



The Problem Log

Newsletter of PBLNet[®] The Problem-Based Learning Network[®] An ASCD Member Network

Network News...

Even though PBLNet is a relatively new member network, we have quickly emerged as one of ASCD's most active networks. The sponsorship and support provided by ASCD, The Hitachi Foundation, and the Illinois Mathematics and Science Academy, as well as our membership, has enabled us to progress quickly. We look forward to another milestone year as we continue to expand our membership and increase our member services.

- **Look** for our Interactive Network Forum on ASCD's WWW site. It is a threaded discussion group moderated by Bernie Hollister, a high school social science instructor and PBL practitioner. We were one of five networks selected to host these forums. It will be up and running this fall. Log on to the ASCD WWW site at <http://www.ascd.org> and click on "ASCD Forums."

- **See** the Charter Member Directory enclosed in this issue of The Problem LOG.
- **Participate** in the PBLNet forum at the ASCD Conference in Baltimore.

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BALTIMORE in 1997

If you are attending the ASCD Conference in Baltimore, consider participating in the PBLNet Forum. We welcome your voice on a panel sharing your experiences and engaging in dialogue with others interested in PBL. Contact Linda Torp for details.

1st PBLNet Forum in New Orleans

PBLNet hosted its first **Network Forum** at the Annual ASCD Conference in New Orleans on Monday, March 18, 1996. Linda Torp, Network Facilitator summarized the goals of the network and overviewed PBL as a curriculum framework and companion pedagogy of worth. Over 50 attendees then heard from panel members who reflected different perspectives and experiences about problem-based learning.

John Thompson, biology instructor at the Illinois Mathematics and Science Academy, shared insights into the power of PBL to advance a goal of deeper and more connected understanding among students in his ecology and genetics classes. John highlighted the experience of students as they grappled with a problem centering upon the reintroduction of wolves into Yellowstone National Park.

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New Orleans (Continued)

Diann Musial, professor at Northern Illinois University (author in the area of assessment), shared the evolution of her beliefs about the worth of performance-based assessments and the power of contextual PBL performances to engender more complex and relevant student learning. *See Diann's article about assessment in this issue.*

Phil Collins, principal of Westgate Elementary School -- Arlington Heights, shared insights into the change process as well as the role of school culture to support and nurture change. Since PBL can be a significant change from the status quo in schools understanding these issues is critical to building a base of support.

Bob Benoit, Butte County, CA, and Director of Project Icarus -- a consortium of interdisciplinary high school teams, shared information about this project and a summer youth program. Bob recounted the effectiveness of the PBL redesigned summer program as compared to the more traditional approach used in prior years. Students learned and produced at higher levels when empowered through PBL.

Nancy Cornell, Director of Curriculum and Staff Development of Rutland NE Supervisory Union, Vermont, shared the rationale and highlights of a Problem-Based Professional Development Program. Nancy detailed the work of educators as they organized their curriculum writing in a problem-based frame.

Following the presentations attendees broke into small groups to discuss specific areas of interest including: PBL at elementary, PBL at middle grade, PBL at high school, PBL and teacher education (preservice and inservice), and PBL and assessment. Discussions were lively and engaging -- interrupted only by the next group's needs to set up for their presentation.

Participant responses to the Forum program were positive and enthusiastic.

"Very informative!"

"Great sense of support!"

"Networking helpful."

"Effective way of improving student learning!"

"I'm interested. I will join!"

Linda T. Torp

Problem-Based

In 1994 the Illinois Mathematics and Science Academy's Center for Problem-Based Learning and the Illinois State Board of Education began a three year collaboration in a state-wide service learning program which integrated problem-based learning. Schools participating in this project were selected through an application process which considered their commitment to service learning and an interest in problem-based learning.

Problem-Based Service Learning (PBSL) reconnects child and community, providing a relational link and relevance for learning. More than volunteerism, PBSL engages students as resources in the solving of real community problems. Not a new idea, but one whose time has come again. Earlier this century Dewey saw the purpose of education to be the teaching of thinking in the context of solving significant community problems. PBSL provides a way for today's educators to immerse students in learning situations which do just that.

In PBSL students:

1. address an unmet community need identified through dialogue with varying community members.
2. grapple with a real-life problem identified at the local level as they develop a response or solution
3. integrate knowledge from multiple disciplines in a most natural way from a holistic, connected perspective.
4. connect with their communities in a meaningful way as active learners, collaborating with community members working toward a common goal.
5. reflect upon their learning and their contribution, generating deeper meaning for both.

The article which follows highlights the experience of one of the project schools, Washington D. Smyser School of Chicago.

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Hot Topic Response...

"Define PBL and its benefits..."

PBL is an inquiry approach to planning curriculum and instruction which places a priority on asking and answering the powerful questions that flow from exploring meaningful problems. A powerful question is composed of several key elements outlined in the acrostic, "LEARNS":

Leads to new questions and further discoveries.

Engages student interest in and active involvement with the topic.

Answers felt needs for knowing more.

Results in feelings of success and accomplishment.

Notes the importance of people, objects, or events (what? or who?), time sequence (when?), locations or origins (where?), and reasons or consequences (why? or how?).

Stimulates further discussions.

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Service Learning

Smyser School

Fifty-six fifth and eighth grade students began a problem-based service learning project at Smyser School and worked in cooperation with Tom Allen, Alderman of the 38th Ward in Chicago.

Our students researched and made recommendations on ways to increase participation by the residents of the 38th Ward in **Chicago's Blue Bag Recycling Program**. Teacher/coaches who assisted the students were Lucy Augustine, eighth grade teacher; Cheryl Lynch, librarian; Camille Tomasello, fifth grade teacher; and Sherry Weinberg, computer teacher.

Our fifth grade students assumed the roles of 4-H Environmental Club Members while the eighth grade students assumed the roles of consultants. Students worked in eight cooperative groups that included both fifth and eighth grade students.

Each of the eight groups chose a leader and group name then decided upon the aspect of the problem they would be responsible for researching. For example:

- the **Lawmakers** focused on determining if Blue Bag Recycling should be made a law;
- the **Questioners** wanted to get more information on how people felt about recycling so they developed and sent out surveys;
- the **Windy City Baggers** wanted to find out if people of the 38th Ward preferred blue bags to an alternative method of recycling.

Students conducted telephone interviews and



From left to right: Tom Allen, 38th Ward Alderman; Sherry Weinberg, Computer Teacher; Cheryl Lynch, Librarian; Jeannie Gallo, Principal; Mayor Daley.

contacted officials at city agencies. They tabulated the results of surveys and contacted suburban communities already involved in recycling. They wrote letters and developed newspaper articles for neighborhood newspapers entitled the "4-H Life Savers."

Other students designed fliers to promote the Blue Bag Recycling Program, and organized a recycling program for Smyser School. Still others conducted exit polls at local businesses in the 38th Ward regarding the blue bag recycling program or distributed surveys to a senior citizen's group and tallied the results.

On April 16, 1996, all student participants went to City Hall, where they met Richard J. Daley, the Mayor of Chicago. They observed the Chicago City council in session, received a guided tour of city hall, and visited the mayor's fifth floor office.

After the conclusion of the regularly scheduled meeting of the City Council, the students

were invited into the City Council chambers to present their recommendations to the Environmental Committee on possible ways to increase participation in the Blue Bag Recycling Program. The Environmental Committee was chaired by Virginia Rugai, Alderman of the 19th Ward. She was joined by Alderman Tom Allen and the other members of the committee.

Chairman Rugai conducted an official meeting of the Environmental Committee. The five member committee listened to the student recommendations and then engaged the students in an intensive question and answer session, giving students the opportunity to expand on their recommendations. The students were impressed with the professional manner in which the meeting was conducted.

Students and teacher/coaches debriefed following the Environmental Committee meeting and critiqued the project. All concluded that the project was not only educational, but also a lot of fun.

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HOT TOPICS...

Each issue of *The Problem Log* will feature questions or topics of interest to PBL educators. **We want to hear from you!!!** Please respond to the following question in 75 words or less:

• We are often asked by parents, students, colleagues, or administrators, "Why PBL?" How would you respond to that question or challenge?

Send your response and identifying information (name, address, grade level, and context) to *The Problem Log*, CPBL, IMSA, 1500 W. Sullivan Rd., Aurora, IL 60506. Several reader responses will be published in the Winter 1997 issue of the PBLNet newsletter, *The Problem Log*.

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Designing Assessments in a

One of the high stakes challenges of problem-based learning design is the development of authentic assessments that provide meaningful experiences for the learner and accountability for the teacher and community. The age-old dilemma of a learner-centered curriculum versus an outcome-centered curriculum is accentuated by the demands of a problem-based learning context. The very nature of such a context focuses on authentically solving a problem without prescribed approaches or solutions. Outcomes, especially concept outcomes provide a requirement and a direction to the problem that may be meaningful to the teacher but not necessarily authentic to the student immersed in a problem. This authenticity tension is especially keen when designing assessments in a problem-based learning context.

If we accept the premise that assessment should be the authentic companion to the problem or process, it is appropriate to examine the natural structure of a problem-based learning experience. A problem-based learning (PBL) experience contains a number of common events: the hook or motivating beginning, problem clarification, data collec-

tion, etc. Several of these PBL events relate quite naturally to the requirements of assessment.

The most obvious assessment event of a problem-based learning experience is the end or

"If we accept the premise that assessment should be the authentic companion to the problem or process, it is appropriate to examine the natural structure of a PBL experience."

final performance. Clearly, when students are asked to construct a response to a specific problem, this final response can be assessed in terms of its suitability to the parameters of the problem. This final performance often takes the form of a presentation or final report. Centering students' attention on this final product is appropriate and reasonable, but limited. There are many other significant indicators of learning that emerge within the problem-solving process itself. If these are not identified as part of the assessment profile, students will focus entirely on the final project and consider the intermediate steps of

the problem-solving process irrelevant or unimportant.

There are, at least, five "natural assessment events" that provide opportunities for teachers to structure assessment activities without interfering with the natural progression of the problem: problem identification, developing a plan (which might or might not include a hypothesis or hunch), data-collection and inference testing, data analysis and synthesis, and communicating a decision or result. These five events, in particular, lend themselves to the specific requirements of an assessment because they require problem-solvers to record their thinking in some sort of definitive manner. By definitive, I mean a direction-setting event, not a specific end. The two-fold challenge for the problem-designer is to (1) determine where these natural direction-setting episodes fall within a specific problem's context and (2) maximize these events or episodes so that students can clearly display what they know and can do.

Assessment, by its very nature, calls on the learner to display something that they know and can do. Any moment that requires the learner to display a point of view and defend

Assessing Students in Cooperative Groups

Cooperative learning activities provide teachers with unique opportunities to observe students interacting as they explain their theories, argue a particular point of view, and help each other. A few minutes of observation during class provides significant insights into a student's ability and performance level. As we observe these learning activities we look for the range of abilities identified by Bloom's Taxonomy, such as:

- understanding of definitions, formulas, and procedures necessary for the solving of problems;
- transfer of knowledge to similar problems or questions;
- extensions of reasoning and analysis to new situations or problems;
- creation of problem statements and questions based on concepts;

- explanations of reasoning.

In this manner we can make recommendations as to materials and procedures which will lead to improved understanding.

Students learning in cooperative learning situations permit teachers to:

- observe the strategies used when working through a problem or assignment;
- identify reasoning, level of knowledge and understanding of concepts;
- identify predominant learning styles;
- identify students in need of guidance;
- determine an approach to most effectively help a student; (We recommend using a questioning approach that guides the student rather than a minilecture approach.)
- encourage conversations between stu-

dents and the teacher; (A classroom environment is thus created that is student oriented.)

- encourage participation since cooperative learning groups are nonthreatening.

Teacher observation of students working in cooperative groups is an assessment tool directed at reflecting upon students' actual learning. The method allows evaluation in a manner that goes beyond merely tallying "correct answers." It provides an understanding of how students reason, analyze and arrive at conclusions. It allows for and encourages differing learning styles.

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Problem-Based Learning Context

it (after some learning or reflection) is a natural assessment opportunity. For example, within the problem identification event, students are encouraged to explore all the problem possibilities. They are asked to note what they know about these problems and to clarify what they do not know. At the end of this problem-finding and identification event, students need to frame the problem and to take a stand. They need to defend why a specific problem statement is the one of most worth. The innate requirement of taking a position and defending it makes this part of the PBL experience ripe for assessment.

Aside from identifying a PBL event that requires students to take a stand, it is critical to transform the event into an assessment opportunity or episode. To transform a PBL event into an assessment episode, the problem designer needs to consider a number of factors:

- *What is the product of the episode?*
- *What form can the product take?*
- *What are the general criteria that should be applied to the product within the context of the entire problem process?*

Once these factors are identified, the PBL event is transformed into a higher stakes, assessment episode. For example, in the problem clarification stage of a PBL experience, students are asked to clarify the underlying problem through a series of activities. If these activities are left somewhat vague, the problem statement will not be clearly recorded; rather, it will gradually evolve and change as the problem-solving process unfolds. If assessment data is to be collected during this stage, a clear direction must be given to students to record and formalize the problem statements. A specific form must be specified and the manner in which the problem will be assessed clarified. This is what is meant by transforming the natural problem-clarification event into an assessment episode. The chart displays how each of the five direction-setting events can be developed into an assessment episodes.

PBL Event	Product	Form	Criteria
Problem Clarification and Identification Teacher Role: Read and listen to students present individual problem statements	Problem Statement	Journal Entry Problem Map Oral Presentation Poster Abstract Statement displays	<ul style="list-style-type: none"> • nature of problem • problem complexity • operability • solvability
Plan Development Teacher Role: Review tasks and listen to students clarify plans	Plan	Task Analysis Timeline GANT Chart Flow Chart Steps Proposal Budget	Tasks are <ul style="list-style-type: none"> • comprehensive • logical • clear • related to nature of problem Controls extraneous variables
Data Collection and Inference Testing Teacher Role: Observe, review notes, data, read journals	Data records Use of Tools Practice of Skills	Tables Charts Field Notes Microscope Use Balance Use Instrumentation Interviews Observations Quizzes Using Notes	Records data accurately Uses tools correctly Practices skills precisely
Data Analysis Teacher Role: Read and review tables	Summary of Findings Frequency Tables Statistical Tables	Summary Statements with Supporting Data Compiled evidence	Statistical techniques are correct Interpretations are logical Collaboratively shares
Synthesizing Capstone Performance	Exhibition/Recital	News article Poem Decision Recommendation Argument Speech Debate	Invention Solution or decision relates to the problem definition Solution incorporates problem parameters


This chart illustrates how PBL events that naturally occur as a problem progresses can be transformed into assessment opportunities or episodes. Generally teachers use these events to gain insight into students' learning but I have found that unless explicit attention is given to clarifying the form of a specific product, the PBL event remains informal and the assessment data are not captured.

In this short article, I have attempted to describe the role that assessment can play within a problem-based learning context. Instead of viewing assessment as something that occurs at the end of a PBL unit of instruction, I have delineated "natural direction-setting events" that lend themselves to assessment. The product, the form and the criteria for each of these events differs. I have even shown a specific place where assessment of prescribed content can occur somewhat naturally (see data collection and

inference step).

I believe that if these different PBL events are maximized by transforming them into assessment episodes, teachers can incorporate pre-formulated content and procedural outcomes without introducing inauthentic time-outs and intrusive assessment methods.

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 **for a feature article by noted PBL authors**
Edwin Bridges (Stanford University)
and Philip Hallinger (Vanderbilt University) in the winter issue of
The Problem Log!

Folk Tale and Fairy Tale Characters as Problem Solvers

Suppose you had a classroom composed of Little Red Riding Hood, Cinderella, Three Billy Goats Gruff, Hansel, Gretel, Three Pigs, Jack (Beanstalk), Goldilocks, Snow White and just for good measure, Lewis Carroll's Alice. It's a small class, just fourteen students, but quite a group of individualists with stories or family histories that would turn a beleaguered family service worker's hair white. How would you help them with problem solving skills? How might they help each other? You would probably start by assessing the skill they have... luckily you know a lot about them.

Most of these characters have "hard luck" stories to tell, but they have survived to tell them. All but Alice (a foil for the others) have had little schooling and have had to learn to solve problems with their wits. What are the problem solving skills this group has learned to use? Are any of the characters using what we would call thinking skills?

Almost all of these characters begin with a trust in themselves. Some are able to maneuver successfully in the world, others run into dangers that are beyond their abilities. Why? Is it all luck or could problem solving have something to do with it? Red Riding Hood misses all the clues given to her. Hansel, however, is a problem solver from the beginning - witness his bread crumb plan.

A learning unit built around these stories might give youngsters an opportunity to identify their own problem solving skills and broaden their repertoire. Central to the unit is learning problem solving strategies, applying them to situations, using them in interactions with others, using information seeking skills, reading, evaluating, and reflecting on knowledge gained. What follows is a basic outline for the unit. Collaborative planning and

teaching is recommended to provide adult assistance as the children assume more responsibility for their own learning. Students may be engaged further as they explore their own interest within the parameters of the unit.

Who were the best problem solvers?

Read folk and fairy tales and decide which characters have the best problem solving strategies.

Problem Solving Strategies:

1. Recognizes problems;
2. Selects major goals;
3. Seeks information;
4. Examines alternatives;
5. Presents problems in terms of resources, constraints, and objectives;
6. Devises a plan;
7. Executes plan;
8. Reframes problems when alternatives are exhausted.

A. Construct a chart like the one below on the wall and update it daily so that all may share in the ongoing development of the unit.

B. Divide children into three small groups using cooperative learning and guided inquiry (Brown and Campione, 1990) techniques. Below are the groups and suggested guides.

- Research, information-seeking, and reading: School library media specialist.
- Writing and thinking: Aides or volunteers.
- Discussion and reading: Teachers.

C. During this time, read Alice's Adventures in Wonderland (Carroll, L.) aloud to help children identify logical and linguistic problem solving strategies (and for fun).

Work Group Suggestions

Groups should help students become more independent as they use research and reading strategies, decision making, and problem solving to learn, think, and create knowledge.

The teachers provide modeling, coaching and feedback as the students learn to learn.

1. Research and reading groups perfect information seeking and evaluating skills as children:

- brainstorm questions.
- use search strategies for finding more sources and adding to their understanding of folk and fairy tales.
- use strategies for evaluating information found based on relevance, reliability, authority, authenticity, etc.
- design other ways to organize stories and keep lists for future reference.
- assess their learning, share strategies with one another, and use new knowledge to ask more questions.

2. Writing and thinking groups engage in writing and communication activities as children:

- write to any one of the characters about how they solved problems.
- compose e-mail messages to other classes sharing information gained and opinions formed.
- create homepages, magazines, and stories critiquing folktales and folk characters.
- rewrite or retell favorite stories.

3. Discussion groups brainstorm questions about the problem solving techniques of the characters and spend time answering their own questions. They share their decisions on the folk tale chart.

If you decide to do this unit or have already done one like it, send me an e-mail message. Talk to you next time or on-line.

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Story	Character	Problems	Strategies used	Prediction for future behavior
Hansel & Gretel	Hansel	Parents plan to abandon them in the woods	1,2,5,6,7,8 (Cite evidence for selections)	Talks to birds, Asks for help, Goes to neighbor
Little Red Riding Hood	Red	Meets evil wolf with sinister intentions	[Uses no strategies, Woodcutter intervenes]	Avoids wolves

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Becoming a Teacher of PBL

Understanding how to implement problem-based learning effectively as a teacher/coach is as important, if not more important, than locating or designing appropriate problem scenarios. At the Center for Problem-Based Learning, we wanted to learn more about the journey teachers travel as they transition from their previous style of teaching to becoming coaches in PBL. We interviewed fifty-two practitioners of PBL in four focus group interviews in January, 1995. The interviews centered around the question,

What does it take to be a teacher of problem-based learning?

We transcribed the four interviews and used a rigorous qualitative data analysis process involving open and selective coding, focusing on Frances Fuller's (1969) stages of teacher development (self, task, and student concerns).

A number of themes were common among many participants. Some teachers reported that their changing understanding of teaching and learning included:

- Making the transition from teacher as information giver to teacher as coach is difficult;
- Becoming a proficient teacher/coach requires learning new skills, such as how to question students more effectively;
- Designing problem scenarios requires an understanding of problem-based learning, curriculum, embedded instruction, and authentic assessment;
- Colleagues may not understand or fully support teachers of PBL;
- Learning, planning, designing, and implementing problem-based learning takes a great deal of time and resources;
- Experiencing the power of teaming was one of the greatest benefits mentioned;
- Through PBL, many teachers rediscovered the excitement and fun of teaching and learning and developed more confidence in their professional abilities;
- Teachers found students' excitement about PBL to be rewarding and important;
- Teachers found they began to trust more in their students' abilities.

Teachers reflected on their role as coaches:

"The hardest thing, I think, for us to learn [about being a guide] is finding the balance between what do they all need to know now, so I need to teach a lesson about that, and letting them go to explore and maybe get a little frustrated and come back and work with the information."

"It's not like there was something missing before PBL, but it gives us the opportunity to work together as professionals because you can't teach and not have conversations about learning anymore."

"Understanding how to implement problem-based learning effectively as a teacher/coach is as important, if not more important, than locating or designing appropriate problem scenarios."

Teachers were also excited about the potential of PBL for students:

"One of the bonuses [of PBL] is that they have to be active participants in the learning process. They can't sit there and absorb information like a sponge."

"Suddenly they have real tasks to do and real reasons to want to learn about things. It's like people are taking them seriously as learners; it's not just a mock situation."

"We had one set of kids making recommendations about district policy to two school board members, a superintendent and a principal."

What are some implications, then, for those of us working with teachers who want to become teachers of problem-based learning?

There are three basic issues:

1. It is essential to stress coaching skills, because the effectiveness of the teacher as coach is a critical component to the success of PBL;
2. It is important to consider the relationships among teachers' beliefs, their classroom practices, and changes in student learning

outcomes in helping significant change to occur (Richardson, 1990);

3. It is very difficult for teachers to make the significant changes in teaching and learning; therefore, they must be supported as learners (Perkins, 1991).

It is clear that what it takes to become a teacher of problem-based learning is what it takes to become a reflective practitioner (Schön, 1983) of any innovation:

1. Personal reflection,
2. Dialogue with peers,
3. A learner disposition, and
4. A supportive organizational climate.

As these teachers reported, it takes a lot to become a teacher of problem-based learning, but it is well worth the struggle!

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All PBLNet members are invited to submit articles of interest to PBL practitioners, program profiles, PBL research, and success stories about PBL.

Articles should be approximately 600 words. Submissions for the Winter '97 Issue will be accepted until Dec. 10, 1996.

For more information about PBLNet or *The Problem Log* call: (630) 907-5956 or 5957 or e-mail Linda Torp at ltorp@imsa.edu

The "e-Mail" Room...

All too often our busy daily schedules preclude extended meaningful dialogue with each other. Posting questions and comments to the list provides a means keeping us connected. Several topics have served as this connective tissue on the Listserve in recent months. One such topic was fueled by a request for submissions to a WWW-based problem directory. Wendy Crebbin of the School of Education, University of Ballarat, Victoria, Australia, responded with enthusiasm.

Wendy adopts an approach that differs in some respects from the "Problem as a unit" approach to problem-based learning. She indicated that some of her PBL is done in units, however a large percentage of the engagement arises out of students responding to "commissions from workplace environments" -- all of which are real problems. A sample is listed below:

- Preparation of a portion of the strategic plan for the city of Ballarat, Australia
- An impact study of proposed new building in a

- historic area
- Recreation services plan for people with disabilities
- The impact of construction of a bypass on tourism
- Water quality management strategies for a local municipality
- The development of a geological software package for secondary schools for the Internet
- Meeting the needs of first year students

As you can see, there is quite a range represented. Additionally, Wendy provides a variety of PBL models for her students, and then allows them to develop their own model, according to their needs and expectations of the commissioning agents. Wendy indicated that a measure of the programs success could be shown in that the commissioning agents are coming to her with work to be done, as opposed to the first several years when she had to go out and sell the idea. She also said that the students liked the idea that there were real outcomes and that many of her students volunteered to come back into the program. Her experience with PBL and real world

problems can serve as a valuable example of ways to successfully implement PBL and enhance student engagement in the learning process, while also supporting the notion of life-long learners.


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Consistent with our goal of promoting dialogue among PBL practitioners, we invite letters addressing any and all PBL issues including those put forth in this issue. Please send your letters to:

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PBLNET MEMBERSHIP



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Membership number found on Ed Leadership mailing label ASCD Membership not necessary for PBL Network Membership

Briefly describe your interest and/or experience in problem-based learning.

Please return with check payable to CPBL for \$15.00 for one year membership in the PBLNet to the Center for Problem-Based Learning, Illinois Mathematics and Science Academy, 1500 W. Sullivan Rd., Aurora, IL 60506-1000.