The Usual Doesn’t Work: Why We Need Problem-Based Learning

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abstract: Difficult to teach and learn, information literacy is a set of skills and knowledge that must be mastered through practice. Advances in the learning sciences reveal that students are not receptacles for wisdom deposits. They decide what they will learn. Problem-based learning exploits that insight. It calls for faculty/librarian collaborations. The following articles recount the steps in one such collaboration. Beginning with this article, they in turn, formulate the problem, design a plausible solution, apply that solution, and explore the implications of the process for libraries, librarians, and their resources.

The library was my Internet. The joy of books discovered me in the third grade. Nothing set the lineament of my life like libraries. In school everyone read the same books, and a teacher told me what they meant. In the library I chose, read, and thought for myself. The library’s freedom promoted my curiosity, making it the key to my love of learning and my hatred of school.

Through several decades of teaching, never was I able to move more than a few students to live and love the library’s liberation. How libraries could fail to inspire everyone to learn puzzled me. The Internet and then the World Wide Web renewed my hopes as excited students showed me new discoveries. Pundits predicted the end of traditional classrooms. This new engine of images, data, and text could fire up that passion for inquiry and learning so lacking in the normal undergraduate slough. Maybe the Internet would be a more inviting, compelling, and ubiquitous library.

It did not work that way. If this magical window on knowledge could not unleash students’ dormant capacities for learning, what could? Why did it so often fail to fan...
the desire to seek and know? Why could I not transfer my enthusiasm? Why did student curiosity not overcome the restrictions of fusty academia? With all these resources and all the energies of youth, why were the results so disappointing? What change could make research more exciting and learnable?

As my escape from the lock step of the classroom, the library saved me from ignorance. Indeed, school got little attention. This arrangement worked so well I ended up a professor attracted by a life of research. For me, research was passionate, free, and exhilarating but without methods or principles.

My drive to know and understand unlocked the library’s wonders. Graduate school made me a stack rat exploiting every assignment to spend more time in the library. I knew the numbering system and layout of the stacks. Every assignment began with hanging out in a subject area for hours or days. My research strategies were half trance, half trial and error. The time spent was such a pleasure and the results often enough spectacular that there was no reason to get beyond my quiz-kid approach. My PhD thesis was a large box of papers, notes, reprints, and scribbles until, panicked, I got it organized into something like an argument.

Based on this experience, as a university teacher I pressed three goals on my students: (1) to write vividly, (2) to detect and abhor crap (in Hemingway’s indelicate phrase), and (3) to use the library as the portal to liberation and growth. These goals were not popular. Students assured me they had heard it and knew it. Their performances and aspirations said otherwise. For more than 30 years, I flogged students through exercises that promised to infect them with the bugs of inquiry and creative skepticism. Nothing was more unpopular than those library assignments.

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My First Assignments and the Library

My first crude library assignments asked students to learn something about men and women who contributed to the fields we studied. Students turned in padded cribs from encyclopedias or publicists’ blurbs. Invariably the subjects of the assignments were born, died, and did something remarkable. Never were they stumped or defeated. There was never any controversy or hints of knavery. Never, it seemed, did students feel the need to judge the relevancy, reliability, or authority of what they read. The scholarly confectionary of the library did not stimulate curiosity and independence. Students came back instead with candy wrappers.

Maybe they did not know how to use the library. “An educated person,” I pronounced, “should be able to use the library like a musician uses her instrument.” Students retorted that the library was a place of dank crannies and dour guardians. “There is nothing in the library about Bertrand Russell and math,” a student would report. My
students would badger hapless librarians late into the night before an assignment was due. In self-defense one suggested that she instruct the class on how to use the library. The students were disgusted with her presentation. “We knew all that. We can use the catalog. What a waste of time.”

They were wrong, of course. They could not search efficiently nor could they evaluate sources. I learned to give an assignment, let them fail, and then invite the librarian. Clutching their D- papers, they would hang on every word. Still the next versions averaged only Cs, and it took much practice on several assignments before a comparative use of sources and real detective work appeared. Students complained about the time. I had to reduce content to accommodate assignments, grading, and coaching. Unable to bring myself to redesign courses to be research focused and ignore the necessary basic content, I dropped such exercises from introductory courses.

Collecting and Patching

Developing research skills in upper-division courses presented different problems. I urged students to write about their interest in a topic and then go to the library. “Tell me what you want to say, and see what information and knowledge you need to say that.” That approach frightened them. Time-harried, yet wasteful, students collected far more information than they needed or could understand. They mucked about without a guiding question, filling folders and floppy disks with notes and citations patched into sprawling papers difficult to read or critique. All-nighters produced piles, which, at best, were raw drafts of some background of a possibly interesting idea followed by brief suggestions for further research.

Why? Consider that researching a hypothesis requires skill and discipline. An organized argument that sustains a knowledge claim requires precise information, careful definitions, and nuanced judgment of reliability. All that means students must learn an effective library search process and spend hours of practice. The costs are time, drudgery, and failures. The rewards of successful craft and care come at the end of a long process. The “collect anything” approach avoided those costs and gained the high marks that most instructors give long-winded, footnoted papers. A fear of failure—”Maybe I won’t be able to find the information,” or “Maybe the information isn’t in the library; I could just be wasting my time”—prevailed.

Again, only a long process of criticism and rewriting could sometimes cure the production of scholarly piles. Despite my wanting students to become professional researchers, if they did not have the skills or strategies to search for specific sources, they were lost to anything but pack rat collections. A disappointing struggle between deciding what they needed to know and finding it versus just collecting and patching prevailed.

I called on librarians to help the students and me fight a rising electronic tide of mediocrity. Ever helpful, they appeared with point and click presentations and real-time demonstrations of search engines. Students moaned. Students groaned. “We knew that,” they claimed. “We’re on the Web all the time. We can find the information we need.” No matter what we did, the end result was the same—most students loathed the library, and most graduated with poor research skills.
It Gets Worse

In the age of the Internet, pack rat research has reached new levels of volume and waste. The standard procedure is to make a few clicks and see what turns up. For students the process is as addictive as gambling. A few lucky hits hook them. They can locate landfills of information using ever-improving search engines with their sleepless spiders and crawlers that creep through millions of pages. But still they cannot judge the relevance or reliability of the material. It is not just a matter of judging sources; it is a matter of understanding what evidence, what examples, or what principles are needed to create a powerful argument. The process overwhelms thought. Their Googling produces more rambling pages sprinkled with graphics and drained of thought as if some semantic vampire had sucked them. If Hemingway was right in claiming that education is the creation of a personal crap detector, then students’ use of the Internet destroys education. Worse, students assert they no longer need libraries for research, and they do not need the librarians who keep trying to press books and scholarly articles on them. Student research seems to waste everyone’s time.1

I want to blame the Internet the way the Luddites blamed the machines of the Industrial Revolution for ruining their work and lowering the quality of their products. Those bad old library assignments look better in comparison to current cut and paste pastiches that verge on plagiarism. Dreams of card catalogs and handwritten notes fill my head making it is easy to forget all the hours and wasteful practices that entranced me. Is the Internet not able to fuel curiosity and encourage skills? It provides fast access to rare sources that used to require privileges and intercontinental travel. On students’ desks are instruments furnishing a fantastic bazaar of information, and yet the same problems remain. Despite, not because of, the Internet students search sporadically and lose any sense of plagiarism. They are just as bored in the classroom as I once was. In the defiant faces of students I see myself. The Internet is their library. They hang out in cyberspace reading what they want and learning on their own. Digging, selecting, and using information about topics that matter to them, they are repelled by spoonfed courses that tell them answers but skip the questions. They resist learning what does not move them. If queried, they will both denounce the boredom of talk and tests and embrace the leisure that these courses give them to loaf and surf. Their own curiosity and discoveries make the standard curriculum seem a sequence of ropes to jump or skip.

Faced with that failure, the question arose: “How do students learn?”

We cannot drag students through our experiences with libraries, research, and learning without killing the very desires we want to foster. Neither my assignments nor my oratory worked. Faced with that failure, the question arose: “How do students learn?”
How People Learn

We live in a wonderful time for a scholarship of learning. We have discovered more about how people learn in the last 30 years than in all of previous history. We have at the touch of our fingers knowledge that Francis Bacon could not imagine. Times of wonder are also times of change. We have to give up traditions and habits and create new methods. That, too, can be exciting, even as it provokes anxiety. Part of the problem is I want my students to exploit the new resources. I do not want to change the way I teach. Yet the novel situation disturbs my confidence as an expert in the classroom. More like an advanced student, I need consultants and partners—friendly helpers just will not do.

Cognitive scientists tell us that students learn when they make changes in the generalized patterns that make up their knowledge of the world. Failures in learning occur because instructors present material to students without knowing what they already know and believe about the subject. What students already know determines what they will learn. And only they can choose to learn.

The old way of viewing students’ minds as something into which we drill information and ideas promotes poor learning. Students memorize and regurgitate with little understanding. Their original assumptions persist. Students quickly forget the new information or distort it to fit their preconceptions.

Instructors mask the failures by asking only those questions that students can answer or by creating assignments that they know students can perform. Since humans are fantastic learners, a percentage of every class will perform well enough to confirm their instructor’s methods. In turn, instructors learn not to probe students’ understanding by requiring them to apply what they have learned to novel situations.

Educators are responding to these discoveries by exploring new educational methods. These go by various labels—engaged, active, cooperative, constructive, and collaborative learning. All share the idea that learning requires students to be actively involved. And the general tendency is to reduce the time instructors spend delivering lectures and increase the time students spend on learning tasks. These changes march under the banner of active learning, recognizing that students do the heavy lifting. Teaching becomes more an exercise in designing learning experiences and coaching—that is, critiquing student performances and introducing useful assignments.

Problem-Based Learning

One of the most aggressive versions of this is problem-based learning (PBL). Pioneered by McMaster University in Ontario in the late 1960s, PBL emerged in medical schools in response to an information explosion. Doctors could no longer learn the techniques and details of medical practice once and for all. Research into new diseases and treatments required life-long learning. Learning throughout a career requires reflective knowl-
edge management and assessment. Medical schools wanted their graduates to “learn how to learn” in preparation of 40 years of self-education. Traditional medical education that emphasized memorizing pages of text, terminology, and symptoms increasingly taxed medical students and dampened their desire to keep up with research after completing their degrees.

Since medical education had clinical elements in its last two years, it was possible to incorporate practice in the first two years by posing virtual medical problems. Such problems enabled students to develop their diagnostic and reasoning skills while providing motivation and context for learning the details of medical knowledge.

The medical PBL model is set up in this manner: (1) students encounter a realistic complex problem (or case), such as a virtual dying derelict in an emergency ward; (2) in teams of six to eight (with a tutor), students attempt to form a diagnosis and in that process develop a list of things they need to learn to be successful; (3) students individually research the topics and present them to their peers—they read textbooks, attend lectures, consult with experts; (4) with tutor guidance, the students take another crack at a diagnosis and treatment, producing another set of learning topics; and (5) repeat the cycle until students produce the most likely diagnosis and promising treatments.

The tutor’s job is to ask provocative questions that guide further research, reduce dead-end explorations, suggest resources, provide examples, and give precise appraisals of performance. Finally, the student must pass standard medical examinations. No one disputes that the model works. Researchers do disagree about whether it works better or that much better than traditional models. The major drawback is cost in terms of personnel—tutors are clinical practitioners.

In short, PBL promotes thinking and content expertise through the use of realistic situations or problems. Teachers act as designers, providing problem scenarios to challenge learners. They are also coaches who support student research and promote self-evaluation. Instructors work to wean students from teacher-dependent responses and rote memorization. Students simultaneously develop content knowledge and problem-solving skills. They are responsible for their own learning.

Because of similar problems of expanding and changing knowledge bases, PBL has (with modifications) been adopted outside of medical schools—primarily in engineering, pharmacy, nursing, biology, and other basic sciences. The most extensive examples of university-wide adoptions are in Europe—Aalborg in Denmark (an engineering and technology university) and Maastericht in Holland (a more general liberal arts curriculum). There are a growing number of programs in the United States at such universities as Delaware, Samford, California–San Diego, California–Irvine and in many other departments at Stanford, Mississippi, and Cornell.

Implementing PBL at Penn State

Penn State initiated a new School of Information Sciences and Technology (IST) four years ago. The school is charged with producing graduates who can apply information technology solutions to commercial, public, and community problems. Undergraduates learn not just how to design and use search engines, databases, and networks but
also how to apply them to solve human problems. The fields of the information sciences and technology change rapidly. Graduates must prepare for a world where knowledge half-life is at most years and often months. Like medical professionals, IST graduates need to learn how to learn. Faced with that challenge, the school adopted a problem-based curriculum. This promoted changes in instructional design, assessment, and student work habits.8

In a PBL course students find out what they need to know to solve problems and search for the information and knowledge to fill in their gaps. The goal is to make the process of learning more transparent. Students must reflect on how they learn and how to improve their learning. In this context students’ inability to conduct efficient research is visible and disrupting. A resulting too-familiar faculty complaint is: “Why can’t students think, evaluate sources, and develop search strategies?” Because students cannot find the necessary resources, they cannot solve problems. Individual tutoring by instructors and librarians gets some students functioning, but many get lost, never to explore the possibilities of systematic research. As a result, they fail to gain the advantages of problem-based learning.

Collaborating with Librarians

After retiring as the founding director of the Schreyer Institute for Innovation in Learning, I worked part-time to implement the PBL approach to instruction. Librarians told me for years that “information literacy” should be a primary feature of undergraduate education. They were right; PBL requires librarian expertise. As an instructor I saw librarians as conveniences. “Where can I find pre-Socratic philosophers?” I would ask; or “I need a workshop in two weeks covering American Colonial political institutions.” Over the years, one of them, Debora Cheney, asked me hard questions. She wanted to know what I was trying to do and what fueled student resistance. Quickly she convinced me that creating library assignments as add-ons to courses promoted student hostility. She forced me to consider what students should learn about library resources and skills in terms of the course design. In turn, my frustration with librarians’ abstract perspective on information came from the way it put off students. As we debated, we began to see that much more was needed than a once-a-year consultation. She had to learn more about my courses, and I had to learn more about her approach to information literacy. We began to collaborate, which meant that she participated in the design and management of the course.

Cheney quickly saw how important information literacy was to a problem-based learning-centered curriculum. If students were to become autonomous learners, they needed to be able to search and evaluate, as well as think and solve problems. As textbooks became more like software manuals and less like repositories of information, students were forced to use library sources and the World Wide Web. In turn, I argued that information literacy skills were best learned by doing something not by watching demonstrations. “Something meaningful,” she added, “something part and parcel of the course.”

What did I learn from these exchanges? First, students would not take library research assignments seriously unless they were part of the intellectual architecture of
courses and curricula. Second, integrating research into courses required an expert’s knowledge of the resources available. Hence, instructors in a PBL curriculum needed librarians as consulting partners in designing assignments. A plethora of diverse available resources meant that instructors needed to develop what Cheney called “information literacy goals.” Those goals took discussion and thought before considering assignments. “If you don’t have a goal, how do you know what kind of resources—texts, Web sites, scholarly journal articles—that you want students to access? If I don’t know what kind of sources, how can I help your students, except in the most abstract librarianish ways—these are primary sources, these secondary, and so on?” Cheney declared.

What started then as my students’ failures and the failure of librarians to help ended with a better understanding of how a lack of sophisticated research assignment design dampened student performance. Cheney showed me that most instructors were teaching from the seat of their pants. My early assignments had not worked and the explosion of information resources did not help. This told me that the improvement of student information skills required a new approach based on partnerships between librarians and instructors.

One approach is to integrate information literacy skills into the curriculum. In IST, a one-credit First-Year Seminar introduces students to both PBL and information literacy skills. The idea is to begin with a problem scenario integral to the course and require students to formulate a research question and find what they need to learn to answer it. A collaborating librarian could devise problems and questions that would develop effective strategies for finding reliable and appropriate information. In tackling those problems, students would confront the inadequacies of their own beliefs and seek ways to overcome them. They could not just surf and paste since they would be seeking real answers and defensible solutions. In the process, librarians could help correct search procedures and provide the helpful hints that grease research, identify processes, and provoke critical thought.

What does it take? Our efforts suggest the following—more time on the design of search goals and assignments, more collaboration between faculty and librarians, and more interactions among instructors, librarians, and students. Of course, that means more work for people habitually over-scheduled. Any major change requires that. But the mind-forged manacles of habit and tradition are crucial. We all know what professors do, what librarians do, and what students do. We also know those traditional activities do not work anymore. To admit that is to enter the exciting world where instructors, students, and librarians work together to create innovations in learning.

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Notes


7. See the University of Brighton’s Problem-Based Learning Directory at http://interact.bton.ac.uk/pbl/ (accessed July 11, 2004).

8. For more information about the Penn State School of Information Sciences and Technology, see the Web site at http://ist.psu.edu/about_ist/index.cfm (accessed July 11, 2004). For more information on the PBL program with resources for instructors and students, see http://pbl.ist.psu.edu (accessed July 11, 2004).

9. At Penn State’s School of Information Sciences and Technology six First-Year Seminars introduce students to the culture and practices of higher education. They present many early learning opportunities, including an introductory experience in using library information sources. They also present both faculty and librarians with their first opportunity to introduce students to a wide range of databases and an extensive research library.