Foundation of Stone: A Case for the Feynman Flip

ZOFIA RYBKOWSKI

On October 11, 1999, Donald Choi, Director of Foster and Partners, addressed third year University of Hong Kong architecture students in a lecture entitled "Technology and Architecture." He itemized a number of the rapid-paced technological advances that have been made in space exploration, especially noting that thirty years ago, mankind had already projected a representative to our moon. Yet, as Choi noted, architecture has neglected to keep pace with the technological advances made in fields such as in space, medical and computer sciences.

The logical question to ask is: "Why?"

Many architects insist that, due to the long and gradual learning curve now required by those in the profession, informed innovative realization generally does not occur until much later in the practitioner's life. Architects typically insist that knowledge can only be acquired through experience. But we must remember that some of the most creative aerospace engineers, computer scientists, and medical technologists invent and realize their creations at a far earlier age than do most architects, often pioneering procedures that have never before been attempted. One difference is that these young inventors enter their professions with a head start since they were systematically taught useful knowledge during their university studies. For example, while the young physician must still practice a number of years before he or she is in the position to create a new life-saving medical device, he or she has been given enough knowledge as a medical student to be able to recognize resources from which to draw.

Therefore, could it possibly be that the sluggishness of innovation in the architectural field has less to do with the complexity of building technology (how much more intricate is the task of a space-bound satellite than the average building!) than the way in which young architects are educated? If this is true, might it not be easier to teach a building engineer the principles of design than a designer the principles of engineering?

To explore this possibility further, consider the following anecdote from the life of Nobel laureate physicist Richard Feynman.

The talents of Feynman resided, by his own admission, primarily within physics. But this didn't stop him from developing expertise playing the frigideria in a Brazilian samba band or from competently accompanying a ballet on the bongo drums.

One day, following heated discussions with his artist friend Jirayr Zorthian, the two men sealed a pact to try to learn the other's profession. On alternate Sundays Zorthian would instruct Feynman in art and Feynman would teach physics to Zorthian. In the beginning both felt inept in their efforts. Nevertheless, the lessons proceeded as planned.

How did their bet end?

As for Zorthian's attempt to learn physics, there was little progress. The physicist noticed his artist friend's mind became easily distracted. But Feynman's advancement in art was a different matter. With persistence and progressive encouragement, his once unsure hand developed an artistic skill masterful enough to earn paid commissions and even later receive an invitation to present a one-man art show.[1]

Today Richard Feynman is remembered primarily for his contributions to physics, not to the realm of art. Nevertheless, the interdisciplinary challenge undertaken with his artist friend, and its eventual outcome, are well worth the contemplation of architects.

Interestingly, in most educational institutions throughout the U.S., teaching the art of architecture precedes teaching its accompanying skill and knowledge base. Simplistically speaking, students engage in the art of architecture in school. Following graduation, they begin to develop their skills set while working in offices.

However, evidence is mounting that this current order of instruction is creating problems for *both* architectural practice and education. Like Feynman's friend Zorthian, the architecture student whose initial training is disproportionately creative appears incapable of adjusting well to the rigors and challenges of office work.

This is also why the results of Feynman's experiment are potentially so exciting. They seem to suggest a far better outcome if the system were to be reversed—that is, *if the skill and knowledge needed to support design were to be taught*

before its creative component-resulting in a sort of "Feynman Flip."

THE HYPOTHESIS: THE CURRENT MODEL ISN'T WORKING

In order to understand how the architectural curriculum might be redesigned, it is necessary to examine how it is presently structured. Figures 1a, b and c tabulate and compare the curricula of eight of the top graduate-level architectural programs in the United States.

Notably shared by the programs is the studio component that dominates each and every year of the student's schedule. While official credit hour designations suggest students are intended to devote an average of 45% of their time to design, estimates of actual time spent in studio run as high as 90%.[2]

The dominance of studio in a student's schedule is not surprising because, unlike other architectural courses that require the acquisition of discrete and testable sets of knowledge and skills, creative pursuit is infinitely expandable. Because both studio and skillbased courses are taken concurrently in the typical architectural program, the all-consuming (and often more enjoyable) creative component of the curriculum invariably pushes support coursework off the academic shelf. The only way to ensure that students actually acquire the knowledge and skills needed to underpin studio work is to develop a scenario where studio and support courses are designated their own time for study. And the only way to ensure the studio exploration of students matures to a level of sophistication appropriate to the conferral of a graduate (or undergraduate) degree of architecture is to offer skill and knowledge-based coursework early enough in the curriculum so that studio work directly benefits.

THE RESULTS: THE CURRENT MODEL ISN'T WORKING

Evidence of failure in the current curriculum and its need for restructuring seems overwhelming. In his article *Professions and Their Discontents: The Psychodynamics of Architectural Practice*, sociologist Robert Gutman suggests that only 10% of an architect's time is spent on design.[3] Since this percentage stands in jarring contrast to the estimated 90 percent that students devote to design in school, his research explores the disillusionment of young architects as they enter practice. Carol Burns concurs as she writes about "the spirit of recent graduates, many of whom confront practice with wrenching dismay."[4] However, while Burns argues that this school-fostered misperception may hurt individual students, she also asserts it "does no harm to the professional firms, who will train those who can think critically."[5]

Burn's latter argument may reflect that held by much of contemporary architectural academia, but it is actually contradicted by a profusion of data. In fact, substantial evidence indicates this notion is not only questionable; it may be dangerously edging the profession into peril.

For example, the Federal Government's National Research Council undertook its own investigation after observing a dearth of skills in architectural graduates. The Council published the results in a 1995 report. The document addresses the often-made suggestion that the profession assume more responsibility for training graduates, as follows:

> "The (architectural) industry comprises a large number of mostly small, local and very competitive establishments. In addition, business activity in the industry is highly cyclical, especially at the local level, and employee turnover rates are high. Consequently, survival in the design and construction industry depends on keeping efficiency up and overhead down. Most design and construction firms are, therefore, reluctant to hire untrained engineers and architects or to invest in expensive training, particularly since the trainees are likely to leave in the near future."[8]

The NRC report ends by suggesting candidate incompetence to be so grievous they advise the federal agency to bypass hiring graduates from professional architectural schools and to "recruit from schools of construction and from schools of technology, many of which have good quality curricula that focus on applied knowledge."[6] Alarmed by the implications of the study at the time of its release, an article in *Progressive Architecture* notes: "It is one thing for the profession to air its concerns over the quality of education. But when the largest single client for architectural services in the country detects a problem, commissions its own inquiry, and is advised not to hire graduates from architecture schools, it is time for us to sit up and pay serious attention."[7]

Some may argue that the NRC complaint merely exemplifies those who do not appreciate the values espoused by architects. But one can also assess the situation by making inquiries of those who hire recent graduates.

To investigate this issue, I surveyed 21 principals of 18 major U.S architectural firms. Among the roster of firms responding to the survey are SOM, Pei Cobb Freed & Partners, Gwathmey Siegel & Associates, Richard Meier & Partners Architects, and Murphy/Jahn Architects (Figure 2). It is worth mentioning that many of the principals in these firms continue to serve as guest critics to prestigious architectural programs. Most were educated at architectural institutions similar to those of their graduate staff.

While respondents repeatedly spoke in favor of the passion for design imparted to students in architectural school, over 50% indicated dissatisfaction with the training of new graduates who have presented themselves for employment during the last 10 years. Following the query, "From your observations, do you feel current architectural graduates possess the skills that are important to work in your firm?," Steve Izenour of Venturi Scott Brown & Associates wrote: "Yes and no. We still get energetic, talented people but their general background is too theoretical. Nobody gets a crit in school that says something is important or buildable, so they have a lot to learn."[9]

Izenour's comment suggests a puzzling oversight by ar-

chitectural educators since in such a competitive field, many "star" architects win the projects they do by embodying a skills and business savvy that accompanies their talent.

Michael D. Flynn of Pei Cobb Freed & Partners feels the uncooperative, anti-technical attitude bred in schools is a recent phenomenon. For some time he has become increasingly disturbed by graduates' poor fundamental understanding of physics. After questioning them, Flynn discovers that while they were, in fact, schooled in structures, "they lack a healthy respect for physics. . . The *content* (presented in schools) is not lacking. The problem is what students are led to believe is important. . ."[10]

Similarly, Izenour asserts that schools actually prejudice students against learning the critical technical aspects of the profession. He believes the problem parallels the recent hiring of full-time teachers who have little or no office experience. Izenour, a practitioner who is often invited to serve as guest-critic at a number of top-ranked schools, has noticed a dangerous degradation of attitude among full-time critics: "If you (the guest-critic) say something practical, jurors sneer at you like you are a ridiculous Luddite."[11] In this climate, it is no wonder that students carry this culture with them into the working environment. In fact it is this attitude, many principals feel, that is creating serious problems for the profession.

John Lijewski, principal of Perkins and Will, describes watching new graduates who are asked to work within the structure of their firm. He says it's quite traumatic, "almost childlike-like they don't want to play the game."[12]

Hiring uncooperative and unskilled employees takes an inestimable financial and emotional toll on architectural firms and on the students who are hired. Time and resources required to make students useful to a firm are squandered every time frustrated graduates leave in the hope of finding a position offering the design opportunities implicitly promised by schools.13 Architectural firms find themselves wanting the professional edge they need to win projects from competitors, developers, engineers and space planners. Ironically, the financial stresses placed on practitioners negatively impact education as well since the firms are in turn unable to monetarily support architectural programs in the manner that legal, medical and business professionals can and do.

THE GREAT DEBATE

The profession and academia have been aware of this conundrum for some time.

There have been numerous attempts to shore up the existing educational structures with internships, "externships," token construction projects, and continuing professional development programs.[14] While such measures help, in reality they appear to do little more than provide band-aid solutions that will never solve the problem at its core.

In 1993, the leaders and members of five architectural organs jointly approached the Carnegie Foundation for the Advancement of Teaching to conduct a half-million dollar investigation into architectural education. The five national organizations consisted of the American Institute of Architects (AIA), the National Council of Architectural Registration Boards (NCARB), the Association of Collegiate Schools of Architecture (ACSA), the American Institute of Architecture Students (AIAS) and the National Architectural Accrediting Board (NAAB).

The investigation was published as a report entitled *Building Community: A New Future of Architecture Education and Practice*, authored by Lee D. Mitgang and the late Ernest Boyer. Its appearance set off its own outburst of debate that is not necessary to resurrect here. However, worth mentioning is a *GSD News* book review by Carl Sapers, Carol Burns and Victoria Beach.[15] Interestingly, none of the three authors attempts to refute the report's critical stance. Instead each expresses frustration that the Carnegie Foundation squandered its opportunity to pave an appropriate path for educators to follow. The authors' remarkable reaction implies there is not only a general acknowledgment among educators that a problem exists but a willingness to implement improvements should a more germane approach be presented. It suggests that neither architects nor professionals know quite what to do.

DOING THE FEYNMAN FLIP

The Feynman anecdote suggests a more positive approach can exist. For instance, what if the order in which knowledge is now imparted to architects were to be reversed? (see figure 2) What if, as was exemplified by Feynman's experiment, students initially acquired knowledge and skills in an uninterrupted fashion and only then immersed themselves in studio work? In a traditional three year graduate program, this "Feynman flip" might translate into students pursuing a solid year of support coursework, two split-semesters alternating between studio and support, and a final year of uninterrupted studio when they can single-mindedly devote themselves to creative exploration (Figure 3). The advantage to this inverted structure is that once students begin studio work, they will have developed a set of knowledge and skills that enable them to design at a much higher level.

The logic here is quite simply that if students dedicate uninterrupted time to acquiring skills--hand-sketching, rendering and computer drafting, reading and discussing architectural history and theory in depth, acquiring a thorough understanding of legal issues and codes, financial and marketing issues, structures, HVAC and material properties--they will be able to produce more mature studio work. In this new academic environment, when students allude to theoretical and historical circumstances in their studio work, it will be because they have acquired a thorough familiarity with historical and theoretical precedents. If they decide to "break code" on a specific detail, it will be because they realize they are challenging codes and are backed by a legal understanding permitting them to argue convincingly. Gone will be the days when studio critics need to spend time trivially correcting a student's naive use of line weight on drawings. In other

words, while the new curricular framework will require the *number* of semesters in studio to be reduced, in actual fact the *quality* of the studio experience for both students and instructors will greatly increase.

This is the kind of fundamental curricular change that can empower the profession, enhance its prestige and increase the public's faith in an architect's know-how and abilities. Best of all, it will imbue future architects with an underlying confidence that they can always rely on a solid bedrock of knowledge and skills, despite later uncertainties which inevitably accompany changing times. What better gift to give to a student than a foundation of stone?

In his book, *Heisenberg Probably Slept Here*, Richard Brennan describes Feynman's approach to the U.S. Government's convoluted investigation that followed the space shuttle *Challenger* explosion. He writes: "Feynman, using ice water and a rubber O-ring sample, demonstrated with stunning simplicity to a national television audience of millions the physics of the shuttle disaster... With this dramatic performance, he convincingly solved the mystery of the *Challenger* explosion, rattled the Washington bureaucracy down to their well-polished black shoes, and shattered the official silence on one of the most disturbing scandals of the 1980s."[16]

As with all problems, many potential workable solutions may exist. But it is my belief that academics can attack the architectural education issue with the type of single-minded clarity shown in Feynman's *Challenger* demonstration. If this happens, there is no doubt in my mind that we will soon be greeting the arrival of a new breed of informed, innovative, young architects—and a much needed win-win solution for all involved.

NOTES

[1] Richard P. Feynman, *"Surely You're Joking Mr. Feynman!": Adventures of a Curious Character* (New York: W.W. Norton & Company, 1985), 260-278.

[2] Ernest L. Boyer and Lee D. Mitgang, *Building Community: A New Future for Architecture Education and Practice* (New Jersey: The Carnegie Foundation for the Advancement of Teaching, 1996), 85.

[3] Robert Gutman, "Professions and their discontents: the psychodynamics of architectural practice," *Practices 5/6* (1997), 15.

[4] Carol Burns, "An approach to alignment: professional education and professional practice in architecture," *Practices 5/6* (1997), 36.

[5] *Ibid.*

[6] National Research Council, *Education of Architects and Engineers for Careers in Facility Design and Construction* (Washington, DC: National Academy Press, 1995), 3.

[7] Michael J. Crosbie, "The Schools: how they're failing the profession and what we can do about it," *Progressive Architecture* v.76 n.9, (September 1995), 48.

[8] National Research Council, *Education of Architects and Engineers for Careers in Facility Design and Construction* (Washington, DC: National Academy Press, 1995), 12.

[9] *Survey to Assess Contemporary Architecture Education*, (by author, unpublished, December 1, 1998), Q # 40.

[10] Michael D. Flynn (personal communication, December 4, 1998).

[11] Steven Izenour (personal communication, January 6, 1999).

[12] John Lijewski (personal communication, December 4, 1998).

[13] Robert Gutman, "Professions and their discontents: the psychodynamics of architectural practice," *Practices 5/6* (1997) p.17.

[14] Carol Burns, "An approach to alignment: professional education and professional practice in architecture," *Practices 5/6* (1997), 37-38.

[15] Carl M. Sapers, Carol Burns and Victoria Beach, "Building Community: A New Future for Architectural Education and Practice (Book Review)," *GSD News* (fall 1996), 53-55.

[16] Richard P. Brennan, *Heisenberg Probably Slept Here: The Lives, Times, and Ideas of the Great Physicists of the 20th Century* (New York: John Wiley & Sons, Inc., 1997), 210.

REFERENCES

Boyer, E. L., and L. D. Mitgang. *Building Community: A New Future for Architecture Education and Practice*. New Jersey: The Carnegie Foundation for the Advancement of Teaching. 1996.

Brennan, R. P. *Heisenberg Probably Slept Here: The Lives, Times, and Ideas of the Great Physicists of the 20th Century*. New York: John Wiley & Sons, Inc. 1997.

Burns, C. "An approach to alignment: professional education and professional practice in architecture," *Practices 5/6*, 1997 p.(32)-39.

Crosbie, M. J. "The Schools: how they're failing the profession and what we can do about it," *Progressive Architecture*, September 1995 v.76n.9, p.47 (7).

Feynman, R. P. *"Surely You're Joking Mr. Feynman!": Adventures of a Curious Character*. New York: W.W. Norton & Company. 1985.

Flynn, M. D. (personal communication, December 4, 1998).

Gutman, R. "Professions and their discontents: the psychodynamics of architectural practice," *Practices 5/6*, 1997 p.15-23.

Izenour, S. (personal communication, January 6, 1999).

Jones, D. (personal communication, January 11, 1999).

Lijewski, J. (personal communication, December 4, 1998).

National Research Council. *Education of Architects and Engineers for Careers in Facility Design and Construction*. Washington, D.C.: National Academy Press. 1995.

Norvell, S. (personal communication, December 3, 1998).

Rubottom, T. (personal communication, January 8, 1999).

Sapers, C. M., C. Burns and V. Beach. "Books (review): Building Community: A New Future for Architectural Education and

Required Course Units Distribution*
for Top-ranked U.S. Accredited First Graduate Degree
(M.Arch)
Architecture Programs

	SEMESTER OF STUDY	COURSEWORK: DS	HT	BT: S	BT: E	PD: L	PD: M	PD: RE	CAD	VS	O	TOTAL UNIT HOURS
UC Berkeley (3 yrs. 72 units)	Yr.1: 1	7	4'									
	" : 2	7		4'								
	Yr.2: 1	5	3 – 4'		3'						14-17'	
	" : 2	5	2 – 3'	3'								
	Yr.3: 1	5				←	2 – 3'	→				
	" : 2	5										
Totals for subject category		34	11	7	3		3				14	72
% of total coursework		**47.2%**	**15.3%**	**9.7%**	**4.2%**		**4.2%**				**19.4%**	**100%**
Columbia U (3 yrs. 108 units)	Yr.1: 1	9	3	3						3		
	" : 2	9	3	3	3"							
	Yr.2: 1	9	3		3"				3'			
	" : 2	9	3	1.5	1.5					3		
	Yr.3: 1	9	3	1.5	1.5	←	3	→				
	" : 2	9	3								6	
Totals for subject category		54	18	9	9		3		3	6	6	108
% of total coursework		**50%**	**16.7%**	**8.3%**	**8.3%**		**2.8%**		**2.8%**	**5.6%**	**5.6%**	**100%**
Harvard GSD (3.5 yrs 140 units)	Yr.1: 1	7	4	1.5	1.5					6		
	" : 2	8	4	2	2				4			
	Yr.2: 1	8	8	4								
	" : 2	8	4	4	4							
	Yr.3: 1	8		2	2	←	4'	→			4	
	" : 2	8 (option)				←	4'	→			8	
	Yr.4: 1	12									8	
Totals for subject category		59	20	13.5	9.5		8		4	6	20	140
% of total coursework		**42.1%**	**14.3%**	**9.6%**	**6.8%**		**5.7%**		**2.9%**	**4.3%**	**14.3%**	**100%**
UCLA (3 yrs. 116 units)	Yr.1: 1	4 + 2 "	4								2 – 4 '	
	" : 2	4 + 2 "		6	2							
	" : 3	4 + 2 "		4	4							
	Yr.2: 1	4 + 2 "		4							4	
	" : 2	4 + 2 "			4						4	
	" : 3	4					4				4	
	Yr.3: 1	4 + 2 "	4			←	(optional)	→			4	
	" : 2	4 – 6 "									4 – 6 '	
	" : 3	8									0 – 4 '	
Totals for subject category		54	8	14	10		4				26	116
% of total coursework		**46.6%**	**6.9%**	**12.1%**	**8.6%**		**3.4%**				**22.4%**	**100%**
MIT (3.5 yrs. 294 units + thesis)	Yr.1: 1	18	9	4.5	4.5					9 (or elec)		
	" : 2	18	9	9							9	
	Yr.2: 1	18		9					12		9	
	" : 2	18	9		9						9	
	Yr.3: 1	18		6	6						18	
	" : 2	18									30	
	Yr.4: 1	24				←	6	→			9	
Totals for subject category		13.2	27	28.5	19.5		6		12	9	84	318
% of total coursework		**41.5%**	**8.5%**	**9.0%**	**6.1%**		**1.9%**		**3.8%**	**2.8%**	**26.4%**	**100%**

Figure 1a

Required Course Units Distribution*
(by percent of total program requirements)
for Top-ranked U.S. Accredited First Graduate Degree
(M.Arch)
Architecture Programs

	S	*H/T*	*BT*	*PD*	*CAD*	*VS*	*O*
Yale	42.6%	8.3%	21.3%	2.8%	5.6%	5.6%	13.9%
UCLA	46.6%	6.9%	20.7%	3.4%	0.0%	0.0%	22.4%
UC Berkeley	47.2%	15.3%	13.9%	4.2%	0.0%	0.0%	19.4%
U of Oregon	44.4%	16.7%	19.4%	2.1%	2.8%	4.2%	10.4%
Texas A&M	46.2%	13.2%	16.4%	3.3%	0.0%	3.3%	17.6%
MIT	41.5%	8.5%	15.1%	1.9%	3.8%	2.8%	26.4%
Harvard GSD	42.1%	14.3%	16.4%	5.7%	2.9%	4.3%	14.3%
Columbia U	50.0%	16.7%	16.6%	2.8%	2.8%	5.6%	5.6%
Percent of Program's	**45.1%**	**12.5%**	**17.5%**	**3.3%**	**2.2%**	**3.2%**	**16.3%**

100%

Legend:

S	Studio (Design or Thesis)
H/T	History / Theory
BT	Building Technology (Structures (Construction) / Environment (HVAC))
PD	Professional Development (Law / Management / Real Estate)
CAD	Computer Aided Design
VS	Visual Studies (or Arch. Dwg.)
O	Other (includes Electives)

* All figures, except those of the University of Oregon, have been extracted by the author from official university catalogues or internet postings for the 1998-99 academic year. University of Oregon figures are supplied by Prof. Nancy Cheng, Department of Architecture, University of Oregon.

Figure 1a (table previous page)**:** In each of the eight architectural programs studied, studio is central to each and every semester of the curriculum. According to the official school credit hours, students spend an average of 45% of their time in studio. In reality, students spend close to 90%. Devoting only 10% of their time to other coursework means students 1) rarely master support material and 2) develop unrealistic expectations about the profession after graduation. Research suggests that this disconnect is creating serious problems for the profession.

Figures 1b & c (table this page and graph on next)**:** Especially noteworthy is the average of 3% devoted to professional development in architecture. If students are given a better understanding of law, management, real estate, and financial accounting, for example, might they not possess the edge that the profession now so desperately seems to need?

		COURSEWORK										
	SEMESTER OF STUDY	DS	H/T	BT		PD			CAD	VS	O	TOTAL UNIT HOURS
				S	E	L	M	RE				
U of Oregon (3 1/3 years: 14 units)	Summer	6	4							3		
	Yr.1: 1	6	4		4				4			
	" : 2	6	4	4								
	" : 3	6	4		4							
	Yr.2: 1	6	4	4						3		
	" : 2	6		4							4	
	" : 3	6	4	4								
	Yr.3: 1	6		4		←	3	→			3	
	" : 2	8									4	
	" : 3	8									4	
Totals for subject category		64	24	20	8		3		4	6	15	144
% of total coursework		44.4%	16.7%	13.9%	5.6%		2.1%		2.8%	4.2%	10.4%	100%
Texas A & M (3 years: 91 units)	Yr.1: 1	6	3	1.5	1.5					3		
	" : 2	6	3	3	3							
	summer	6	3									
	Yr.2: 1	6		3'							4	
	" : 2	6			3'						4	
	Yr.3: 1	6	3'								4	
	" : 2	6				←	3'	→			4	
Totals for subject category		42	12	7.5	7.5		3			3	16	91
% of total coursework		46.2%	13.2%	8.2%	8.2%		3.3%			3.3%	17.6%	100%
Yale (3 years: 108 units)	Yr.1: 1	6	3	6**						3		
	" : 2	6	3	6**						3		
	Yr.2: 1	9		3	3				3			
	" : 2	7		1	4				3		3	
	Yr.3: 1	9	3			←	3	→			3	
	" : 2	9									9	
Totals for subject category		46	9	16	7		3		6	6	15	108
% of total coursework		42.6%	8.3%	14.8%	6.5%		2.8%		5.6%	5.6%	13.9%	100%

Legend:

S	Studio (Design or Thesis)
H/T	History / Theory
BT	Building Technology (Structures (Construction) / Environment (HVAC))
PD	Professional Development (Law / Management / Real Estate)
CAD	Computer Aided Design
VS	Visual Studies (or Arch. Dwg.)
O	Other (includes Electives)

* All figures, except those of the University of Oregon, have been extracted by the author from official university catalogs or internet postings for the 1998-99 academic year.
University of Oregon figures are supplied by Prof. Nancy Cheng, University of Oregon, Department of Architecture.

** Where content of course was not specifically delineated in source material, an intelligent estimate was made regarding subject matter of course (i.e. "Materials" or "Building Project" courses were assumed to fall under Building Technology).

' Specific semester of study was optional or not delineated in course listing.

" Support coursework to accompany design studio.

‴ Course covers enclosures and environments.

Figure 1a (continued)

Survey to Assess Contemporary Architectural Education

	Number of Principals in Firm Which Responded
Antoine Predock, Architect	*
Cesar Pelli & Associates Inc.	1
EDAW, Inc.	. .
Eisenman Architects	. .
Ellenzweig Associates, Inc.	1
Ellerbe Becket	. .
Frank O. Gehry & Associates, Inc.	. .
Gensler	2
Gwathmey Siegel & Associates	1
Hardy Holzman Pfeiffer Associates	1
Kaplan/McLaughlin/Diaz	. .
Kevin Roche & John Dinkeloo & Associates	1
Leo A. Daly	. .
Michael Graves, Architect	. .
Mitchell Giurgola Architects	1
Murphy/Jahn Architects	1
Payette Associates, Inc.	1
Pei Cobb Freed & Partners	1
Perkins & Will	1
Philip Johnson, Ritchie & Fiore	*
Richard Meier & Partners Architects	1
Robert A.M. Stern Architects	. .
Robert T. Brodie & Associates	. .
RTKL Associates Inc.	. .
Schwartz/Silver Architects Inc.	2
Shepley Bulfinch Richardson & Abbott, Inc.	2
Skidmore, Owings & Merrill	1
Smith-Miller + Hawkinson, Architects	1
Studios Architecture	. .
The Stubbins Associates, Inc.	1
Tigerman McCurry Architects	*
Venturi Scott Brown & Associates	1
Total number	**21**

* firm formally declined to participate in survey

. . firm did not respond

32 = Total number of FIRMS to which surveys were distributed
18 = Total number of FIRMS which responded
56% = Percentage of FIRMS which responded

Figure 2: In December 1998, 21 principals of 18 U.S. architectural firms were surveyed regarding their satisfaction with the education of recent graduates in their employ. Over 50% indicated dissatisfaction with the training of recent graduates.

Sampling of Required Course Units Distribution
(by percent of total program requirements)
for Top-ranked U.S. Accredited First Graduate Degree
(M.Arch)
Architecture Programs

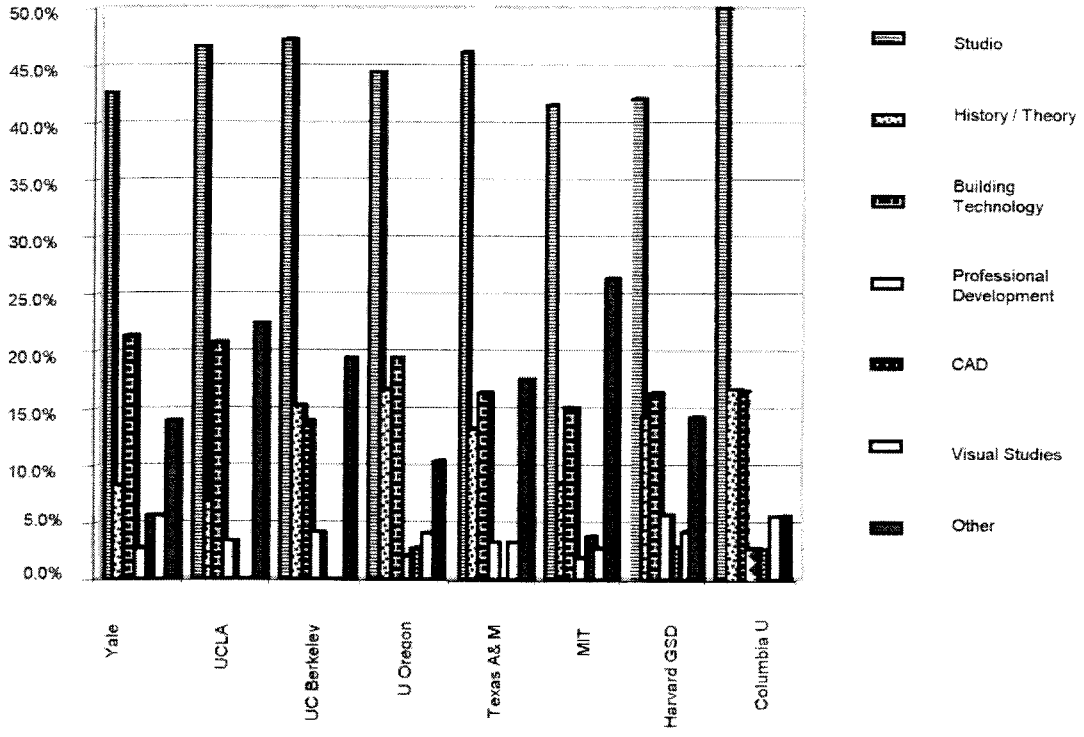

Figure 1c

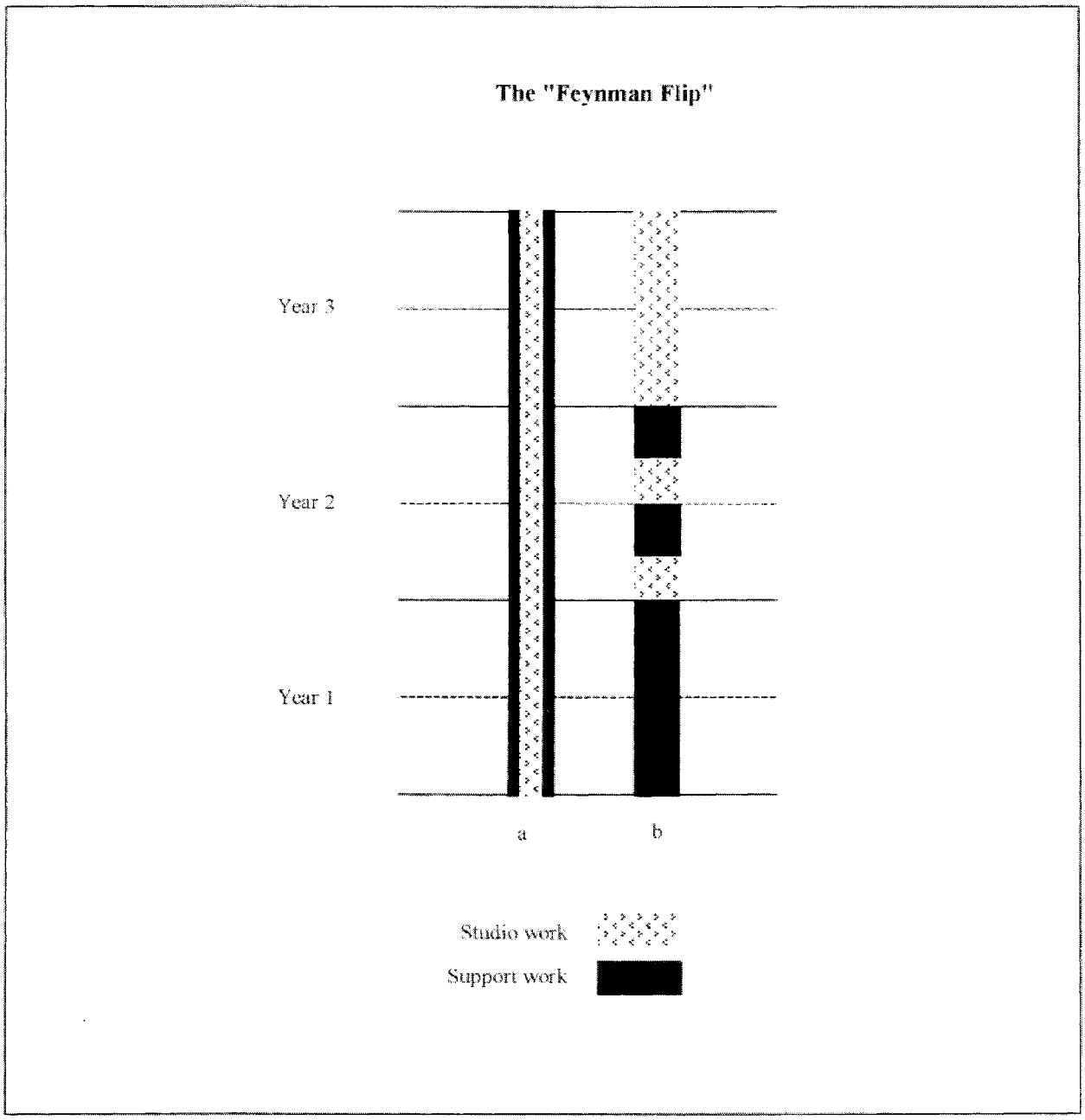

Figure 3:

The current system of architectural education represented in (**a**) places studio at the heart of every semester of study, requiring students to simultaneously engage in creative thought and master support work. The problem with this arrangement is that, while support work can be perfected in discrete packages of time, the nature of studio work renders it completely time-absorptive. When studio and support courses are combined, the former forces the latter into the margins of a student's day. In this curricular structuring, support content is seldom mastered.

If, on the other hand, support courses and studio are temporally separated as in (**b**), support skills and creative thought are allocated their own time for attaining proficiency. This form of "split curriculum" would result in a much higher caliber of studio work and ultimately, a more knowledgeable, better grounded academic or professional.