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Author: Shaun Paul Van Vleck
Telephone: 301-731-9248
Address: Carrera 106A #156-98 Sauces de Suba, Torre 5 Apt 501, Bogotá
Email: shaunv@ciedi.edu.co
Biography: I am in my fifth year as an English teacher in CIEDI and hold a bachelor’s degree in English and Spanish, a Master of Arts in Teaching from Binghamton University, New York and a CELTA Certificate through Cambridge University. I strive to deliver the highest quality education in language and literature.
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Problem Based Learning: An Authentic Education

Abstract

The essay describes an application of problem based learning in a ninth grade English class that begins with a literary text and progresses to a year-long project that teaches research, organizational, writing and presentation skills. The pedagogic theory supporting problem based learning is presented alongside evidence that attests to success in affecting student outcomes. The essay outlines the methodology used to implement this project, including both the stages of the project and their subcomponents as well the skills and teaching support necessary to ensure the success of the project. Through the discussion of the learning process, anecdotes represent the shift in thinking brought about by problem based learning and thus the efficacy of this methodology. This shift in thinking is shown to be transferable across subjects and the critical thinking skills developed are not subject specific but rather transdisciplinary. Problem based learning, as described in the class experience found in this essay, responds to the needs of a postmodern educational system and a conceptual education system as it creates innovative learners who can apply the knowledge they learn. Finally, the essay presents the results in the form of descriptions of the final products as well as improvements in student learning, critical thinking and general satisfaction with their education.
Problem Based Learning: An Authentic Education

Introduction

What was our classroom experience? The students of English 9A learned to solve problems and fix the world. And they had fun doing it. These weren’t problems of grammar or problems one can identify in a literary text. No, these were problems inspired by reading great literature and then looking critically at the world around us. Our classroom experience began with a novel, led to related problems in education, propelled extensive research in academic sources and inspired a project-based solution to these problems that culminated with an action plan and a TED Talk style presentation. These ninth grade students developed serious research skills and a high level of competency in the planning, investigation and composition of an evidence-based proposal for real change. It all began with a novel, *The Curious Incident of the Dog in the Nighttime* by Mark Haddon, and it ended with students investigating and responding to problems they identified in the real world.

The protagonist of this detective novel, an autistic teen, struggles to solve the mysterious death of his neighbor’s dog at the same time as he learns to live in a world that doesn’t accept him or his way of thinking. Despite his brilliance in mathematics, he is educated in a school for the disabled. This unfortunate fact suggested to the students the problems of fairness and methodology in education that they would confront in the project. To begin, I posed a deceptively simple question to the students: What is wrong with education today and how can we fix it?

With a project-oriented approach to problem based learning, the students began by brainstorming as many problems in education as they could, both in their immediate context as well as in Bogotá or Colombia on a wider scale. After thirty minutes, the marker board was filled with ideas, unconnected and in a rainbow of colors. Working in groups of three, the students began to make connections. Such problems as lack of resources, antiquated methodology, low teacher status, misuse of homework, poor student motivation and lack of access to technology appeared alongside many others. It was a map born of years of critical reflection on their own studies as well as a keen eye to the inequalities that surround us in the Colombian educational system.

It is important to note that the students did not receive a specific, narrowly defined problem at the outset. In the article “Authentic Education by Providing a Situation for Student-Selected Problem-Based Learning”, G. Strimel writes that “In an activity developed by the
author, students are provided with a specific situation to which they can relate. This is strictly a situation and not a problem statement, since the students should not be limited to a problem proposed by the teacher” (Strimel, 2014). Without this imposed limit and without a predetermined “correct” answer, the students were free to explore their own paths of research and endeavor to solve the problems that they found important. This is not to say that there were no standards—far from it. The students were challenged to evaluate their sources, clearly define their problem, annotate bibliographies, rank problems, evaluate solutions, adapt strategies and coordinate implementation of their ideas. Skills were honed with the use of professional journals, application of proper citation methods, note taking techniques, outlining for writing, goal setting and of course high-level academic writing. We laughed at one another, sweated the difficulties, lamented the disappointments and often argued about the writing, but in the end the students were proud of both the results and the experience. Here is how we did it.

**Philosophy and Nature of Problem Based Learning**

A traditional educational model often teaches students skills to answer discrete and narrowly defined questions with a given set of information. Memory and a predominantly mechanical application of learning are central to this model, but it lacks critical thinking and the flexibility to solve realistic problems. Borthwick & et. al. write that “Redesigning subjects to include authentic learning therefore has potential to inculcate a critically self-reflective capacity” (2005). A more post-modern approach to education is the Problem Based Learning (PBL) that the students of English 9A experienced. “Problem Based Learning is based on a progressive approach which according to the view of John Dewey, is about introducing students to real life problems and giving them the opportunity to solve those problems” (Dolmans, De Grave, Wolfhagen, Vleuten, 2005). Seldom are students more engaged with their education than when they are hard at work on the real problems that they identify because it is both relevant to them and applicable in the real world. We—children and adults alike—are motivated when we see that our views are considered and our actions have an impact. But does this method improve educational outcomes and build discipline-based competencies? Yes, it does.

The students began ninth grade with an idea of how to write argumentative essays on literary topics. I and other teachers had previously instructed them in proper application of the MLA norms and the structure of argumentative writing as well as source evaluation, but only in reference to a closely defined class essay or presentation. During this project, the quality of the
research improved dramatically with extensive annotated bibliographies feeding directly into essay outlines. Through the writing process, the level of argumentation was critiqued and perfected with outlines and peer-edited drafts until the results were impressive. The students not only improved their ability to investigate, plan and write in their English class, but many of them transferred these skills directly to their MYP Personal Project and other disciplines such as history and math. Theirs is not an isolated success of PBL methods either. Batdi writes in the article “A Meta-Analysis Study Comparing Problem Based Learning with Traditional Instruction” that

According to data obtained from 26 research studies in this meta-analysis study including Masters and PhD theses in Turkey, and from examining the use of PBL in learning environments, there is a positive effect on academic achievement when taught using PBL. Thalheimer and Cook (2002), classify this effect as very large (Batdi, 2014).

The statistical data is there in the educational research on PBL but our classroom experience was eye opening. Students were excited to attend class and often had to be urged out the door at the end of the hour. Students could be heard arguing their proposals during the break times and emailed each other on the weekends. Students ended the year-long unit with advanced skills in research, planning and academic writing. Rather than sitting for a high-stakes exam to demonstrate their skills, their success could be seen in the improving quality of the individual components of their group projects and the impressive final results that brought together all of their research, planning and writing.

The experience of the students was one of critical exploration and discovery as they read and wrote their way to new solutions, but what of the teacher’s experience? Redefined as facilitator rather than teacher, K. Goh lists the attributes and actions, fully detailed in the appendix of the essay, all of which we saw throughout this project:

1. Engaging learners in key concepts, issues and themes according to the lesson objectives
   Helping learns to—
2. reason effectively and develop deep understanding
3. collaborate meaningfully with their peers
4. be self-directed in their learning approach
5. be self-reflective about their learning process

(Goh, 2014)
It was clear from the beginning that this was not going to be a teacher-centered class in which the students looked to a wise master to provide them with facts to be memorized or rote skills to be drilled. This was post-modern. The MYP provided a conceptual framework for a problem based learning project that asked the teacher to step off the stage and allowed students to rise to the challenge to demonstrate not only improved skills but critical thinking and reflection. How was this implemented and what challenges did the students and their facilitator face?

**Implementation**

While neither the literature-based curriculum nor the focus on improving the students’ level of English were abandoned, we were able to devote one hour out of every four to solving the student defined problems. The project was divided into four principal stages and each of these contained several smaller components.

**Stage 1: Identify and Investigate a Problem**

A) Brainstorm possible problems (graphic organizer)
B) Annotated bibliography (minimum twelve sources with analysis and notes)
C) Descriptive essay exploring the selected problem

**Stage 2: Identify and Investigate a Solution**

A) Brainstorm possible solutions (graphic organizer)
B) Annotated bibliography (minimum twelve sources with analysis and notes)
C) Descriptive essay exploring the selected solution in its context

**Stage 3: Develop and Argue for the Solution**

A) Outline with citations and details for the solution essay
B) Position paper for applying the selected solution
C) Complete MLA bibliography for the position paper

**Stage 4: Plan and Present the Solution**

A) An action plan for the solution (human capital, resources, time, stages)
B) A persuasive oral presentation of the plan (eighteen minutes)

Students were given assessment rubrics and detailed instructions for the project one stage at a time and each of the subcomponents was included as a graded assignment. Each of the components was assessed according to the criteria of the MYP, taking into consideration analysis, organization, text production and language use, though never all four criteria in the same tasks.
Formative tasks built to summative tasks, while always aligned according to these four criteria and in a logical progression. This level of documentation allowed students to visualize the big picture while at the same time focusing on the project in stages.

Classes often began with a mini-lesson on research methodology, source evaluation, outlining or the construction of arguments. Ten to fifteen minutes of teacher explanation interspersed with student questions and short exercises were followed by application. It is important to note that the teacher, before stepping into his role as facilitator, became a demonstrator of a project that paralleled that of the students. This project was larger in scope and met professional expectations for research writing, but it followed the same requirements and applied the same research skills the students learned. Before the research question that each group of students posed then workshopped in class was presented, they first critiqued that of their teacher’s project.

In order to teach group work, use of logical outlines and annotated bibliographies, the students were required to write their problem and solution essays in three basic steps that emphasized the importance of evidence and collaboration in academic writing. First, each group of three students created a fully annotated bibliography with notes on a minimum of twelve sources. Second, the students were given one hour to create, as a group, an outline for a 1,500 word essay that presented the problem or solution (depending on the stage) and that referenced the annotated bibliography. The two key elements of this outline were that it contained text notes and it assigned each section to a specific group member. Third, students were given one hour in school to write the essay but were not allowed to interact in any way during this time. Those who constructed logical outlines, inserted supporting information and assigned writing tasks fairly were able to produce cohesive, well-supported essays that read as a single text, all while working separately and only in school. Each section was written simultaneously, then joined.

Each stage and its corresponding components responded to its own unique set of skills and learning dynamics but the constant was the teacher as facilitator, guiding the research process, teaching the skills necessary to achieve their goals and providing constant feedback. The other constant was the role of the students who directed the path of their learning, researched prior art and created their own solutions to the problems that they identified.
Results and Experiences

The results of this project with a PBL focus were profound both with regards to the students’ skills and their ability for conceptual thinking. To illustrate a shift in thinking, one anecdote, though not a planned part of the project, stands out. One of the groups finished early their outline of the proposal essay, complete with detailed references to their annotated bibliography and clearly defined writing points. As the other groups continued to debate the organization of their writing and which pieces of evidence to include, this group turned their conceptual thinking to another problem. Their topic, the low social status of teachers in Colombia and its impact on the educational system, exposed them to the structural inequalities across the nation, not only in education but elsewhere, and one group member asked the key question: what about the armed conflict in Colombia? They had been designing campaigns to raise the status of teachers, some of these based on appeals to traditional figures of authority while others focused on social movements. Here the discussion is recreated with only the embellishments and modifications made necessary by the failings of memory after nine months:

Student 1: Is your family going to pay the exemption from military service?
Student 2: No, I plan to do my service since it’s morally unfair that the rich pay while the poor fight and die.
Student 3: If the Army needs recruits to continue the conflict, then without recruits for the Army they would be forced to seriously negotiate for peace.
Student 1: What if someone paid off all the military exemptions for every poor Colombian? I mean the people who barely earn enough to live and have no hope of paying it themselves?
Student 2: What, like some rich guy? Like Bill Gates?
Student 1: Sure, why not? If the government and the guerillas both invest so much in war, why not peace?
Student 3: But it’s not Bill Gates’ problem, it’s our problem. What if we had a crowdfunding campaign but instead of donating to a music project, everyone in Colombia could put in money to pay off the military service of someone poor?
Student 1: Yeah, since the price is based on the social class and income of a family, it would be easy for even middle class people to pay off the service of poor families.

Student 2: It could be like “adopt a soldier” and maybe instead of destroying the farms of coca farmers, there could be a similar campaign to subsidize their agriculture of other crops too. The money spent on bullets and chemicals could go to the ones who are hurt most and it would take away power from both the Army and the guerillas.

The overheard exchange showed students applying the post-modern type of solution of their education problem—social status of teachers—to a new context. Using research into both context and methodology, they had transferred not the facts gained in their hours of study but instead the way of creatively solving problems. Gone were the old beliefs that the enemy must be defeated with more death and violence and instead they looked to the root causes of the problem: economic inequality and the power incentives on both sides to continue the conflict. This is the power of problem based learning. It teaches and inspires students to think creatively about real problems and generate real solutions. Their idea of a crowdfunding campaign to bring an end to the Colombian conflict was a spontaneous event, not found in any curriculum document or lesson plan, but it is of greater value than any list of memorized facts could be because it is what demonstrates the ability to shape the world rather than repeat the mistakes of history.

The students’ projects, the product of their own interests and research into both problems and solutions, had the following areas of focus: teacher status in Colombia, the proper utilization of homework as a pedagogic tool, the advantages of blended learning to improve learning outcomes and the implementation of problem based learning within the Primary Years Program’s units of inquiry.

The results of the first project were plans for a multilevel campaign to improve the status of teachers and the presentation of this campaign through a TED Talk style video. The second project, the problem of poorly designed or coordinated homework tasks, culminated in a workshop given to teachers that provided the strategies to better design and schedule homework to support the formative learning processes. The third project demonstrated to primary school students and teachers the advantages of blended learning (technology integration) with a working model of a website for extending learning beyond the classroom. The last of the four projects
took the idea of problem based learning itself and applied it to the PYP program with a workshop that outlined how to integrate PBL into the units of inquiry that are so central to the PYP.

Yet these campaigns, workshops and demonstrations, as exciting as they were to witness at the end of the year, were not the truly important results of this problem based learning model. Instead, it was the lived classroom experience of researching problems and theories, proposing solutions and learning how to tackle real world problems with the academic tools of the investigation and writing processes. The nature and results of problem based learning is described by G. Strimel when he writes:

Authentic learning activities involving ill-structured problems do not produce a single correct answer. It is obvious that employing the engineering design process to solve the ill-structured problems in the earthquake situation will not produce similar solutions. Students will be able to have their own voice in solving the problem and be able to apply their own interests and experiences. This leads to a variance in solutions that can be shared as a learning experience among all members of the class. (Strimel, 2014)

There is no one right answer any more than there is one right problem. What matters for the students of the future is how we go about solving our problems. We reflect on where we are, we investigate what has come before, we plan for the future and we propose innovative strategies to overcome the challenges that we face. Our classroom experience began with a novel, a work of fiction—and it concluded with students learning to confront real problems with academic rigor, imagination and the will to make a difference.
## Appendix

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<tr>
<th>PBL facilitator attributes</th>
<th>Examples of facilitator actions in the classroom</th>
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| 1. Engaging learners in key concepts, issues, and themes according to the lesson objectives | - Connect with learners’ starting point and use appropriate scenario settings such as contexts or examples familiar to learners.  
- Scaffold learning by making connections between prior and new knowledge in order to gradually help learners reach the next level of understanding.  
- Use appropriate language, references, and analogies to help learners overcome the challenge of difficult terms.  |
| 2. Helping learners reason effectively and develop deep understanding                       | - Prompt learners to justify their claims and provide examples when explanations are vague or unconvincing.  
- Encourage learners to critique ideas by considering their value and limitations within the context of the problem scenario.  
- Comment on the quality of arguments presented.  |
| 3. Helping learners collaborate meaningfully with their peers                                | - Help learners build on one another’s knowledge by modelling how feedback and constructive criticism are given.  
- Include reticent or quieter learners in group discussions.  
- Create opportunities for shared meaning across groups to take place.  |
| 4. Helping learners to be self-directed in their learning approach                           | - Identify learning obstacles and suggest strategies to manage them.  
- Sharpen learners’ research and information management skills.  
- Develop professional habits of working in learners such as agenda-setting and action-planning.  |
| 5. Helping learners to be reflective about their learning process                            | - Set clear criteria so that learners can evaluate themselves.  
- Draw attention to blind-spots, misconceptions, and weak reasoning so that learners can address them.  
- Give feedback regularly.  |

(Goh, 2014)
References


