

Theme 2: Learn-by-Doing CPR DRAFT Report

What is currently meant by learn-by-doing and what should it be?

Abstract

The results of multiple campus surveys suggest that Cal Poly needs a working definition of learn-by-doing that is specific enough to be meaningful and inclusive enough to account for the variety of disciplines at a comprehensive polytechnic university; the multiple curricular, co-curricular, and extra-curricular venues in which students learn; and the intellectual and practical aspects of higher education. This essay advances the hypothesis that, because of the “upside-down-curriculum,” learn-by-doing happens earlier and more often in a student’s career at Cal Poly than at comparable institutions. It observes that any area of the curriculum or co-curriculum not associated with a highly-valued pedagogy, such as learn-by-doing, is necessarily undervalued. General education, and consequently diversity learning, is such an area. It concludes that learn-by-doing is not a product; it is an intellectual process whereby students, acting alone and in consort with others, gradually acquire essential knowledge and skills through active, self-reflexive engagement with the world inside the classroom and beyond it.

What are the historical and theoretical foundations of our learn-by-doing pedagogy?

Historical Foundations

With the California Assembly’s passage of the Enabling Act in 1901, San Luis Obispo became home to the state’s first Polytechnic School. Guided by the utilitarian ideas of John Dewey and other American “pragmatists,” the school’s founders stressed teaching the hand as well as the head. Cal Poly retained its signature, hands-on, learn-by-doing pedagogy even after its transformation into a comprehensive university offering undergraduate and graduate programs in technical and non-technical fields alike.¹

Over the course of Cal Poly’s long history, students, staff, faculty, and administrators have made surprisingly few attempts to define what learn-by-doing means for the entire campus community. One exception was the 1983 university mission statement, which addressed learn-by-doing obliquely by emphasizing work preparedness and some methods for achieving it—“internships, cooperative education, enterprise projects, and numerous co-curricular activities.”² Far more common are statements like the one that inaugurated the Centennial Campaign in 1996, where learn-by-doing “defines our identity and charts our future” but remains a vaguely defined process that “actively

¹ Robert E. Kennedy, *Learn by Doing: Memoirs of a University President: A Personal Journey with the Seventh President of California Polytechnic State University* (San Luis Obispo: Cal Poly Foundation, 2001), pp. 5-6, 227-29.

² [WASC Self Study, California Polytechnic State University \(2000\), p. 2.](#)

engages students in their own learning ... from the first quarter of enrollment.”³ One need only look at the [University Advancement](#) websites that resulted from that campaign to see that active engagement means widely different things to different groups of people.⁴ In short, very little has been said in the past about Cal Poly’s signature pedagogy.

Theoretical Foundations

At the heart of the polytechnic tradition is an insistence on the union of theory and practice, with an emphasis on the latter, but a review of theoretical literature on learn-by-doing suggests that there is disagreement on not only how best to achieve such a union, but also what the result might be. For instance, biologist Jean Piaget posited a rather rigid model of gradual cognitive development (so-called “cognitive constructivism”) that rendered many types of experiential education futile until an individual reached psychological “maturity,” whereas Carl Rogers’ humanistic psychology tipped the balance in the opposite direction by postulating the primacy of direct experience and focused reflection in intellectual and psychological development. Similarly, while Rogers, Dewey, Paulo Freire, and others agree on the dialectical and potentially empowering nature of experiential education, Freire’s “critical transformative praxis” places much greater emphasis on eliminating the traditional hierarchical divide between teacher and student and on exposing what he describes as the inherently inequitable, political nature of reigning epistemologies.

Using these historical references and theoretical perspectives as a benchmark, the Learn-by-Doing Working Group set out to craft a definition of learn-by-doing that honors Cal Poly’s past while anticipating its future. To facilitate that process the group began to identify some of the most effective and innovative learn-by-doing practices on our campus.

How is learn-by-doing currently implemented in different programs/parts of the curriculum?

In attempting to identify what learn-by-doing currently looks like at Cal Poly, we have benefited from several important sources. The Spring 2009 survey of department chairs and heads, which was conducted as part of this self-study, asked respondents to rank twenty possible learn-by-doing practices with respect to their contribution to student learning. The results revealed a marked preference for tried-and-true methods such as the senior project (95%), collaborative work (90%), student research papers & projects (80%), and, finally, laboratories (70%). It is worth noting that the twenty-eight of forty respondents who selected laboratories unanimously ranked it as highly important to student learning.⁵

³ [WASC Self Study, California Polytechnic State University \(2000\), p. 7.](#)

⁴ [Why Give to Cal Poly? \(accessed 10 August 2009\)](#)

⁵ LBD Department Head Survey Results, pp. 14, 80, 86, 92.

We have also availed ourselves of ongoing work on the Cal Poly Strategic Plan, particularly the preliminary report of the interdisciplinary Project-Based Learning Group. The report explicitly acknowledges the need for a more precise definition of learn-by-doing that includes but is not limited to project-based learning; we affirm this distinction, as well as the report's conclusion that "project-based learning enhances learn-by-doing, where it is appropriate." The authors offer numerous, fairly detailed profiles of projects that permit students to apply theories or principles they learned in the classroom to produce work characteristic of professionals in their chosen disciplines—a key aspect of project-based learning according to the report. Among the numerous projects profiled are the College of Architecture and Environmental Design's "cold lab" design studios, in which students occupy their own individual workspaces for the duration of the quarter, the Music Department's production of operas in MU 383, and museum displays designed by interdisciplinary teams of faculty and students in UNIV X424.⁶

One way we may enlarge our understanding of learn-by-doing at Cal Poly is to cast a broader net and examine what members of the campus community are doing outside of the conventional classroom. For instance, roughly a third of respondents to the [Cal Poly Student Survey](#) indicated that they have participated in supplemental workshops in math and science (38.1%) or in co-ops or internships (30.9%); roughly twenty percent have participated in study abroad programs (19.7%). More to the point, 83.1% of these respondents think these curricular experiences will benefit them personally and professionally.⁷

Equally impressive is the fact that 82.5% of current Cal Poly students participate in co-curricular activities that they deem beneficial to their personal and professional growth. For example, 74.3% participate in clubs and organizations, 44.2% in WOW and other new student orientation programs.⁸ The Cal Poly chapter of Engineers Without Borders is just one example of a student club that embodies the learn-by-doing philosophy by devising innovative projects at home (e.g., creek embankment stabilization in Poly Canyon) and abroad (e.g., water purification and sanitation in Mae Nahm Kuhn, Thailand).⁹ Cal Poly students have also inspired, and continue to manage, projects like Cal Poly's Organic Farm¹⁰ and *The Forum*, a historical journal of student research edited by students in History and designed and produced by their peers in Graphic Arts.¹¹

⁶ Project-Based Learning Strategic Planning Working Group, PowerPoint Presentation (available on MOSS website)

⁷ Diversity Learning Objectives Survey: Preliminary Report, pp. 21, 26. Data from the 2008 NSSE indicates that 61% of Cal Poly students will have had similar experiences by the time they graduate (See p. 1 of the NSSE08 Pocket Guide).

⁸ Diversity Learning Objectives Survey: Preliminary Report, pp. 27, 31. The most recent Alumni Survey indicates greater involvement in academic clubs as well as professional and career-related activities on the part of Cal Poly students extending back many years, but provides no direct evidence of the value alumni attach to such experiences (see, e.g. Results from the 2008 Alumni Attitude Study, slide 79).

⁹ For an example of the projects undertaken by the Cal Poly chapter of EWB see: <http://ceenve3.civeng.calpoly.edu/ewb/Projects.htm> (accessed 16 August 2009)

¹⁰ See <http://www.sarc.calpoly.edu/about/history.html> and http://www.sarc.calpoly.edu/programs/organic_farm.html (accessed 16 August 2009)

¹¹ <http://cla.calpoly.edu/hist/pat/index.html> (accessed 16 August 2009)

These and comparable undertakings demonstrate how Cal Poly students often take the lead in implementing and refining learn-by-doing activities in co-curricular settings. Such evidence of student learning beyond the regular classroom at Cal Poly is corroborated by results of the National Survey of Student Engagement (NSSE), which show 66% of Cal Poly freshmen and seniors participating in such activities, most of them for 1-5 hours per week (34/32% respectively). These numbers are on par with our polytechnic and national peers; they are significantly higher than those for other CSU campuses as a whole.¹² The high concentration of learn-by-doing in the co-curriculum presents a perfect opportunity to forge the types of intentional connections discussed in the Integration and Student Learning essay, a factor we must keep in mind as we endeavor to define learn-by-doing for our campus community.

Is learn-by-doing different at Cal Poly than at other institutions?

Learn-by-doing, then, is widely implemented at Cal Poly, but is there anything unique in the way it is practiced here? One need only peruse the websites of other polytechnic institutions to see that it is not the learn-by-doing pedagogy itself, but the weight that Cal Poly attaches to it throughout a student's tenure here that is perhaps most distinctive. Though any single example of learn-by-doing may not set Cal Poly apart from our peers, the wide range of learn-by-doing opportunities available, as mentioned above, may do so. In addition, the consistent application of theory to practice across the curriculum and co-curriculum may distinguish students' learning experiences here from what is taking place elsewhere. The preponderance of professional degree programs at Cal Poly combined with the unusual requirement that students declare a major upon matriculation should mean that these experiences start earlier and occur more frequently than they would at other institutions, even other polytechnics.

The major-declaration requirement leads to freshman enrollment in major classes, which results in the so-called upside-down curriculum. This pattern is in stark contrast to most other universities, where freshmen and sophomores concentrate on satisfying a broad range of common core or general education requirements before delving too deeply into major courses. The requirement may have a significant impact on the student experience of learn-by-doing at Cal Poly; 91.9% of respondents to the student survey stated that the major provides them with the greatest opportunity for learn-by-doing, which suggests that students do in fact encounter learn-by-doing much earlier at Cal Poly than at peer institutions. The more important question, however, is whether and to what extent this early exposure to learn-by-doing contributes to student success. The answer may well be that involvement in major, learn-by-doing coursework from day one at Cal Poly has a paradoxical effect, strengthening the resolve (and perhaps success) of students eager to immerse themselves in work that is most directly "relevant" to them while accelerating disillusionment with the major among individuals who might have gone several terms at another institution before enrolling in a major course.

We have reason to believe that a surprisingly high number of students are dissatisfied with their choice of major. According to the Cal Poly Student Survey, a sizable number

¹² NSSE08 Mean and Frequency Reports, 9d.

of respondents have changed their major (19.4%) or would still like to change their major (23.6%).¹³ This situation needs to be understood and addressed before our students can be expected to reap the full benefits of learn-by-doing. By consulting comparative data on changes of major for peer institutions and/or organizing focus groups for prospective, current, and former students during the next phase of the self-study, we may be able to determine how learn-by-doing activities influence student decision-making in this regard. Analysis of existing assessment data and qualitative comments on the student survey will also help us determine to what extent specific learn-by-doing approaches contribute to student success.

What impact does learn-by-doing have on student success after graduation?

Though anecdotal evidence abounds that employers prefer Cal Poly graduates because of their ability to “hit the ground running,” we do not currently perform any comprehensive program of evaluation or tracking of alumni or their employers. Results of the 2008 NSSE do suggest that, when compared to their peers at other CSUs and polytechnic institutions, Cal Poly seniors leave here with a greater sense of having acquired the skills and knowledge directly relevant to their chosen career (means of 3.28/2.99/3.15, respectively).¹⁴ Alumni have reported similarly high levels of satisfaction with their Cal Poly degrees regardless of when they received them, but satisfaction is not the same thing as measurable success.¹⁵ In professional degree programs, completion of licensing exams and achievement of licensure may be used as evidence of direct evidence of lifelong learning, some departments conduct exit interviews with graduating seniors, and Careers Services surveys employers for some but not for all colleges. None of the results are analyzed longitudinally nor do these instruments ask questions aimed specifically at learn-by-doing. If we are to understand the lasting impact of our pedagogy, Cal Poly needs to conduct these surveys more assiduously and with more emphasis placed on the long-term effects of learn-by-doing.

How can learn-by-doing be leveraged to assist in the recruitment and retention of students, faculty, and staff from underrepresented populations?

The Cal Poly Student Survey seems to suggest that learn-by-doing is an effective tool for recruitment and retention: 58.7% of respondents agreed that it was an “important” factor in their decision to apply to Cal Poly, and an even greater number, 68.2%, have been satisfied with their experience of learn-by-doing.¹⁶ As the self-study proceeds, we will disaggregate the survey results by gender, ethnicity, and age to see whether or not this preliminary conclusion is accurate for all segments of the student population.

The efficacy of learn-by-doing as a recruitment tool was further explored in Spring 2009 when students enrolled in Professor Stern Neill’s BUS 418 Listening to the Consumer took on the pedagogy as their class project. One team specifically addressed current and

¹³ Diversity Learning Objectives Survey: Preliminary Report, p. 190.

¹⁴ NSSE08 Mean and Frequency Reports, 11.b.

¹⁵ See, e.g., 2008 Alumni Attitude Study, slides 74-76.

¹⁶ Ibid, p. 188

future marketing of the learn-by-doing “brand” to prospective students and concluded that Cal Poly does enjoy a “competitive advantage” once people are aware of what learn-by-doing entails. They also underscored the need for a university-wide definition of learn-by-doing.¹⁷ But again, we will need to dig deeper to see whether or not these conclusions hold up with all populations.

In contrast to these results, the [Cal Poly Faculty/Staff Survey](#) shows that the university’s emphasis on learn-by-doing is less effective in attracting new hires (37.9%), yet popular (60.1%) with respondents once they have had an opportunity to experience it firsthand.¹⁸ Again, this data will be examined more closely in the upcoming year to determine if this holds true for everyone, especially members of traditionally under-represented groups.

As a sidebar, informal interviews with area teachers whose students participate in the College of Science and Math’s learn-by-doing laboratories for junior high boys and girls provide additional, anecdotal evidence of just how appealing the learn-by-doing model is for educators serving in more diverse communities within San Luis Obispo County. As one science educator explains it, the experience is a “motivational” one for students who might not otherwise think about going to college, as the Cal Poly students who provide them with direct, “hands-on” opportunities to test scientific theories and principles serve as excellent “role models.” She also describes the experience as a “mutually beneficial” one for both groups of students, as it builds community and self confidence and may well inspire students’ interest in pursuing a career in science or teaching.¹⁹

How can a campus-wide model of learn-by-doing contribute to student achievement of the University Learning Objectives?

Cal Poly survey results for all campus constituencies suggest that learn-by-doing experiences play a vital role in student achievement of the [University Learning Objectives](#) (ULOs). Students overwhelmingly credit the major curriculum both with providing the most learn-by-doing opportunities (91.9%) and with ensuring their achievement of every single ULO (from 71.5% for ethical understanding to 98.8% for disciplinary expertise) with one exception: the ability to make reasoned decisions based on an understanding of diversity (53.7%).²⁰ Results of the faculty/staff survey corroborate the preeminence of the major curriculum in providing students with learn-by-doing opportunities (88.5%) yet hint at considerable variation in the ULOs that faculty and staff stress in their interactions with students. For instance, communicating effectively (81.9%) occupies pride of place in this context, whereas only 41.1% of faculty/staff respondents devote considerable attention to sustainability.²¹

¹⁷ PowerPoint presentation: Team 1 BUS 418: Marketing LBD, especially slides 7 and 9.

¹⁸ Faculty/Staff WASC Survey, pp. 119, 120.

¹⁹ Interviews with participants in SCM 302: Science Teaching Practicum (Learn-by-Doing Laboratory), spring 2009.

²⁰ University Learning Objectives Survey: Preliminary Report, pp. 122-57. Though the major lags behind general education by less than a percent in responses regarding the diversity ULO, the difference is significant when considered in relation to the major's importance for achievement of all other ULOs.

²¹ Faculty/Staff WASC Survey, pp., 88 and 22, respectively.

As intimated above in the discussion of current learn-by-doing practice, the Cal Poly surveys also show that there is some difference of opinion among campus constituencies as to where this kind of learning is taking place. For instance, faculty and staff attach much greater importance to the senior project (80.1%) as a learn-by-doing experience than students (40.9%). Given the high percentage of student survey respondents who “don’t know” if the senior project will help them achieve the ULOs (typically around 60%), we may surmise that most students are not aware of the potential value and importance of this culminating experience; this is very likely because they have not yet attempted or completed it. If senior project is to serve as an integrative, culminating experience for all Cal Poly graduates, we may need to do a better job of articulating its importance early on in their academic careers.

The relationship between learn-by-doing and fulfillment of the university’s [Diversity Learning Objectives](#) (DLOs) warrants serious consideration by all campus constituencies. The DLOs were developed to clarify the ULO that states, “All students who complete an undergraduate or graduate program at Cal Poly should be able to make reasoned decisions based on an understanding of ethics, a respect for diversity, and an awareness of issues related to sustainability.” The need for such a clarification was illustrated by results of the 2008 NSSE, which showed Cal Poly students lagging behind their peers nationwide, including the CSU and other polytechnic institutions, when it comes to exposure to diverse perspectives (e.g., religion, race, gender) and interactions with people unlike themselves.²²

Results from the Cal Poly Student Survey suggest that the General Education curriculum, including United States Cultural Pluralism (USCP) courses, prove more influential in accomplishing the DLOs than major courses. A case in point is the first DLO promoting an “understanding of the relationship between diversity, inequality, and social, economic, and political power both in the U. S. and globally,” which a majority of Cal Poly students claim they acquire in GE (65.9%, including 46.9% for USCP) and major (48.7%) courses.²³ We also know from the faculty/staff survey that 21.1% of faculty and staff are entirely unaware of this DLO and that only 33.9% of them frequently address it in their interactions with students.²⁴

Unfortunately, the same survey data also suggest that only a small percentage of students (14.4%), not to mention faculty and staff (21%), associate general education with learn-by-doing; this combination of results suggests that students, faculty, and staff perceive learn-by-doing as only weakly associated with learning about diversity.²⁵ The results may reflect the fact that the knowledge, skills, and perspectives that are typically introduced and honed in general education programs are perceived by many in the campus community as somewhat tangential to a student’s professional development in

²² The relevant data is cited in a PowerPoint presentation by Cheryl Ney and Sara Cooley, Cultural Competency: Adopting Inclusive Excellence (23 October 2008).

²³ Diversity Learning Objectives Survey: Preliminary Report, p. 256.

²⁴ Faculty/Staff WASC Survey, pp. 25, 26.

²⁵ Diversity Learning Objectives Survey: Preliminary Report, p. 182 and Faculty/Staff WASC Survey, p. 88.

the major, which is strongly associated with learn-by-doing. When the university values a particular pedagogy so highly and an area is perceived as not contributing to that pedagogy, whether or not the perception is accurate, then that area becomes undervalued.

One place where learn-by-doing and diversity awareness appear to be converging with positive results is in University Housing's diversity education programs, thereby reminding us that all areas on a campus are potentially valuable pedagogical spaces. In the student survey, respondents consistently rank campus housing third (30-40%) in terms of where they think they have attained each of the DLOs.²⁶ As the self-study proceeds we will examine Housing's assessment data to ascertain more clearly its role in promoting student awareness and understanding of diversity-related issues.

By encouraging a more holistic understanding of learn-by-doing that embraces many ways of knowing the world, multiple ways to do so, and respect for all people without regard to gender, religion, ethnicity, etc., we may more readily demonstrate our professed commitment to provide all Cal Poly students with a genuinely superior educational experience that is truly integrated by a commitment to learn-by-doing and that does indeed prepare them for life in an increasingly diverse world. If learn-by-doing is really at the heart of our collective identity, we should be striving to use it more effectively throughout the entire curriculum to help students attain the learning objectives we have established for them. Moreover, we need to ensure that all campus constituencies are not only aware of the learning objectives but also committed to working to address each one of them in ways that seem most appropriate for their respective programs or units.

Learn-by-Doing: A Working Definition

The members of the Learn-by-Doing Working Group do concur with the faculty, students, and staff members who have suggested that the campus community needs to define more clearly what we mean when we invoke this pedagogy. Specifically, we need a more expansive definition of learn-by-doing that captures what distinguishes as well as what unites all members of the Cal Poly community in a shared educational enterprise. When it comes to explaining what we as an institution mean by learn-by-doing, it is not enough to focus on our own individual disciplinary assumptions, processes, and outcomes. On the contrary, surveys of all campus constituencies suggest that we must begin defining learn-by-doing by taking into account multiple ways of knowing, that is to say the different epistemologies, methodologies, and views of the relationship between theory and practice that shape how professionals in each of our respective disciplines understand the world and our place in it.

As we began to compare practices across campus, we also discovered that it is not simply the place (e.g., laboratory, stage, archive) that defines learn-by-doing but also the method by which students gradually acquire firsthand experience of the core principles, practices, and ethos that characterize their chosen fields or professions. Learn-by-doing is a process, not a product; local and national student survey results have made it patently clear that this process unfolds not only in the classroom and other familiar curricular

²⁶ Ibid, pp. 255-64.

venues but also in student clubs and organizations, campus housing, and in many types of employment. Thus as we set about explaining our signature pedagogical style to prospective students and colleagues, we must remind ourselves that our learn-by-doing pedagogies break down the spatial boundaries of more conventional educational institutions. They also mediate the traditional teacher-student hierarchy in ways that may be highly beneficial to student learning as well as to faculty/staff scholarship and professional development.

Learn-by-doing, then, is not the property of any one major. Whether we are speaking of aspiring practitioners of materials engineering, ethnic studies, organic farming, elementary education, or biochemistry, we need a more holistic definition of learn-by-doing that highlights the immensely diverse ways and multiple venues in which Cal Poly students gain firsthand knowledge and skills that will enable them to become highly proficient and productive representatives of their chosen professions, in addition to actively engaged citizens and lifelong learners. Perhaps it is sufficient to say that learn-by-doing at Cal Poly is an intellectual process whereby students, acting alone and in consort with others, gradually acquire essential knowledge and skills through active, self-reflexive engagement with the world inside the classroom and beyond it.

Proposed Action Items

- **Establish a working definition of learn-by-doing.** Based on the findings of the self-study, the Academic Senate should adopt a statement on learn-by-doing that is specific enough to be meaningful and inclusive enough to account for the variety of disciplines, venues, and ambitions that characterize a comprehensive polytechnic university.
- **Investigate the educational effectiveness of learn-by-doing.** Investigate the impact of learn-by-doing experiences on major satisfaction and change-of-major decisions. Begin to survey alumni and employers on the long-term impact of learn-by-doing. Analyze University Housing data for the impact of its diversity awareness programs. Use program review to assess the effectiveness of specific learn-by-doing practices.
- **Strengthen learn-by-doing as our signature pedagogy.** Consider ways to address the perceived imbalance between learn-by-doing in GE and the major, including the weak link with diversity learning. Ensure that the senior project is understood to be a learn-by-doing experience that integrates the broad sweep of senior-level learning.