

**I** *The author argues that professors must engage students in problem-solving activities across all disciplines. To ignore students' problem-solving skills is to undermine the possibility of creating "educated individuals" through higher education.*

## Preparing Students for Educated Living: Virtues of Problem-Based Learning Across the Higher Education Curriculum

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This volume provides insight into many virtues of problem-based learning (PBL). In this article, though, I offer a broader and more philosophical argument for incorporating PBL into higher education. I begin by defining PBL and discussing how its characteristics are educationally useful. Then I develop and defend the argument that the academy as a whole cannot meet its mission of educating students unless students are engaged in problem-solving activities. In the final section of this article, I address some common objections to my argument.

### **PBL: Definitions and Virtues**

Problems have two characteristics. First, a problem is an unknown, and second, value must exist in solving the unknown (Jonassen, 2000). *PBL*, then, is any pedagogical approach that requires students to solve for an unknown. Although such a definition may seem simplistic, Jonassen notes that not all problems are equivalent, and thus problem solving is not a rote activity. Therefore, PBL can take on many forms of both processes and products.

One common form of PBL is the "classic version" (Hmelo and Evensen, 2000) which is characterized by free inquiry among students and student-centered learning. Also, the classic version requires students to collaborate, formulate learning issues by determining factors that may contribute to the cause or solution of a problem, identify relevant content, and generate

hypotheses. Most PBL models also contain student reflection components as a means of self-evaluation.

Inherent to both this classic version and other variations of PBL are numerous characteristics that are educationally principled. For example, inherent to PBL is a connection to self-directed learning; indeed, the connection between PBL and self-directed learning is well documented (see, for example, Williams, 2001; Hmelo and Evensen, 2000; Hmelo and Lin, 2000). As Blumberg (2000) notes, PBL and self-directed learning are not synonymous, but self-directed learning can result from PBL. Blumberg's position has been confirmed empirically. Participants in one study noted that engagement in PBL advanced their sense of being self-directed learners (Kaufman and Mann, 1996).

Beyond self-directed learning, PBL requires students to be active. Students who are actively engaged in the educational process make substantive connections with course content. These connections promote a deep level of processing. For example, requiring students to generate ideas and provide explanations to support those ideas promotes learning (Dominowski, 1998).

Another characteristic of PBL that is likely to promote learning is collaboration. Students often understand course material better when they interact with and learn from each other (Daiute and Dalton, 1993). Through collaborative learning and social interaction, students can help shape each other's ideas by providing feedback to each other. As students receive feedback, they can refine their ideas in light of that feedback and submit their newly shaped and refined thoughts to classmates for further debate and discussion.

## **Problem Solving and Purposes of Education**

So far in this article, I have defined PBL and described how its specific characteristics can promote an active and collaborative environment. This type of environment is more likely to promote learning than a traditional classroom, which often only requires students to passively absorb and regurgitate information as organized and delivered by the professor. In the remainder of this article, I establish and defend a larger argument about the virtues of PBL. Namely, students cannot meet the basic criteria of "an educated person" unless they are adept at managing and solving problems. From this statement emerges an allied mandate to faculty members in higher education: Professors must engage students in PBL because to ignore problem-solving skills is to undermine the academy's responsibility to develop educated individuals.

I build this argument by noting a connection between the purposes of education and problem solving. Specifically, a formal education should prepare students for participation in the workplace, educate students in the liberal arts tradition, and help students learn about themselves.

**Occupational Preparedness.** Certainly, a formal education should prepare students for participation in the labor market. In the Industrial Age,

successful employees often needed only rudimentary skills for understanding and following directions. Knowledge and information were finite; thus, procedures were relatively static.

In the Information Age, however, much of the content of business is shaped by social factors that constantly change (Zorn, 2002). As Goldsmith (2001) notes, “No longer can [organizations] depend on the same old answers, because [they] are faced with new problems” (p. 78). Because these socially constructed problems are systemic to business and industry, successful employees will be able to “serve in a strategic decision-making context. . . . [,] implement detailed operational plans and work toward strategic goals” (Whiteley, 1993, p. 2). The message from Zorn (2002), Goldsmith (2001), and Whiteley (1993) is clear: In the Information Age, an employee can contribute to an organization’s success only by engaging in problem-solving activities. The importance of problem solving seems to be confirmed by Edney (1991), who notes that managers list employees’ “rote” and “mechanical” approaches to problem solving as a chief concern.

Undeniably, as the dawn of the Information Age becomes a metaphorical midday, the nature of the workplace and the requirements of employees have changed. Therefore, the process of preparing students for the labor market necessarily must change. Said differently, learning in the real world is different from learning in classrooms (Jonassen, 2002). Traditional modes of classroom learning—often characterized by memorizing information and mirroring the views of professors—do not prepare students for the type of learning they will encounter in the real world. Learning in the real world is a product of problem solving. Such problem solving does not occur through processes of memorizing and mirroring; rather, it comes through processes of carefully defining and analyzing problems that exist in the organization for which one works.

Internships can bridge the gap between classroom learning and solving problems within organizations. But many students never hold internships or participate in field experiences. Therefore, professors have a responsibility to integrate into their classrooms the types of problems that students will encounter in the workplace.

**Liberal Arts Education.** Holmes (1996) notes that learning in the liberal arts tradition “takes the long-range view” of education by focusing on content and processes that prepare students to be “persons.” Pedagogically, writing is at the heart of learning in the liberal arts tradition (Hersh, 1997), and writing is inherently a problem-solving activity (Lindemann, 1995). In one sense, then, problem solving is the heart of liberal arts. Professors who are teaching in institutions that support a liberal arts mission are bypassing that mission if they do not design their pedagogical approach to support problem-solving activities.

Beyond pedagogy, though, the definition of *liberal arts learning* as preparing students to become persons begs a question: What counts as valid content—not to mention valid knowledge that will come from studying the

content—that can prepare students to become persons? Valid content and viable knowledge are often unknowns, and a liberal arts education depends on students solving for the unknown. It may seem to be overly dramatic to claim that curriculum and content themselves are the source of a problem that students must solve, but consider the difficulties of determining valid content in postmodern academia. Lang (1999) points to the difficulties by simply noting that “contemporary liberal arts curricula are . . . [often] substantially consumed by internal academic agendas” (p. 135). Less cynically, the postmodern academy perhaps has become more tolerant of what “great works” are worthy of inclusion in a liberal arts curriculum. In many disciplines, notions of a canonical literature or an essential set of content are obsolete, and professors who promote such essentialism are considered retrograde. Replacing the traditional ideas of a canon and essential content is a dependence on the decisions of professors. Individual professors decide the scope of worthy content, and professors choose content for a variety of reasons, not all of which are based on principles of educational soundness or student need. For example, professors sometimes base their courses on content with which they are already familiar.

I am not lamenting the rise of postmodernism, the demise of essentialism, or the purview of professors to determine worthy course content. I am merely noting that the shifting paradigm sometimes leaves students in a quandary. They are left purposelessly to roam the academic landscape looking for the content that they, as individuals, need to become persons—that is, to become educated in the liberal arts sense. For each student, recognizing valid content and viable knowledge is in itself an act of problem solving. Professors, then, must support students’ problem-solving efforts if a liberal arts education is to be important and viable.

**Learning About the Self.** Learning about the self is a corollary to both occupational preparedness and liberal arts learning. For example, career preparation is not just learning the content and processes of a career; career preparation also involves developing an understanding of how a career will fulfill—or fail to fulfill—students as individuals. Similarly, learning in the liberal arts tradition requires more than studying the content. As Holmes (1996) notes, the central question of liberal arts focuses on the individual: “What will all this stuff do to me?” (p. 24). Despite the overlap between this and other purposes of education, learning about the self deserves separate treatment as a purpose of education. In fact, some empirical evidence supports the connection between learning about the self and PBL (for example, Evensen, Salisbury-Glennon, and Glenn, 2001).

Specifically, the characteristics of PBL provide a unique opportunity for students to learn about themselves. As part of the problem-solving process, for example, students must consider their own educational goals (Bridges and Hallinger, 1997). In the context of some problems, determining educational goals is likely to require introspection about students’ values, ethics, and beliefs. These types of problems may even highlight for

students key differences among their beliefs, decisions, and behaviors. PBL activities provide an impetus for students to reconcile these differences, and in the process of reconciling them, students may learn more about themselves than they would learn in a traditional curriculum that simply focuses on the coverage of content.

Social interaction is another characteristic of PBL that provides the opportunity for students to learn about themselves. Hmelo and Evensen (2000) seem to support this perspective. They note that learners in a PBL environment can be seen both as “transforming” and “transformed.” By examining how these transformations happen in the context of a PBL social system, students can gain insights about the ways they relate to, and are influenced by, other students. For example, through social interaction, students might discover their own propensity to stay silent even when they disagree with other members of the group.

PBL also provides students with opportunities to gain insights into their own approach to solving problems (Allen, Duch, and Groh, 1996). As students transition from solving problems (a cognitive activity) to learning about their own approach to solving problems (a metacognitive activity), they begin asking themselves numerous questions that will provide insights into who they are as learners: Which problem-solving strategies work well for me? Which ones do not? Why do some work well for me, but others do not? (For a fuller discussion of metacognition, see Chapter Ten.)

I am not suggesting that learning about the self is an automatic by-product of problem solving. Professors may need to act as facilitators so that students see how their engagement in problem-solving activities can teach them about themselves. Elsewhere in this volume (Chapter Eight) is a discussion of how professors can help facilitate students’ understanding of group dynamics, which may help students consider their own role within a group. Instructional strategies—like journal keeping and role playing—can help students learn about themselves within PBL environments (Chapter Nine). Speck (1997) provides insights into helping students consider ethical dilemmas that they may face. All of these resources can help professors guide students toward learning about themselves in PBL.

## **Objections to the Virtues of PBL**

As I have argued, if education is to meet its central purposes of occupational preparedness, liberal arts learning, and learning about the self, then PBL is indispensable. As I conduct faculty development workshops that establish and defend arguments similar to the ones that I promote in this article, I occasionally hear objections from administrators, professors, and even students. Hung, Bailey, and Jonassen in the next chapter of this volume address many tensions surrounding PBL, but in the remainder of this article, I address some additional common objections.

**General Education Curriculum Should Emphasize Problem Solving.** Many professors agree that problem solving is a worthy pursuit, but they suggest that PBL is more suited for the general education curriculum. In other words, they contend that general education courses should promote problem-solving abilities among students but that courses within a major—and certainly junior, senior, and graduate-level courses—should focus on content.

Numerous problems with this argument exist. Most basically, the scope of the general education curriculum is not broad enough to help students become adept at solving problems. Many universities do offer courses designed to introduce students to general learning skills, like problem solving. But it is naïve to assume that one semester (or even four) is an adequate “magic bullet” for helping students learn how to solve problems and gain fluency in problem-solving processes.

Furthermore, we must acknowledge that problem solving is domain specific. That is, solving problems in science is not the same as solving problems in the fine arts. Solving problems in mathematics requires a different approach from solving problems related to the study of literature. So, although many general education courses, like English composition, may emphasize problem-solving skills, these courses do not provide students with an adequate background for solving problems within specific disciplines.

**Foundational Knowledge Must Be a Precursor to Problem Solving.** Other professors and administrators assert that students are not capable of solving problems without a foundational knowledge of the discipline to support their problem-solving efforts. This is a valid argument to a point, but how much foundational knowledge is enough? Is it necessary (or even possible) for students to have *all* of the foundational knowledge associated with a discipline before they can tackle any problem? More provocatively, what do we mean by “foundational knowledge”? Typically, when faculty members point to a need for students to have a foundational knowledge, they really are advocating that students memorize information as a precursor to applying the information through problem solving. Rarely, though, does memorizing a database of knowledge assist students in solving problems.

**PBL Is a Scam for Poor Teaching.** Some professors and administrators have suggested that PBL reinforces habits of poor teaching. That is, the view persists that professors assign problems to be solved in lieu of lecturing and engaging students in more organized and directed teaching activities. In short, the skeptic argues that PBL allows professors to set their teaching responsibilities aside so they can focus on research while students solve problems without the guidance of a faculty member.

Admittedly, a fine line exists between student-centered approaches, like PBL, and bad teaching. I can point to examples of professors who confuse student centeredness with abdicating their responsibilities to students, and you probably can, too. What the various articles in this volume should suggest, though, is that executing PBL well takes more time on the part of

professors, not less. Professors' responsibilities are not abdicated, only recast. Professors transition from playing solely an active role to playing both an active and reactive role in the teaching and learning process.

## Conclusion

The opportunities for implementing PBL into the higher education curriculum are endless, and professors would do well to seize those opportunities. Problem-solving skills are a defining characteristic of an educated individual, and without a focus on problem solving, professors are ignoring their responsibilities to help students journey toward the educated life. When designed and implemented well, PBL can serve as a "road map" for professors who are guiding students on their journey and as a pathway and bridge for students who are traveling toward becoming educated individuals.

## References

- Allen, D. E., Duch, B. J., and Groh, S. E. "The Power of Problem-Based Learning in Teaching Introductory Science Courses." In L. Wilkerson and W. H. Gijsselaers (eds.), *Bringing Problem-Based Learning to Higher Education: Theory and Practice*. San Francisco: Jossey-Bass, 1996.
- Blumberg, B. "Evaluating the Evidence That Problem-Based Learners are Self-Directed Learners: A Review of the Literature." In D. H. Evensen and C. E. Hmelo (eds.), *Problem-Based Learning: A Research Perspective on Learning Interactions*. Mahwah, N.J.: Erlbaum, 2000, 199–226.
- Bridges, E. M., and Hallinger, P. "Using Problem-Based Learning to Prepare Educational Leaders." *Peabody Journal of Education*, 1997, 72(2), 131–146.
- Daiute, C., and Dalton, B. "Collaboration Between Children Learning to Write: Can Novices Be Masters?" *Cognition and Instruction*, 1993, 10, 281–333.
- Dominowski, R. L. "Verbalization and Problem Solving." In D. J. Hacker, J. Dunlosky, and A. C. Graesser (eds.), *Metacognition in Educational Theory and Practice*. Hillsdale, N.J.: Erlbaum, 1998, pp. 25–46.
- Edney, R. K. "Great Expectations." *Pennsylvania CPA Journal*, 1991, 61(3), 12–16.
- Evensen, D. H., Salisbury-Glennon, J. D., and Glenn, J. "A Qualitative Study of Six Medical Students in a Problem-Based Curriculum: Toward a Situated Model of Self-Regulation." *Journal of Educational Psychology*, 2001, 93(4), 659–676.
- Goldsmith, B. "Innovative Problem Solving." *AFP Exchange*, 2001, 21(4), 78–79.
- Hersh, R. H. "The Liberal Arts College: The Most Practical and Professional Education for the Twenty-First Century." *Liberal Education*, 1997, 83(3), 26–33.
- Hmelo, C. E., and Evensen, D. H. "Introduction to Problem-Based Learning: Gaining Insights on Learning Interactions Through Multiple Methods of Inquiry." In D. H. Evensen and C. E. Hmelo (eds.), *Problem-Based Learning: A Research Perspective on Learning Interactions*. Mahwah, N.J.: Erlbaum, 2000, pp. 1–16.
- Hmelo, C. E., and Lin, X. "Becoming Self-Directed Learners: Strategy Development in Problem-Based Learning." In D. H. Evensen and C. E. Hmelo (eds.), *Problem-Based Learning: A Research Perspective on Learning Interactions*. Mahwah, N.J.: Erlbaum, 2000, pp. 227–250.
- Holmes, A. F. *The Idea of a Christian College*. (rev. ed.) Grand Rapids, Mich.: Eerdmans, 1996.

- Jonassen, D. H. "Toward a Design Theory of Problem Solving." *Educational Technology Research and Development*, 2000, 48(4), 63–85.
- Jonassen, D. H. "Engaging and Supporting Problem Solving in Online Learning." *Quarterly Review of Distance Education*, 2002, 3(1), 1–13.
- Kaufman, D. M., and Mann, K. V. "Students' Perceptions About Their Courses in Problem-Based Learning and Conventional Curricula." *Academic Medicine*, 1996, 71(1), S52–S54.
- Lang, E. M. "Distinctively American: The Liberal Arts College." *Daedalus*, 1999, 128(1), 133–150.
- Lindemann, E. *A Rhetoric for Writing Teachers*. (3rd ed.) New York: Oxford University Press, 1995.
- Speck, B. W. "Challenging the Validity of Students' Ethical Relativism." *Perspectives*, 1997, 27(1), 55–70.
- Whiteley, S. "The Society Responds to Employer Expectations." *CMA Magazine*, 1993, 67(6), 2.
- Williams, B. "The Theoretical Links Between Problem-Based Learning and Self-Directed Learning for Continuing Professional Nursing Education." *Teaching in Higher Education*, 2001, 6(1), 85–98.
- Zorn, T. "Converging with Divergence: Overcoming the Disciplinary Fragmentation in Business Communication, Organizational Communication, and Public Relations." *Business Communication Quarterly*, 2002, 65(2), 44–53.

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