In Conversation

Design Education, Training, and the Broad Picture: Eight Experts Respond to a Few Questions

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Interviewee Biographies

Richard Buchanan is Professor of Design and Innovation at the Weatherhead School of Management, Case Western Reserve University. He is an editor of the international journal *Design Issues*, published by MIT Press. He is also Chair Professor of Design, Strategy and Entrepreneurship at the College of Design and Innovation at Tongji University in Shanghai, China. He received his Ph.D. from a distinguished interdisciplinary program established by the philosopher Richard McKeon at the University of Chicago. He was Head of the School of Design at Carnegie Mellon University for 10 years.

Meredith Davis is Professor Emerita at NC State University, where she served as Graphic Design Head and Director of the Ph.D. in Design. She is a National Association of Schools of Art and Design fellow and medallist of the AIGA. She has consulted with 100 college programs in eight countries and co-authored numerous college accreditation standards in design. Meredith has written five books, including *Teaching Design*. Her research includes education studies for the National Endowment for the Arts and the US Department of Education, and a study of teaching critical and creative thinking for NC State University.

Ken Friedman is Chair Professor of Design Innovation Studies at Tongji University and Professor Emeritus at Swinburne University of Technology, where he served as Dean of the Faculty of Design. Friedman's research concentrates on organization, culture, and design in the knowledge economy. He is part of the international community for experimental art, design, and music known as Fluxus. His work is represented in the Museum of Modern Art in New York and the Hood Museum of Art at Dartmouth College.

Willard McCarty is Professor of Humanities Computing in the Department of Digital Humanities at King's College London, England, where he is director of the doctoral programme in the department. He is a visiting professor in the Digital Humanities Research Group in the School of Humanities and Communication Arts at the University of Western Sydney, Australia. He is a Fellow of the Royal Anthropological Institute, London.

Ezio Manzini has worked on design for sustainability for more than twenty years. He is the founder of DESIS (http://www.desisnetwork.org), an international network of design schools active on design for social innovation and sustainability. He is Distinguished Professor of Design for Social Innovation at Elisava, Barcelona; Honorary Professor at the Politecnico di Milano; and Guest Professor at Tongji University (Shanghai) and Jiangnan University (Wuxi). His most recent works include *Design, When Everybody Designs: An Introduction to Design for Social Innovation* (MIT Press, 2015; published in 7 languages), and *Politics of the Everyday* (Bloomsbury, February 2019).

Don Norman is Director of the Design Lab at the University of California, San Diego, cofounder of the Nielsen Norman Group, a member of the National Academy of Engineering, and former Vice President of Apple. He serves on numerous company and educational advisory boards and boards of directors. He has published 20 books translated into 20 languages including *Emotional Design* and *Design of Everyday Things*. He can be found at www.jnd.org.

Sharon Poggenpohl has taught at three notable schools: the School of Design at Hong Kong Polytechnic University, the Institute of Design at Illinois Institute of Technology, and the Rhode Island School of Design. For twenty-six years, she edited *Visible Language*, an international scholarly journal dealing with communication design. Working with master's degree and Ph.D. students, her interest was to advance research and practice and foster an understanding of design's unfolding trajectory. She recently wrote *Design Theory to Go: Connecting 24 Brief Theories to Practice*.

Saskia Sassen is the Robert S. Lynd Professor of Sociology at Columbia University and a member of The Committee on Global Thought. Her latest books are the 5th fully updated edition of *Cities in a World Economy* (Sage, 2018) and *Expulsions: Brutality and Complexity in the Global Economy* (Harvard University Press, 2014, now available in 18 languages). She is the recipient of diverse awards, including multiple doctor *Honoris Causa*, the Principe de Asturias 2013 Prize in the Social Sciences, and is a Foreign Member of the Royal Academy of the Sciences of the Netherlands. For more information, visit www.saskiasassen.com.

The guest editor of this issue of *She Ji* invited me to interview experts in design and education to explore the central themes of design education today. In response, I crafted questions for eight leading thinkers. Their comments foster reflection. I provide my own response following the interviews.

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When you hear the word "education"—as distinct from "training" or "instruction"—what core meanings come to mind?

Saskia Sassen: The key element that makes education different from training or instruction is the open character of education. Yes, it must be a disciplined and discipline-forming endeavor—but it is not simply the solution to a problem or a know-how function.

Willard McCarty: I think of education in the Socratic sense, which the etymology of the term suggests: the drawing out of—or assisted expansion of—a person's innate capacities and desire to know and to do, an awakening to the astonishing and complex phenomena of the world, and the developing of cognitive and manual skills that enable students to make the most of them. In my experience, the fundamental hunger for something beyond the information given[1] remains innate unless beaten out of a person. What the educator does is remove impediments, encourage, and foster. Of course, clever trickery may be needed to evade students' defenses and get beyond any false expectations—for example, the notion that education is nothing more than training for a job. Such intellectual growth is not easy. Failure is neither unavoidable, nor is it valueless. Education offers the chance to work hard, very hard, to achieve a life worth living.

Don Norman: The distinction between training and education is very important as we examine the future of design education. Usually training has been taken to mean "learning the essentials for doing a real job or task"—"real" meaning "in the world," not just in the classroom. Education is gaining a deep understanding of the underlying principles and historical underpinnings of what we learn. Note that someone educated in a topic—for example, typography—may be quite unable to practice it, because the strictly educational system often deliberately skips the training phase.

Indeed, when I was an undergrad in engineering at MIT, the department was proud when industry complained that newly hired MIT graduates were incapable of doing any of the tasks they were asked to perform. "We don't train," they said to us, "we educate. Training is specific to the tools and practices of the moment, so if we were to train, in 5 years your skills would be obsolete. We educate, so that you will always be current." This has proven to be true for me; many decades after that education, I can still read and follow technical debates in electrical and computer engineering.

In design, the focus of traditional instruction is on *design as craft*—in other words, on training. As my article with Michael Meyer[2] in this issue explains, when it comes to traditional design tasks such as industrial product design or graphic document design, crafting skills are critical, which means considerable time must be devoted to training. However, for newer forms of design—redesigning a bank's business plan or a hospital's admissions procedure, or a new mode of transport for an isolated, poor village in the remote countryside—we must educate rather than train. These kinds of projects require a broader and deeper understanding of culture, the world, philosophy, history, politics, and ethics.

Design today is largely populated by well-trained practitioners who produce wonderful work. But they are not necessarily capable of designing where traditional craft skills no longer apply—for example, in the design of a health care system.

Which is more important? Craft training or academic education? That's the wrong question. We need both—but each serves different needs. The aspiring designer needs to choose which path to follow. "When you come to a fork in the road, take it."[3]

Richard Buchanan: Before we talk about education in the universities, I believe it is important to recognize that design thinking is now being taught successfully and with sophistication in a growing number of primary and secondary schools around the world. The movement is significant, involving thousands of students, and it has implications for university education. Those younger students will soon begin to enter university programs, sometimes in design and perhaps more often in other disciplines. They will expect design to be of continuing relevance to their studies

and they will expect more than a repetition of their earlier education. Universities should begin to think carefully about how they will best serve those students.

Education is more than training in skills and techniques. It is an intellectual preparation for life-long learning that cultivates the capabilities of the mind to encounter new situations and respond with ingenuity, imagination, and creativity. It is what we mean by a liberal education that transcends specialization, enabling a student to adapt to a changing environment with integrity and purpose. The essential elements of a sound liberal education are, in fact, the four dimensions of creativity. First, to be *inventive* in perceiving new possibilities in the world. Second, to be open to *discovery* of new facts when an inventive idea is explored in the context of the circumstances of how we live. Third, to be *innovative* and imaginative in exploring connections among diverse kinds of knowledge gained through a university education and experience in the world. Fourth, to be open to *intuition* in perceiving the principles and values that provide organization, coherence, and interdependencies in the many systems that surround us in our lives.

An education of this kind is what we mean by the ability of human beings to amplify and augment human intelligence through creative inquiry, responding to the development of artificial intelligence. A sound education provides the Intelligence Amplification (IA) that balances the Artificial Intelligence (AI) that now surrounds us. In our time, design is the pathway of IA.

Ken Friedman: Training involves mastering skillsets. Training also involves practice to perfect those skills. In contrast, education goes beyond training to include rich human development.

When we learn to play a violin, we practice repeatedly to master it. Mastery involves more than perfecting finger placement, bowing, and note reading—we must take time to think deeply and reflect on our practice to master the violin. Mastery involves philosophy, engagement with the music, and appreciation of a range of perspectives.

Instructors teach skills. Educators help students to develop an art or science. This is true of education in all fields: design, applied arts, fine arts, liberal arts and humanities, along with the social and natural sciences.

There is a difference between universities and professional schools. Universities have four key

responsibilities, and they exercise these responsibilities in several ways. These four responsibilities involve two paired sets of values. These pairings come with some tension between them. Two goals of universities are 1) to create new knowledge, and 2) to preserve existing knowledge. The other two are 3) to train specialists, and 4) to educate citizens.

Professional schools primarily preserve and transmit existing knowledge to train specialists. Most professional schools in design fail to understand or work with the dimension of research that involves creating new knowledge.

It is important to understand what it means to create new knowledge in the context of a university. The university is a social institution where scientists and scholars create knowledge for the wider fields and disciplines to which they belong. They create new knowledge for human beings in general, and for the larger societies and nations that create and support the university as an institution.

Learning creates knowledge for the learner. Creation in design, like creation in art or music, may also involve new knowledge—but this new knowledge belongs to the creator alone. Others may benefit from what the creator knows, but they do not gain the knowledge itself.

Creating new knowledge for a field benefits people beyond the immediate individual who creates the knowledge. This is the role of research. Research shares the knowledge, and it involves showing others how to develop, apply, and use the knowledge.

Many design schools are professional schools that engage in creative education that helps individuals enrich and perfect their skills. This also takes place in medical schools and law schools. Even so, professional schools focus inward on the future members of the profession. They train professionals to do a competent or even a superior job. The ultimate goal is inducting them into a profession so that they may earn a good living.

Education involves greater dimensions than personal enrichment and career success. Education involves the development of the whole person. The word educate has its roots in a Latin verb, *educare*. This is related to the verb *educere*, which means to lead out, to guide. An educated person is a human being among other human beings, a citizen whose sense of the self is rooted in community.

Many forms of education include skills training. Education itself is something larger.

Meredith Davis: I don't think "training" and "instruction" are pejorative terms, but they do play a very different role from "education." Training and instruction focus on the mastery of procedures and the acquisition of knowledge about which there is some disciplinary or professional consensus regarding definition, application, and evaluative criteria. There is often broad agreement on teaching instrumental know-how and settled concepts through exercises or puzzles for which faculty generally know the solution. The goal of design training and instruction is *proficiency* in applying these skills and concepts under similar circumstances with comparable results.

On the other hand, "education" is transformative and challenges a worldview. It involves more than mastering preferred professional behaviors, instead confirming or recalibrating beliefs, values, and ways of thinking. The goal of education is *insight*, not just proficiency, and guiding decisions in novel situations. Faculty control the delivery of educational prompts—lectures, readings, discussions, assignments, and so on—but students' knowledge perspectives and approaches to uncertainty are the larger outcomes of education and cannot be evaluated through work products alone. Unlike exercises and puzzles, transformative design projects immerse students in a complex universe of questions, shifting constraints, and competing values.

Ezio Manzini: "Education" means to contribute to the social construction of human beings. Training and instruction are what give these human beings the capability to operate, and to do this with competence (and critical spirit), under specific conditions.

Sharon Poggenpohl: "Education" helps you to live an interesting and productive life—it goes well beyond getting a job, although it can secure this too. Over recent decades, there has been much discussion of the importance of lifelong learning. Education supports this by developing curiosity and breadth of knowledge, skill in finding appropriate information, and confidence in tackling what is personally unknown. Transference of knowledge from one domain to another, seeing patterns of application and connections between methods, materials, people, and other ways to think fluidly about problems or situations are elements of a good education. At a time when technology is rapidly changing everyday life, even gobbling up professional jobs, the long term existence of a particular career path is doubtful. Training, with its counterpart instruction, seems to easily become obsolete due to technological advances. Education prepares a person to be more resilient and better engage with lifelong learning and life's cultural pleasures.

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(to Sassen and McCarty only)
In your view, what are the main competencies—or meta-competencies—that any university-level educational program should offer to help students in the human sciences?

Sassen: I see the core elements, or meta-competencies as those ensuring not only an in-depth focus in pursuit of a well-designed question/discovery, but also an awareness that this entails closure. Thus, how the closure is constituted can make all the difference to the outcome. We must be aware of this when we engage in this type of research. Yes we need openness, not walls—but that openness has to be built-designed, and its boundaries must be visible to others—even if it is an abstract or purely mathematical boundary.

McCarty: The basic competencies are
  1 Linguistic: the ability to read with love for language and insight, and to write well—in as many languages as possible but at least at a high level in one;
  2 Rhetorical: the skill to construct a persuasive argument and to unpick one;
  3 Historical: a keen historical imagination and knowledge of the past;
  4 Anthropological: a cross-cultural understanding sufficient to appreciate that no one culture, including one's own, has privileged access to what there is and how things are;
  5 Philosophical: insight into the problematic qualities of apparently straightforward realities and simple truths and the ability to deconstruct them;
  6   Computational: the ability to write a simple program, a basic knowledge of how digital machines work and a good grasp of their constraints and capabilities;
  7 Scientific and mathematical: basic familiarity with at least one natural science as well as a good idea

of the others; an idea of where a mathematical approach, including a statistical one, might impinge on a student's interests and what it might be capable of revealing.

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(to Sassen and McCarty only)
What do you see as the most notable missing component in education today?

Sassen: Given that I am a professor at one of the great US institutions for higher education (Columbia University), I see mostly the positives of the university system. But I also see both what falls away and what remains unaddressed: for instance, advanced graduate studies tend to generate strong closure around how graduate students must construct their research. Yet history keeps changing, innovations keep coming up … we professors *must* recognize that new generations may grow up seeing/discovering conditions and instruments that we the elders do not quite see, or do not quite value.

McCarty: Serious commitment to embody and communicate the love of learning.

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(to all except Sassen and McCarty)
What is the most important element missing from design education today?

Norman: It would take a complete article—or maybe a book—to answer that question. I make an attempt to do so in my article in this issue of *She Ji*.[4]

Buchanan: There is an old saying whose truth has withstood the test of time: "First you learn the craft, then you learn the art." Teaching the *craft of design* is a reasonable task of training at every level of education, including university level programs. However, teaching the *art of design thinking* should be the added value of education, whether in universities or in other schools of design. If design is to regain its status as a significant cultural art of our time—a position that threatens to be lost today in the face of new circumstances—then there are four elements that should be added or better cultivated.

The first element is *improved communication*. Design students continue to be somewhat weak in how they present their work. Whether in posters or in oral and written presentations, students should develop better ability to identify (1) the problem that their work addresses, (2) the central idea of their project, (3) how that idea is explored and developed, and (4) the expected significance of their work.

The second element is a refined and more sophisticated understanding of the *sources of creativity*. At present, our culture regards innovation as the basis of creativity. This ignores the other three dimensions of creativity: invention, discovery, and intuition.

The third element is explicit education in the *ethical dimensions* of their work. Many students are looking for guidance in dealing with ethical issues, but our design programs provide little or no useful help. This does not have to be a normative element of education. Rather, it should show students how they can reason to address the ethical dilemmas that they are sure to encounter.

The fourth element is sophisticated discussion of the many *principles* that guide the designer in his or her work. This should help the student distinguish between the methodological principles that apply in various branches of design and the *first principles* that represent the deeper goal of design in serving fellow human beings. This should help students better explain and justify the decisions that they make in the features and qualities of products.

Friedman: It is difficult to describe missing elements generally. Many schools are good in specific ways, what is lacking at one may be quite different to what is lacking at another. To create a strong all-around school requires benchmarking against a demanding model. The benchmarking exercise will disclose the missing elements specific to each school.

This kind of benchmarking requires intellectual honesty. Too many schools believe their own advertising. At 50% of the design schools I've visited, someone seems to believe that their school ranks in the top 5% of the world's design schools. There is a simple discrepancy between self-evaluation and the standing of most schools in the wider world. By definition, 45% of those schools lie outside the top 5%.

But there is more to this problem than incorrect self-evaluation. Most schools are not as good as they can be simply because excellence requires resources. It is difficult to get the resources that excellence requires. Even when a school and its leaders honestly

measure their deficiencies, filling the gaps often costs money.

Money is not usually the central problem, however. The greatest problem is nearly always culture—the inertia of culture. Most design schools function within the culture of the artisan craft guild, which is highly traditional. There are several ways around traditional design school culture: one is building something from scratch.

Minerva Schools at KGI and Olin College of Engineering offer excellent models.

You can't study for a design career at Minerva. Rather, you benefit from a kind of T-shaped foundation that enables you to become a good designer. You can build on that kind of education with a good master's program in design.

People do study design at Olin. The focus is engineering design. They study design in the rich context of a real world that requires reflection and breadth. Minerva and Olin both have the added benefit of being designated greenfield institutions.[5]

Another model requires the relentless pursuit of excellence from a strong research university within which a design school is located. We see this at Delft University of Technology. Delft slowly grew its design faculty into greatness. Another is the Ullman School of Design at the University of Cincinnati. The Ullman School is now 150 years old.

Persistent, innovative leadership is another factor. The Aalto University School of Arts, Design, and Architecture began in the University of Art and Design Helsinki with Yrjö Sotamaa, as president for nearly a quarter century. The Illinois Institute of Technology had Patrick Whitney as dean for 25 years. These were long term leaders who patiently pushed forward, moving past obstacles and blockages along the way.

There are several dozen excellent design schools. People at those schools engage in careful self-examination and strive for continuous improvement. Perhaps the one element missing is a broad overview of design education based on an understanding of the different issues visible in university-level design education around the world. This also requires understanding the different national systems as well as the major international higher education systems—the Bologna system, the Anglo-Australian system, the North American system, and the Chinese system.

Now that many design schools have been merged into universities or designated as universities, university-level design education requires an understanding of what it is to be a university, and why. These missing elements are systemic and contextual. The broad general failure to understand these interlinked systems and the contexts in which they function explains a great deal of what is problematic in design education today.

Davis: I have done more than 100 curricular consultations in the US and abroad, and read more than 200 institutional self-studies in my accreditation work with the National Association of Schools of Art and Design. What I have found is repetition of object-centered assignments from one level of the undergraduate curriculum to the next. The subject matter and medium change, but not the scope of problems, range and stability of constraints, or scale of consequences in complex systems.

Rather than defining courses using an industrial era paradigm of "form and function"—and through medium, product, or segment of practice—conditions call for studies shaped by systems-level thinking—what people want and need; what the context demands; how design is planned, produced, and delivered; the outcomes we expect of a design process (including principles or guidelines); how we evaluate outcomes; and the tools and methods for studying these things. This will produce knowledge that will allow graduates to evolve with a rapidly changing field over fifty-year careers.

It is not clear how most MFA curricula transcend what a mature learner can develop through work in a good design office, or what a non-designer can learn better through a second bachelor's degree. Many MFA graduates enter teaching, having limited practice experience and no predisposition for systematic inquiry or academic research. These graduates perpetuate the shortfalls of their master's education with generations of students by repeating what and how they learned, regardless of their new academic context and an evolving field of practice. Good graduate programs are clearly distinct from undergraduate study, responsive to the complex challenges of emergent conditions, and well positioned for intellectual leadership. Good programs ask advanced students to raise and explore meaningful questions, not to solve known or inconsequential problems. And they contribute to interdisciplinary work at a time when other fields make claims of expertise and software democratizes the means of production.

Manzini: In my view, it is not possible to identify "the most important missing element" for two reasons: first, design schools are quite different from one another; and second, the quality of design education can be evaluated across numerous dimensions.

In light of this, I offer a list of these dimensions and suggest we examine how well a school educates its students relative to each. This will generate a multi-dimensional profile for improvement at each institution, rather than pointing to one single element that every school is lacking. Does the institution (1) adopt a contemporary idea of what design is in the 21st century; (2) develop a greater sense of and sensitivity towards social and environmental issues; (3) cultivate a research approach and, in particular, a dynamic relationship between pedagogy and research; (4) focus on project-based research?

Poggenpohl: Having spent decades in master of design and Ph.D. design programs, I answer this question in terms of graduate programs and professional practice. Design projects have many diverse characteristics. They can be simple or complex, achieved individually or collaboratively, the goal and process with which to undertake them may be well- or ill-defined, and they may need original research or not. This range of characteristics leading to design action is often overlooked or taken for granted.

From this perspective I identify four missing elements in design education: 1) design lacks a philosophy, 2) design research is in its infancy and is poorly understood, 3) design action takes place in a cultural and technological context rather than in a vacuum, and 4) interdisciplinary collaboration requires respect for other disciplines and their methods. These four elements are tightly inter-related.

I want to back into these relationships by beginning with interdisciplinary collaboration (4). Understanding the limitations of our knowledge or skills opens the door to collaboration with others who have what is missing from our repertory. This is particularly important if a project is complex or an advanced design application. Recognition of the context a project inhabits, such as language, culture, introduction of new ideas, technological resistance or acceptance—the list could go on—and its content domain and use are important considerations (3). Existing research may be accessed or new research studies may be needed.

Depending on the research goal, the investigation may be practical and quick or extensive and in depth. If research is to support collaboration across disciplines, it is important to understand what constitutes acceptable research evidence for various disciplines (2).

These three elements, collaboration, context, and research lead to the need for a philosophical position. I offer John Dewey's pragmatism[6] as a possibility that is well disposed to design. Pragmatism is a philosophy of practice, it accepts that knowledge is evolutionary and that we learn from primary experience on which we reflect through research to gain a deeper or theoretical understanding. Such a philosophical practice can focus research and practical design action.

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(to all except Sassen and McCarty)
How can design education programs be more relevant to the design profession today? How can they provide students with the learning opportunities and tools they need for professional life in the design field?

Norman: I refer you, again, to my article in this special issue of *She Ji*.[7]

Buchanan: Design education and professional practice in the past twenty years appear to have divided into two new pathways. Of course, the traditional pathway of graphic and industrial design remains the backbone of the field, the surest examples of concrete design to which we always return. But in the new culture, there is, first, a pathway that leads to corporate design, and the design of digital products and the large platforms and systems that are unavoidable yet sometimes too evident in our lives. Whether in the consultancies that support this pathway or within corporations themselves, designers work at the problems of communication, interaction, and service as well as product development. Sometimes they also work at the problems of management and business, applying design thinking in some form to business issues.

Alternatively—and sometimes almost in unconscious or even in conscious protest—there is a second pathway toward social innovation, improvement of government policy and services, improvements in community living. This pathway sometimes involves digital technology, but often it is locally based and low-tech. The concept of the four orders of design[8] can help to clarify these pathways.

My earlier comments provide some suggestions that may make design education programs more relevant to professional practice. However, one of the most important features that could be added to design education is an idea first recommended by the design thought leader Darrel Rhea in his presentation at a recent conference held at Tongji University: "Experience and Principles of Design." He argues persuasively that design programs should include a significant component of instruction in how to design algorithms, the forms that drive and shape the large digital platforms that affect so much of our lives. Without this knowledge, designers will have little to say in the design of digital systems and platforms in the future. I believe he is prescient in identifying a subject that will certainly help students become more relevant for the new areas of work that are emerging.

Friedman: I've written half a dozen articles about these exact issues.[9] There is no way to answer this in short form, so I'll stop there.

Davis: In many cases, employers argue for skills with temporary relevance. The challenge for college design programs, however, is to provide *enduring* content that will serve their graduates well across fifty-year careers. Design education is in the futures business—it needs to be anticipatory, not just reactive.

As part of the *AIGA Design Futures* project, we authored eight briefing papers on trends shaping the future context for professional practice, including related competencies.[10] The papers ground a continuing education effort that will include online glossaries, bibliographies, tools and methods, interviews, and short courses. The mission of this work is to assist designers and educators in transitioning to new practices, expanding offerings in their businesses and institutions, and deepening their positive influence on a continuously evolving culture. The project looks at design education as a continuum from college *through* practice, not just entry-level job preparation.

AIGA and IDSA also assisted the US National Association of Schools of Art and Design in rewriting accreditation standards for college design programs, acknowledging that the most pressing design issues may not be those shared with fine art. And for the first time in the agency's history, there are now graduate design standards that differ from the undergraduate level.

Both efforts represent serious challenges to the traditional paradigm of design education. They affirm multiple problem constraints in constantly changing relationships, not easily addressed one at a time by a linear design process. They reconsider longstanding ideas regarding designer control and perceptions of the people *for* and *with* whom we design—people as *producers*, not just *consumers*. They acknowledge a shift from designing messages, objects, and spaces to designing conversations, tools, systems, and communities. And they recognize increased roles for planning and analysis, built on a foundation of research.

Manzini: Design education must clearly take four things into account: (1) the complex nature of contemporary design; (2) the variety of fields in which it can operate; (3) the variety of artifacts designers can contribute to conceiving and realizing and, finally, (4) the speed at which designers' roles and capabilities have changed in the last few years.

Given that, design education should give students a clear understanding of what are, or could be, their specific role and contribution in the co-design processes. And, on top of that, the capability to present themselves in an effective and convincing way. These issues are, in my view, quite important.

In fact, because of the speed of change (my earlier point 4), it frequently happens that designers' interlocutors (potential clients and partners in co-design processes) have no idea of what they (the designers) can do and what is, or could be, their (the designers') role in the process (see my previous points 1, 2, 3). Of course, in the future this situation will change. But today, and perhaps for a long period, designers, in particular the young ones, must learn how to promote themselves and what they can do. In other words, case-by-case, they must be able to explain the (design) tools, competencies, and capabilities they can and will use. And beyond that, describe the specific point of view they will adopt and the cultural contribution they will bring.

Poggenpohl: For too long, design has focused on its sensibilities, understanding its role as a finisher of something. With a focus on aesthetic form-making, books showing the current visual vocabulary provide samples for designers to emulate. These books reinforce an obsolete notion of design's primary operation

to deliver only aesthetic resolution. Broader contextual knowledge is needed. We live during a time when nothing is finished—it is only a step in a sequence that continues to develop or disappears. An understanding of new communication media like websites, games, or online learning systems for example, along with observation and analysis of new technical directions and possibilities, and even critical commentary relative to technology's continuing development are warranted.

Educational programs need to foster leadership skills so creative designers can reach their potential well beyond their current limitations. There are few design-led case studies that explore project development along with skills related to team building, decision making, and overall prototyping and synthesis important for interdisciplinary teams.[11]

Typically, if a project is culturally significant or strikes out into new territory, research is needed. Answers to research questions may exist. If not, an ability to formulate a study is needed and an ability to work with researchers. Research is a bad word for some in the design community as it is misunderstood, either narrowly confused with scientific research, or broadly watered down to accommodate virtually any web search. Thinking about research requires identification of what is unknown but requires an answer. Such an analytical approach to a project under consideration goes beyond creativity and aesthetics. It deals with the unknown and becomes evidence that guides a project in new directions. There is a difference between research to advance a practical design project (applied research) and research undertaken at the university by faculty or a PhD student to provide a more rigorous study (basic research). Elsewhere, I have compared what is similar or different between them.[12] Research, whether practical or rigorous, is not the antithesis of creativity; formulating a research question and its process of investigation can be a creative process in itself that further adds to creativity in practice or scholarship.

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Is there anything else that you would like to add, and that was not included in your responses?

Sassen: I think I covered the main points above.

McCarty: Study the best of the American liberal arts colleges.

Norman: Design is a complex, multi-faceted field. When I argue for a new form of education, I see this as complementing the existing, craft-based training. I do not wish to lose the powerful craft-based work.

Davis: Curriculum development is a cyclical process of projection, planning, implementation, and assessment. Faculty are generally good at planning and implementation, but not at projection or assessment. Schools enter into tacit contracts that the knowledge and dispositions students develop will be relevant to a practice context two or four years later, and will enable them to evolve within a rapidly changing field over a fifty-year career. That means the design of curricula must be anticipatory as well as reactive. A curriculum is neither a "job description" of technical skills matched to current entry-level positions, nor composed entirely of theories that are temporarily fashionable. How faculty determine the distribution of various curricular content types should result from informed projection of what is enduring, as well as what is marketable.

Manzini: In my view, it is very important to better understand the role of design experts in the emerging design networks. This also implies to be able to understand when and where the new demand of design expertise emerges (that could be far from the traditional industrial businesses, institutions, associations, policy making organizations, etc.).

Poggenpohl: Design has many subfields; some are well established like architecture, while many are not. To complicate things, some like communication and product design have increasingly vague boundaries. At the same time that designers focus on their particular subfield, other well-developed disciplines like engineering are reaching out to discover project-based learning and design thinking. To complicate things even further, software packages available to amateurs enable the creation of design while they undercut professional knowledge. In this context with other disciplines borrowing design strategies and technology providing systemic, finished looking solutions, how can design practically secure itself as a recognized and worthy discipline?

Design subfields are intellectual silos that support an outmoded tradition and ignore an understanding of design writ large. Disciplines have structure and agreed

upon methods and understandings. For example, biology studies all life from various perspectives. It has well defined branches of knowledge that include microbiology, ecology, and genetics. It also encompasses neurobiology, paleontology, zoology, and botany. A discipline closer to design is linguistics, with its study of language. Its subfields include: phonetics, phonology, morphology, syntax, semantics, pragmatics, discourse analysis, stylistics, and semiotics. My purpose is not to explore biology or linguistics in depth, but to demonstrate their basic disciplinary structure and their accounting for their sub-fields.

To become a discipline, design needs to be writ large with its subfields defined and put into relationship. What are its essential understandings? Which methods tie design to people and culture, and bridge the divide between intuition and logic? Elsewhere, I have examined four design subfields according to their shared or different foci.[13] Among the shared elements are aesthetics, human factors, interaction, meaning, patterns of use, and style. Differences relate to the material character of their design outcomes and the sciences important to them.

This is only a beginning—it is work that needs to be extended through collaboration with others across the spectrum of design fields. I foresee argument and resistance in the search for agreement and a reasonable structure. Working from an understanding of other established disciplines and looking to mirror them in design (where possible) brings design into an academic alignment, sorts out possible research positions, and shares knowledge and performance ideas across subfields. Design is a significant human undertaking that is not art or science, but that bridges both in some unique ways.

Frascara: Preparing Students and Educators for Lifelong Learning

A few things emerge from these interviews, taken as a whole: education is open, individual, and personal. In the words of Willard McCarty, a design education enables designers "to live a life worth living." Training can be transmitted, and most design programs concentrate on that. Education, on the other hand, is an awakening that can be fostered and supported but not transmitted. The key is not to choose one focus or the other; education *and* training are both necessary, as

Don Norman points out. Education is more difficult to provide, but should not be overlooked. We need to train designers to master the craft, and to be skillful and inventive, but we must also educate them to be culturally aware, socially responsible, and proactive. From William Morris, who emphasized mastering the craft, to Walter Gropius, who sought to merge art with technique, and to a lesser extent the School of Ulm, through its incorporation of science and philosophy into design curriculum, it was thought that design education required the transmission of known concepts and skills from teacher to learner.

From a conception of design as based on the application of existing methods and processes, we have now arrived at the notion that the quality of a design research method depends on the quality of the design research team applying it. We have also learned that the entire design process—not merely the ideation to delivery process, as some would have it—from identifying a design intervention opportunity to evaluating its final impact on reality, is a process of progressive understanding. This process of improving understanding grows from problem definition, through research, prototyping and iterating, all the way into the final "reality check" when the design product—tangible or intangible[14]—is implemented at full scale. If the process is not bracketed by research at the beginning and evaluation at the end, design cannot claim to be a responsible practice.

The rapidly-changing world of today has fundamentally expanded the focus of education and spurred the cultivation of meta-competencies—the basic life skills that allow a person to adapt to constantly changing circumstances. In addition to focusing on what students should learn about design, we must also foster their desire to engage in lifelong learning, and help them develop the skills and competencies that a life of flexibility and adaptability requires. Our problem as design educators is that *we really do not know how to do this as well as we ought to*. There is very little in pedagogy research demonstrating how to push this new horizon in design education. In addition to passing on the best current conceptual and instrumental design knowledge, we in the design education field must prepare *ourselves* to help students learn *how* to learn, to become able to thrive and adapt within changing conditions, and discover the power of the love for learning.

Notes

1 Jerome S. Bruner, "Going Beyond the Information Given," in *Beyond the Information Given: Studies in the Psychology of Knowing*, ed. Jeremy M. Anglin (1957; repr., New York: W. W. Norton & Company, 1973), 218–38.

2 Michael W. Meyer and Don Norman, "Changing Design Education for the 21st Century," *She Ji: The Journal of Design, Economics, and Innovation* 6, no. 1 (2020): 13–49, DOI: https://doi.org/10.1016/j.sheji.2019.12.002.

3 Donald A. Norman, "When You Come to a Fork in the Road, Take It: The Future of Design," *She Ji: The Journal of Design, Economics, and Innovation* 2, no. 4 (2016): 343–48, DOI: https://doi.org/10.1016/j.sheji.2017.07.003. The title of this article quotes the famous American baseball player Yogi Berra, who reportedly told people this was how to get to his home.

4 Meyer and Norman, "Changing Design Education for the 21st Century."

5 For more information on Minerva Schools, see: https://www.minerva.kgi.edu. For more information on Olin College of Engineering, see: http://www.olin.edu.

6 John Dewey, *Experience and Nature* (New York: Dover Publications, 1958); Larry A. Hickman, *Pragmatism as Post-Postmodernism: Lessons from John Dewey* (New York: Fordham University Press, 2007).

7 Meyer and Norman, "Changing Design Education for the 21st Century."

8 For example, see Richard Buchanan, "Wicked Problems in Design Thinking," *Design Issues* 8, no. 2 (1992): 5–21, DOI: https://doi.org/10.2307/1511637; Richard Buchanan, "Design Research and the New Learning," *Design Issues* 17, no. 4 (2001): 3–23, DOI: https://doi.org/10.1162/07479360152681056.

9 For example, see Ken Friedman, "Design Curriculum Challenges for Today's University," in *Enhancing the Curricula: Exploring Effective Curricula Practices in Art, Design and Communication in Higher Education* (London: Royal Institute of British Architects (RIBA), 2002), 27–63; Ken Friedman, "Design Science and Design Education," in *The Challenge of Complexity*, ed. Peter McGrory (Helsinki: University of Art and Design Helsinki UIAH, 1997), 54–72.

10 See https://aiga.org'aiga-design-futures/ for more information.

11 John Armitage, *Bringing Numbers to Life: LAVA and Design-Led Innovation in Visual Analytics* (Amsterdam: Interaction Design Foundation, 2015).

12 Sharon Helmer Poggenpohl, *Design Theory to Go: Connecting 24 Brief Theories to Practice* (Estes Park: Ligature Press, 2018).

13 Poggenpohl, *Design Theory to Go*.

14 Jorge Frascara, "People-Centered Design: Complexities and Uncertainties," in *Design and the Social Sciences: Making Connections* (London: Taylor & Francis, 2002), 33–39.

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