012) in their article, *Does Academic Performance Affect the Challenges Faced by Students in their Initial Adaptation to a Problem-Based Learning Environment?* In this article the authors turn our attention to two separate studies by Samsonov, in 2006 and by Klein, in 2007, both investigating the factors which affect students' performances in the PBL classroom: problem behavior, socioeconomic status, previous academic achievements, and scaffolding. Both reached the same conclusion: the students with greater prior academic performances did better in the PBL assignments than those with less prior academic performances.

Lim & Lew's own study of 1019 students, as mentioned above, (the questions used in the study are attached as appendix 2), reached a similar conclusion: the weaker students, who had trouble performing in the subject studied, in this case English, also faced greater challenges in the "presentations, the learning process, and resource management" as well as discovering that the students "found it a challenge to work together in teams /.../ analyze, and synthesize information towards a solution" (2012, p. 4) due to the fact that their English skills were not at the required level.

At the Aalborg University in Denmark Problem and Project Based Learning has been used as complement to other teaching forms, where the students meet once or twice a week to keep the manner of work fresh in their memory. At this university many positive aspects of Project and Problem Based Learning have been observed. However, Michael J. Prince & Richard M Fender (2006), who have been investigating, among other things, the effectiveness of Project and Problem Based Learning at the Aalborg University, write in their article *Inductive Teaching and Learning Methods: Definitions, Comparisons, and Research Bases*, that the authors note that "the experience seems to accentuate the differences between strong and weak students, with the latter being more likely to become demotivated and to make less progress in the distance environment than they do in a conventional classroom environment" (Prince & Felder, 2006, p. 15).

Yet another criticism aimed at PBL as a teaching method is that there is a lack of research and thus a lack of evidence supporting its effectiveness. Hung (2011, p 530) states that studies carried out with the same research question as their foundation have come to conflicting results. He also argues that the existing evidence regarding the effectiveness of PBL cannot be seen as trustworthy because of the vast number of variables affecting the student's desired learning outcome when conducting the

investigations and studies. So far, there is no single method for evaluation, but several to evaluate the effectiveness of different teaching methods. However, these methods only focus on the learning outcome and “they ignore the influence of the instructional and learning processes [sic] on the final student-learning results” thus not taking the significant part of the PBL method into consideration (Gijsselaers & Schmidt, 1990, p. 96).

Hung continues by pointing out that the use of PBL within medical schools and engineering programs as a functional method to develop future problem solving skills is a questionable concept. He bases this assumption on a study compiled of 13 studies which “surveyed medical school graduates’ competences from 1 to 23 years after graduation,” and showed a result with a “weak level of evidence supporting the claim that PBL promotes problem solving skills” (Hung, 2011). He continues by claiming that ritual behaviors undermine the student’s learning and defeat the objective of developing problem-solving and self-directed learning skills, as well as that the “theoretical assumption that problem-driven instruction motivates students’ active learning” is a wrongly formed assumption that lacks evidence supporting it (p 539).

The debate concerning whether or not PBL should be used as the single teaching method for a class or an entire school, or if it should be used as a complement to other teaching methods is still ongoing today. Sweller (1988) argues in his article *Cognitive Load During Problem Solving: effects on Learning* that the sole use of problem solving methods will interfere with the students learning outcome. This is, he argues, because of the fact that students develop, when using PBL, cognitive schemas which make them able to group together the problems they encountered, according to their schemas, and the knowledge they have lead up to. Furthermore, the students will, instead of analyzing and solving the problem, separately apply the already developed schemas and knowledge for how they have learned that a similar problem should be solved, thus not leading up to a further learning outcome (Sweller, 1988, p 261f).

Although PBL proved to be an effective method according to Perrenet’s article on the effectiveness of PBL in the Engineering classroom, it needed to be adapted to meet the specific requirements of the program. Specifically, Perrenet suggests that the knowledge required in engineering is sequential, or each part is needed to move on to successive parts, and cannot be acquired through a hands-on approach (Perrenet, Bouhuijs, & Smits, 2000, pp. 355-356).

Lastly, as mentioned in the benefits section, Kuruganti et al (2012) suggest that there is no increase in knowledge retention and that factors such as prior knowledge and entry grades play a bigger role in the assesment of what is “learned”.

4.2.2 Implementation/Curriculum

One of the major problems a teacher faces using the PBL method is, according to Egidius (1999b), today’s large classroom sizes. Due of the number of students in a class there are very few classes in which one can conduct a PBL session. Egidius (1999b) suggests that the optimal group size should be between five to eight students (p. 52). To be able to conduct a PBL session the teacher needs to divide the class into several small groups and guide all of them at the same time, resulting in difficulties for the teacher to follow each group’s’ progress and problems.

As mentioned before, the goals of a planned lesson must be based on the goals of the curriculum, and the curriculum is written with guidelines for the entire school and not separate classes. Poikela & Poikela (2005, p. 58) claim that to be able to use PBL as a teaching method, the curriculum must provide goals and guidelines according to this method, which means that a curriculum based on the ideas of PBL needs to be used by the school, thus resulting in the entire school working with the PBL method, and not separate classes. This results in problems for Egidius’ (1999b) idea that one can use PBL as a complement to other teaching methods. To be able to do this, the teacher must make sure that what they have planned as a PBL activity follows the goals and guidelines of the school curriculum, which will provide a lot of extra work and time for the teacher.

Newman (2005) and Parton & Bailey (2008) both discuss the fact that, among teachers using PBL as a teaching method, it is not clear exactly what is presented to students in the true name of PBL. Today there are several versions, or hybrids, of the PBL approach; each consisting and including certain aspects of the PBL method as described by Barrows (1996, p. 5f), and each adding and adopting new ones. The fact that there is not one “single unanimous position about the theoretical basis for, or practice of, Problem Based Learning”, and that “there is not even agreement about whether there is or should be one type of Problem Based Learning or many variants” leads to questions being raised concerning the reliability of the studies done focusing on PBL and its effectiveness (Newman, 2005, p 12).

The transformation from the traditional teaching methods to a PBL-centered teaching method takes time and money. According to Berkson, as quoted in Burch, Yeld, Seggie & Schmidt (2007), the findings of a study conducted in South Africa, focusing on the implementation and the effectiveness of PBL, says that PBL has a “considerable potential implications for medical education in South Africa in the face of the relatively greater financial costs inherent in PBL programs” (Burch et al. p.355).

4.2.3 Assessment

One of the major problems a teacher working with PBL faces is the manner of assessing the students work and progress. To accomplish this teachers need to use other methods than simply providing the student with an exam which will test their rote knowledge of a subject, or giving them a grade on a paper written. A PBL assignment is based on problem solving skills through group work, and the questions to be answered here is: how do you assess a student’s problem solving skills? Further, how do you test, or assess, interaction or group work? Tai & Yuen (2007) states that when “assessing PBL, authentic assessment seems as a more appropriate means to assess learning compared to traditional assessments such as norm-reference and standardized testing that assesses recall of factual content knowledge” (p2). Ranald MacDonald (2005) and Tai & Yuen (2007) describe in their articles different manners used to assess a PBL assignment, and Tiangco writes that “the assessment phase should focus on evaluating acts of creativity, problem-solving, self-management, and teamwork” (p. 5). However, it takes much more effort and practice from the teachers to be able to apply the different methods of assessment in a *correct* and *functional* way.

One crucial aspect of PBL is self-assessment; the students participating in a PBL session “have to make statements about what they already know and can do and where there are gaps in their knowledge and competences” (Macdonald, 2005, p. 86). Teaching the students how to self-assess will be an important part of the teacher’s job. When assessing an assignment of any sort, the teacher looks at the curriculum, in this case GY11, to see what his or her students are expected to learn and what they should assess. Tiangco states that “assessment largely hinges on what is perceived as most important in the curriculum” (p 5), and Tai & Yuen (2007) describe this as “the curriculum content in PBL is authentic and resembles the real-world setting, evaluation for students’ work turn into authentic assessment which measure their performance and learning of the authentic content (p 2). Tiangco stated that the manner of assessing an

assignment is based on the goals stated in the curriculum and continues by stating that the assessment methods for PBL do not always match the skills developed and therefore do not properly reflect the “knowledge” gained. To solve this problem, he argues that the curriculum needs to be modified so that “the curriculum can focus on both English language use and in preparing for possible challenges meant to develop the students’ character” (p 6).

4.2.4 Role of the teacher

According to Barrows, the role of the tutor in a PBL classroom is not to convey knowledge to the students but rather to facilitate their learning experience. The students are supposed to understand and determine what it is they need to learn and how to do this on their own with only guidance from the tutor (Barrows & Tamblyn, 1980). Neville (1999) argues that it might be problematic for a teacher, who is accustomed to giving lectures and thus providing the students with the necessary knowledge, to adopt the different role as a tutor. The author continues by stating that there is a risk that the teacher will become a “wallflower”, not providing the students with any help or guidance, or that the teacher will continue with their accustomed role as a lecturer (Neville, 1999, p 393).

Yet another problem addressed by Neville is that the PBL focused curricula developed at different faculties do not follow any unanimously determined guidelines for the tutor, which leads to a confusion regarding how the tutor role should be realized (1999, p. 394). The role of the tutor must be revised, redesigned, and clearly stated in the curriculum as to facilitate the teacher’s transformation from the lecturer to the facilitator before PBL can be a truly functioning method to use in the classroom. Hung (2011) also addresses the problem of inexperienced tutors. For PBL to be an effective approach the group management is a crucial part of the tutor’s job. Hung states that to be able to handle this issue in a satisfactory way, in regards to student development, it “requires sophisticated tutoring and group management skills, which are often not readily possessed by the first-time instructor” (p 542). An inexperienced tutor can thus affect the students’ learning outcome in a negative way.

Research concerning how people learn and what we need to learn shows that “the structures that constitute human cognitive architecture point to the importance of emphasizing guidance during learning” (Kirschner, Sweller, & Clark, 2006, p.

75). Kirschner, Sweller & Clark emphasize that even though the use of minimal guidance within PBL has been used for almost 40 years “there is no body of research supporting the technique. Insofar as there is any evidence from controlled studies, it almost uniformly supports direct, strong instructional guidance rather than constructivist-based minimal guidance during the instruction of novice to intermediate learner” (2007, p. 83).

Methodology and its effectiveness have also been cited as a serious concern for PBL. The problem arises as teachers do not have the same ability to interpret the curriculum and present it clearly and, further, the differences between student groups can lead to differences in learning (Capon & Kuhn, 2004). Simply put, they believe that the variables of the teacher and/or the design of the work are not consistent enough to provide proper quantitative data (Capon & Kuhn, 2004). In terms of group work, Capon & Kuhn (2004) further state that there is no evidence to rule out social transmission as the students might already have pre-knowledge of the subject at hand.

5 Conclusion

The first purpose of this paper was to take an impartial look at problem-based learning and what the empirical evidence says about its effectiveness. Our second aim was to see how PBL as a method is applicable to the guidelines set out in the Swedish curriculum; GY11 in regards to English language learning. As teachers, we strive to give students the best education possible and to accomplish this we require the best possible teaching method. It has been suggested that PBL is one such method; but what does the research say about it?

1. What is the empirical evidence regarding the advantages and disadvantages of PBL in the classroom?

Qualitative research shows clearly that students in PBL classes “feel” like they have learned more and are more engaged in the learning process and engagement is a common goal, and serious concern, of all teachers. The majority of the pro-PBL research suggests that weaker students benefit from teamwork and problem solving sessions in mixed ability groups. It is suggested that PBL also increases the students’ in-school, problem-solving abilities and practical skills as well as contributing to an overall “positive mood” in both the teachers and students. Lastly, the majority of the pro-PBL research also suggests that this method leads to the gain of life skills which are taken

into the professional world such as; planning skills, independent learning skills, independent thinking skills, and reasoning skills.

Contrary to some of the pro-PBL research, con-PBL research shows that this method benefits stronger students who already have a good learning ethic while weaker students find the method challenging. Working in teams and lack of the planning skills required lead to demotivation in weaker students. Further, the con-PBL research denies that the limited quantitative evidence is trustworthy and suggests that the evidence is weak for problem solving and life skills. Lastly, the research suggests that PBL is not suitable for sequential learning subjects, such as engineering, and needs to be adapted to meet the needs of the specific subject. This again refers to rote knowledge rather than problem-solving skills.

2. How do factors such as how often is the method used, whole school vs. one class, role of the teacher, assessment, and group size influence the effectiveness of PBL?

This is perhaps the most disputed area when it comes to PBL as an effective method. Although many pro-PBL researchers stand by the method, they do point out that the current class size makes PBL difficult. Current class sizes are too large thus there are too many groups for the tutor to help effectively but with proper implementation PBL can be a benefit to both teachers and students. For PBL to be effective a “whole school” implementation needs to occur which takes resources which many schools do not have. Further, no single, unanimous theory, or definition, for PBL exists which leads to further implementation problems. Moreover, research suggests that it is difficult to assess problem solving skills, interaction or group work. Today’s standardized testing of factual content does not go hand in hand with the “core values” of PBL as self-assessment critical to PBL. The research also suggests that without properly educated teachers, in the PBL method as well as sophisticated group management skills and tutoring skills, the benefits of PBL cannot be achieved. What all of the research does agree on is that the role of the teacher is paramount and that the curriculum has to match the style and goals of PBL. Lastly, there is no body of data to show anything concrete in terms of effectiveness due to the limitations of ethical research.

3. Research pertaining to the relation of PBL to GY11.

Quite simply, there is no research, which we could find, in regards to the relation of PBL to the current curriculum in Sweden, in the field of EFL or otherwise.

From the body of research we have found, we must conclude that PBL is a method, like all the others, which works in some situations with some students. We must also summarize that not enough research has been done, or really can be done due to ethical limitations, to generalize and concretely state that PBL is a method which increases knowledge retention. What it does do, however, according to the majority of the research, is increase the ability of many students to find the answers through the development of problem-solving skills and independent thinking, increase students' engagement in their education, and promote life skills. Although this is not a specific goal in the course goals for English, it is one of the main points in the overall objectives and guidelines section of the curriculum. GY11 states that: "Det är skolans ansvar att varje elev tillägnar sig goda kunskaper i de kurser som ingår i elevens studieväg och kan använda dessa kunskaper för vidare studier och i samhällsliv, arbetsliv och vardagsliv" (Skolverket, 2011, p. 8). This translates to; it is the responsibility of the school that each student acquires good knowledge of the courses included in the student's course of study and to use these skills for further studies and in social life, working life and everyday life.

6 Discussion/ professional relevance

This study has focused on the inductive PBL approach as well as its effectiveness. What we discovered is that because we are in a knowledge-based or rote memory school system, the effectiveness of PBL does not coincide with summative assessment. As PBL is a life-long learning skill, summative testing cannot assess the effectiveness of PBL in any quantifiable way. We aimed to discover if PBL was a method appropriate for use in Swedish EFL classrooms and the evidence is not conclusive if it is an effective method at all, let alone in the EFL classroom for knowledge retention. Because we are concentrating on EFL, we must be critical of teaching methods which prioritize learning rather than acquisition. Acquisition is the gradual development of an ability, in this case the English language, through natural situations and "relevant language" (Yule, 2010). PBL seems to be a method which focuses on acquisition with the tutor leading the students to find explicit answers when necessary.

Our way to act, think and communicate is highly influenced by our social experiences and relationships, and through the various discussions we encounter and

participate daily we recreate our perception of reality (Säljö, 2000, p. 35). It thus appears to be through the social encounters in our lives that we acquire the most, which is also the idea behind the sociocultural perspective on learning. According to this perspective, learning is a consequence of all human activity which can either occur on an individual or a collective level, such as in classrooms. It is furthermore suggested that our learning experience is highly influenced by our cultural surroundings and how we chose to use the tools provided to us by our surroundings (Säljö, 2000, p. 17f).

For this paper we wanted to focus on a method in line with the ideas of the sociocultural perspective, and in which communication between students had a major focus. We also wanted a method which would be suitable to apply in the Swedish school system, where students are encouraged to try to solve a problem, but where “failure” is an important and acceptable part of the learning process as well. PBL, with its seven step and student focus, is a method which fits in both of these criteria.

Research cannot generalize results from small-scale testing as each class, each student, and each classroom situation is unique and research ethics prohibit any real, large-scale quantitative study. PBL was designed initially for medical school with high achieving students in mind and the research does show that it has been effective in that field but to simply take the method and apply it to other fields, situations, and subjects is difficult.

One of our biggest concerns about PBL was how it is applicable to our classrooms in Sweden. The current system in Sweden uses summative assessment, in the form of standardized national testing, to grade students, not an in-depth, formative look at what the student has done over the term. Although there is a shift in the trend of summative assessment to more formative methods, it remains the dominant method in use today. As our data reveals, for the full effect of PBL to be realized, a whole-school shift and dedication to PBL is required as well as a common understanding of what PBL as a method means. This also is in conflict with the Swedish school system. At the moment, Swedish schools are governed by the municipal government and therefore have very little standardization, except for the National tests, in terms of learning materials or interpretation of the State-provided curriculum goals. This means that not only are schools able to choose relevant methods and interpretations, but individual teachers are left to teach as they see fit. This, however, does open the door for a whole-school implementation of a PBL program and would only require the acceptance of the faculty and proper training. Independent schools in Sweden are an example of how

schools can adopt an overall method, such as Montessori, with some success. However, these independent schools are still required to use State-provided National tests.

Finally, as teachers we are expected to “know” our students’ needs and abilities and provide individual support. We must be able to plan classes and activities to reach all of our students, not just the top achievers. To provide the best possible opportunity to every student we must then understand all available methods and learning theories and use whichever is best suited to each student, group, or class. Until further research concretely proves which method “is best”, we can only aspire to teach in the most appropriate way for our students.

7 Suggestions for Further Research

The Swedish school system clearly has a “student-centered” curriculum so perhaps a larger qualitative study is needed to see how PBL enhances, or diminishes, the students’ learning experiences. Secondly, as educational environments differ from country to country, a more Swedocentric look at PBL is needed because generalizing results from North American, Asian, or African medical schools can not be seen as representative of PBL in general.

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Matrix of Learning Theories

	Dewey	Vygotsky	Krashen	Piaget	Kolb	Schön	Barrows PBL
Teacher's role	Student-Centered	Teacher guided, push students beyond what they can do independantly	Provide tools to help students obtain more input. Use topics which are familiar to the student.	Formal Operational Self directed	Student centered according to their preferred learning style	Student-Centered, where the teacher takes the role as a counseller and guide challenging their previous knowledge	Student centred, Learn in small groups, teachers are facilitators or tutors
Type of Learning	Learning by Doing	Authentic activity, collaboration	Input hypothesis	Self exploration, assimilation and accomodation	Concrete experience	problem solving and reflection	Self motivated, self directed learning
Environment	Hands-on	Authentic, relevant activity	Natural, communicative input.	Provide a suitable environment for students to explore themselves	Experimental learning, creative reflection, formation of concepts, practical application.	solving problems that don't fit in their previous knowledge categories	Problems form the organizing focus and stimulus for learning, relevent and authentic situations
Outcome	Experiential Education	Social interaction initiates cognitive development	Speakers are concentrated not in the form of their utterances, but in the communicative act.	Schemas developed	Learning is an uninterrupted process based on experiences	Experimental reflection	Development of problem-solving skills

Appendix 2

Table 1. Questionnaire items and categories

Scale Item

Teamwork (T)

- T1. I feel unable to lead a team efficiently.
- T2. I feel that my team-mates see my ideas as irrelevant.
- T3. I find that my team-mates are not cooperative.
- T4. I find it challenging to work with people I don't like.
- T5. I find it difficult to work with people who have different working styles.
- T6. I find it difficult to interact with others.
- T7. I find it hard to work in teams because I prefer to work alone.
- T8. I find that not all my team mates are willing or able to share ideas and/or resources.

Learning Process (LP)

- LP1. I find it difficult to speak out and share ideas.
- LP2. I find it difficult to search for the answers myself.
- LP3. I don't know what questions to ask.
- LP4. I don't know how to tell whether other teams have correctly addressed the problem.
- LP5. I can generate learning issues from the problem statement. (rev)
- LP6. I am afraid that I will go off-track.
- LP7. I feel that I am learning alot from PBL. (rev)

Resource Management (RM)

- RM1. I don't know how to find the correct resources to put into the presentation.
- RM2. I am unable to understand the information I find from resources.
- RM3. When I do research, I don't get the answers I want.
- RM4. I find it difficult to find answers to the problem on the internet.
- RM5. I am unsure how to learn without books.

Problems (P)

- P1. I find that the way the problems are phrased makes it difficult to understand.
- P2. I feel that the problems are interesting. (rev)
- P3. I feel that the problems are very general.
- P4. I feel that the problems are not relevant to my daily life.
- P5. I find that I am lost in the problems.

Structure (Struc)

- Struc1. I enjoy going through the same routine everyday. (rev)
- Struc2. I find there isn't enough time to do good research.
- Struc3. I find there is too much to do in one day.

Presentations (Pres)

- Pres1. I find it difficult to present my slides confidently to the class.
- Pres2. I find it hard for me to explain my presentation clearly.
- Pres3. I tend to get stage fright when I present.
- Pres4. I find it difficult to answer questions during my presentation.
- Pres5. I tend to read off the slides when I am presenting in 3rd meeting.
- Pres6. I feel that my language is not good enough for presentations.
- Pres7. I find it difficult to prepare a presentation of good quality.