

LEARN!2050 AND DEXIGN FUTURES

LESSONS LEARNED TEACHING DESIGN FUTURES

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1. INTRODUCTION

This paper explores how we might redesign education to face the challenges and opportunities of a sustainable future. Increasingly, designers operate within ever-broader contexts (e.g., technological, social, political, environmental, global). Design for sustainable futures requires the ability to envision longtime horizon strategic scenarios driven by forces likely to shape change in broader contexts. Traditional pedagogy poorly equips designers to integrate long-range strategic thinking with current human-centered design methods.

We present two interlocking projects: LEARN! 2050 and Dexign the Future. Please note the term *dexign* was introduced to indicate an experimental type of design. The LEARN! 2050 scenario describes design pathways from today to a new learning landscape in the year 2050. *Dexign the Future*, a course integrating Futures Thinking with Design Thinking, was introduced in the School of Design at Carnegie Mellon University in fall 2013 to a mix of third year undergraduate and graduate design students. Students learned to engage strategic longtime horizon scenarios from a generative design perspective.

Lessons learned led to a three-semester sequence teaching design methods for longtime horizons aimed at transitioning towards sustainable societies. The sequence includes: *Dexign Futures Seminar*, *Introduction to Dexign the Future*, and *Dexign the Future*. The *Dexign Futures Seminar* is an online module that teaches students to critique and deconstruct existing futures scenarios. In the *Introduction to Dexign the Future* course students explore futures based themes, design methods, and research techniques. The *Dexign the Future* course deep-dives into a semester long project set in 2050. In summary, we provide here three contributions: first, an example of a future learning scenario set in 2050; second, a design course sequence that combines Futures Thinking with Design Thinking to create desirable design futures (what futurists refer to as Normative Scenarios); and third, lessons learned that lead to a pedagogy for designing for longtime horizon futures.

2. BACKGROUND

The world is changing rapidly. As corporations, governmental organizations, and civil associations face accelerating change in uncertain times, increasingly they look to designers for new ways of thinking and acting. Designers today are engaged as thought leaders, strategists, activists, and agents of change in complex socio-technical problems throughout private, public, civil and philanthropic sectors worldwide.

These exponential times represent unprecedented creative opportunities for innovation – aligned strategically with the forces that drive change in the future (i.e., social, economic, political, environmental, technological). These forces are complex and dynamic.

Designers need new design methods and tools to envision/shape futures defined by uncertainty and change. To articulate such a complex and dynamically changing design space, we use an eclectic approach that relies on composite representations to find the best available paradigm or set of assumptions for each problem rather than seeking a single paradigm to apply to everything. We operate in the tradition of Nobel Laureate Herbert Simon, who coined the portmanteau term *satisfice*, combining the words satisfy and suffice, to describe a decision-making strategy aimed at reaching an acceptability threshold rather than finding the best possible option (Simon, 1996). A solution satisfies when it is “good enough” to move on to the next iteration.

Shaping the future is a *wicked problem*. *Wicked problems* are often described as difficult problems to solve due to incomplete, contradictory, and changing requirements. Because there is not a clear problem definition, *wicked problems* cannot be solved with traditional approaches where the problem is defined, analyzed, and solved in sequential steps (Rittel & Webber, 1973). Examples of *wicked problems* include economic, environmental, social, and political issues. *Super wicked problems* include issues such as global climate change where time is running out, there is no central authority, those solving the problem caused the problem, and policies discount the future (Levin, Cashore, Bernstein, & Auld, 2012).

Design problems require heuristic exploration. *Heuristics* are rules of thumb to help designers explore the design space quickly (Newell, Shaw, & Simon, 1957). *Heuristics* help designers describe the dimensions of the space (e.g., physical, conceptual, social, cultural). Heuristic design frameworks reduce the cognitive load of decision-making by providing conceptual constructs. A heuristic design framework is not a linear process; it orients exploration in a design space and helps organize thoughts. A heuristic design framework allows designers to create an external representation and articulate aspects of the design space they are operating within. Being able to visualize and structure a design space helps designers with insights, connections, and opportunities (Klein, 2013).

In the two sections that follow we describe: first, an example of a future learning scenario, “[LEARN! 2050: How we transformed America’s learning system,](#)” written by Arnold Wasserman for the Design Management Institute. Second, in *Dexign Futures*, we describe three design courses that combine Futures Thinking with Design Thinking to create desirable design futures. For each course, we describe lessons learned that lead to our pedagogy for designing for longtime horizon futures.

3. LEARN! 2050: HOW WE TRANSFORMED AMERICA’S LEARNING SYSTEM



Arnold Wasserman wrote an article for the Design Management Institute (DMI) in 2014, “Learn! 2050: How we transformed America’s learning system”. [See full article online here.](#) This excerpt of the article below illustrates what a learning scenario for 2050 might be like.

Dear reader:

I am writing this article from the year 2050. I look back at how we moved from the parlous state of American public education in the early decades of this century to our vibrant, open, lifelong learning system in 2050.

Where are we? How did we get here?

Today’s generations cannot remember a time when all education was not free.

Today, open learning takes place everywhere – out in the community and at cultural institutions, at fab labs, tech shops, tinker spots, arts studios, innovation hubs, and at learning incubators and accelerators. It takes place online, on-demand, and just in time. Today’s students know that you don’t learn by getting the right answer but by asking provocative questions and by failing early, fast, and often.

Back in the early 2000s there was a high wall of tests separating high school from college and separating school from work life. ...in 2013, after Austria, Luxembourg, Norway, and Switzerland, the U.S spent more on education than any other nation: \$12,743 per public school student per year. And yet, American students ranked at or below the average among the 34 OECD (Organization for Economic Cooperation) member developed nations.

The OECD warning

In 2014 the OECD issued this warning: “The international achievement gap is imposing on the United States economy an invisible yet recurring economic loss ... even small improvements in the skills of a nation’s labor force can have large impacts on that country’s future well-being...”

In absolute terms, America's human capital was lagging ever further behind resource demand. Graduating students were having a hard time finding decent jobs. Students' graduating skills did not align with the jobs available; American employers had to hire skilled foreign workers or send jobs overseas. Could there be a worse misalignment between means and ends?

More than one in four of all new jobs created in the U.S. economy during that time would call for degrees in STEM (Science, Technology, Engineering, and Mathematics) fields. Far too few US students would be equipped to do those jobs if we did not change course dramatically.

Not surprisingly, education mirrored America's disparities in income, opportunity, and social mobility, ...caused by inequality in education. The U.S. government invested most of its public reform money to push up attainment at the bottom end of the socio-economic scale. This intensity of focus made it seem like the bottom tier was America's whole education problem, which was not at all the case.

Reforming educational reform

"Reform is no use anymore, because that's simply improving a broken model. What we need...is not evolution, but a revolution in education. It has to be transformed into something else." – Sir Ken Robinson

This 2010 quote summed up the inadequacy of the term "reform" to capture what had to happen to education in America. ... No reforms seriously addressed the meta-cognitive capacities required to succeed in an exponential world; i.e.: learning to learn, knowledge about knowledge, collaboration, adaptive creativity, mental resilience, critical thinking and problem solving.

America's poor showing against countries like Finland, Singapore, and South Korea produced STEM hysteria. Arts advocates worked with marginal success to squeeze art into Common Core and nudge STEM toward STEAM. Forget about humanities ...nothing mattered except that we test well on science, technology, engineering, and math.

In 2011, OECD had offered lessons from high performing countries for establishing ambitious, focused and coherent education standards: "...All of the high performing countries ... have developed world-class academic standards for their students. Such standards shape high-performing education systems by establishing rigorous, focused and coherent content at all grade levels."

As America's recovery from the Great Recession of 2008 lagged, revenue-strapped states and school districts radically defunded education, closed schools, eliminated courses, fired teachers, and enlarged classes. Out with arts, out with physical education American education overall was in a death spiral. Yet, "out there" in the world existed myriad ad hoc models of how to think about redesigning learning; among them these two instructive cases: 1. An extraordinary high school; 2. A smart nation-state.

EXAMPLE 1. NOCCA New Orleans Center for Creative Arts

The New Orleans Center for Creative Arts (NOCCA), founded in 1973, is one of America's preeminent high school arts conservatories ... home to one of the most successful arts learning pedagogies. Students attend, tuition-free, from diverse socio-economic backgrounds and educational preparation.

In 2005 our consultancy Collective Invention began working on a long-range program to develop a full day residential academic program – the "Academic Studio." We deeply analyzed the DNA of NOCCA's arts pedagogy – learning by doing in a master-apprentice model; purpose-driven creativity and inquiry; and student-centered learning – then transplanted it into completely new math, science and humanities curricula. Students developed the same passion for math, science and humanities as they had for music and dance; becoming producers of knowledge just as they were producers of art. Most importantly, students that had lagged academically became significantly higher performers.

Lessons Learned: Principles of creativity-based learning can be transferred to dramatically improve academic learning.

EXAMPLE 2. Remaking Singapore

In 2002, the government of Singapore launched a ten-year plan to transform its widely admired efficiency/productivity economy into a creativity/innovation culture. The program was called Remaking Singapore. The reason? The nation's economic success had priced it out of the market for contract manufacturing and other AsiaPac countries were challenging its dominance as the region's premier transshipping entrepot and finance center. Singapore had to move higher up the added-value chain. The crucial precondition for Remaking Singapore was transforming Singapore's education system – as Prime Minister Lee Kuan Yew put it – “From a test meritocracy to a talent meritocracy!”

The Idea Factory and Collective Invention worked with a number of ministries. I was special advisor to Design Singapore, the new agency created to develop the Creative Industries sector. In order to Remake Singapore, Singaporeans would have to learn new habits of mind, new thinking skills, and new definitions of success. A key element of Singapore's plan to become a creativity/innovation powerhouse was the “Creative Industries Development Program.” categorized into three broad groups: Arts and Culture, Design, and Media.

This roadmap (Figure 1) tracks the evolution of Singapore's innovation and design development from 2000 through 2011. The entries are representative, but not exhaustive, of the activities in the seven building blocks that comprise the architecture of a transformation grounded on education.

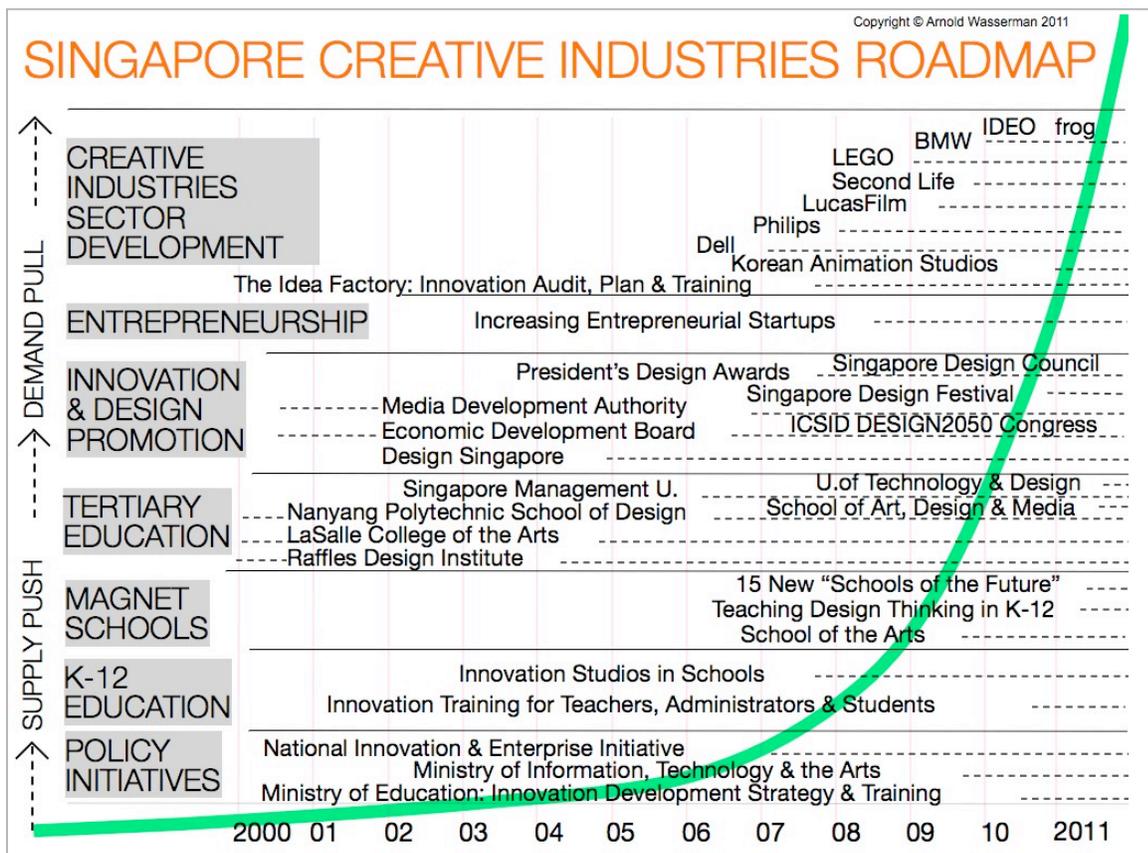


Figure 1. A roadmap of the evolution of Singapore's innovation and design development from 2000-2011.

Lessons learned:

A nation needs to align its education system with clear, long-horizon vision goals. Where do we want to be socially, culturally and economically, and by when? What is the national learning architecture?

Summing Up

Writing from the year 2050: From myriad “Early Signal” examples like these, America drew practices of open, goal-led, student-centered learning, to build a new system of learning in which students no longer go to school – school goes to students. Learning in 2050 is continuous, ubiquitous, embedded and aligned with national economic and social goals. Today we support learning as the crucial foundation of a life of equity, justice, health, creative opportunity and sustainable prosperity for all.

4. DEXIGN FUTURES COURSES

In 2013 Arnold Wasserman was invited to teach a course of his choosing as the Nierenberg Professor at Carnegie Mellon University’s School of Design in Pittsburgh. Arnold developed a course called “*Dexign the Future: Human-Centered Innovation for Exponential Times*” around topics he is involved with as a consultant in innovation, strategy, and design. Arnold delivered the course with co-instructor Professor Peter Scupelli, Ph.D., in the Fall semester of 2013. In the sections that follow, we describe three new courses: *Dexign the Future*, *Introduction to Dexign the Future*, and *Dexign the Future Seminar*.

4.1 DEXIGN THE FUTURE

The purpose of 2013 semester *Dexign the Future (DTF)* course was to explore an integration of Futures Thinking with Design Thinking. Futures Thinking is about models and methods for inquiry into what the future might be. Design Thinking is about the purposive means - methods, techniques, tools - for planning and actualizing preferred futures. We call this synthesis *FUTURES DEXIGN*.

The course was experimental in four ways. First, it was the first course in the School of Design at Carnegie Mellon University to explore the intersection of Futures Studies and Human-Centered Design. Second, the course was a flipped, blended, distance taught course: Arnold was “telepresent” from his laptop in San Francisco, connected via Citrix GoToMeeting™ an online collaborative videoconferencing service; and Peter and the students were at the CMU-Pittsburgh campus in the Design School’s media-rich design studio classroom. The course was a first prototype in the School of Design for how to deliver a semester long hybrid-studio design practice course online. Third, every class was observed by Judy Brooks, Director of Educational Technology & Design from Carnegie Mellon University’s Eberly Center for Teaching Experience & Educational Innovation. Fourth, Peter Scupelli won a Wimmer Faculty Teaching Fellowship to develop the technology and pedagogy aspects of the course. Marsha Lovett, Ph.D., Director of the Eberly Center, and Judy Brooks provided learning research insights that helped shape the pedagogy and use of technology in the *DTF* course.

We organized the course content around a semester-long project conducted by student teams called PITTSBURGH 3.0. A bit about the project: The intensive urbanization of life on earth is arguably the crucial design problem of our era. Fortuitously, the Urban Planning department of Pittsburgh had just initiated its first long-range comprehensive development planning process for the city metro region called PLANPGH. This served as a real-world locus for students to pursue four goals. First, explore the imperatives, opportunities, risks and uncertainties of urban life on a long horizon, in this case, the year 2050. Second, envision goals for preferred “normative” futures. Third, backcast to define decade-by-decade milestones along pathways required to achieving the goals. Fourth, create a desired world of health, equity, justice, creative fulfillment, and economic sustainability for all.

Finally, each student team selected a Pittsburgh neighborhood where they did field research to identify present day “Early Signals” of forces likely to drive change toward (or inhibit) their 2050 vision goals. For example, how might today’s Massive Open Online Courses (MOOCs) be early signals of a dramatic shift in the relationship of colleges and universities, as well as K-12 schools, to students? How will schools be transformed by widely accessible community based life-long learning, increased global competition, ever faster career changes, radically new non-hierarchical embedded learning systems and research on creativity and knowledge creation from learning science and neuroscience? Student teams published all of their work on a website in the form of human-centered future scenario narratives. The complete course, day-by-day syllabus and student projects are available at <http://dexignthefuture.com>

The student teams chose three different focus topics for 2050 scenarios: *Opportunity*, *Share/Quality of Life*, and *Learning*. Team *Opportunity's* 2050 scenario made economic opportunity available for people involved in multiple economic sectors and across social classes. Team *Share/Quality of Life's* 2050 scenario explored how the sharing economy might improve the quality of life in the future. Team *Learning's* scenario explored the future of learning as a ubiquitous activity. All three projects are available here: <http://dexisthefuture.com/student-projects>

The *DTF* course was very successful and spurred great interest. Both instructors and students rated the course very favorably; all involved agreed that the *DTF* course was challenging and had a steep learning curve. To lessen the learning curve for students new to Design Futures, in the Fall semester of 2014 Peter Scupelli developed and taught a new course called *Introduction to Dexisthe Future (iDTF)*. In parallel, Judy Brooks developed a workshop to teach design students how to work with forces of change on long time horizons. More details on the workshop are available in her Masters of Design thesis available here: "[Wonder, Play, Learn: How Might Students Wonder and Play Their Way into Deep Learning.](#)"

4.2 INTRODUCTION TO DEXIGN THE FUTURE

The *iDTF* course focused on six challenges that the *DTF* course students encountered. Students struggled to: first, imagine the 2050 timeframe in a grounded way linked to existing global trends, establish believable benchmark goals, and articulate forces of change along decade-by-decade pathways; second, connect global forces of change described in the futures literature (e.g., WBCSD, IFTF) to the Pittsburgh region; third, meaningfully interpret and articulate early signs in the present as future signals for 2050; fourth, create a believable three-generation persona family to describe generational needs in 2050; fifth, discover and understand the materials forms, emotional needs, values, and alternative worlds imagined in 2050; and, sixth, deeply explore the interconnections between forces of change, three-generation persona families, and 2050 benchmark goals.

The *iDTF* course was organized as a seminar-studio course with readings, videos, discussion, and applied design assignments. The *iDTF* course had four assignments: *Alternative Worlds and Economies*, *Three Generation Personas*, *Signs of the Times*, and *Sustainable Lifestyle Scenarios*. Course materials are available here: <https://dexisthefuture.wordpress.com/>. The first assignment, *Alternative Worlds and Economies*, explored forces of change through alternative scenarios. Students explored Dator's four alternative futures: continued growth, collapse, disciplined society, and transformational society (2009) and the Montfleu Scenarios that helped South Africa choose a path out of racial apartheid to majority-rule democracy (Kahane, 2012). Alternative scenarios helped students understand how combinations of forces of change might shape desirable and undesirable futures. Students described in their future scenarios how particular forces of change shaped everyday life experiences.

The second assignment, *Three Generation Personas*, introduced students to the potential impact of forces of change on intergenerational dynamics. The three-generation personas are a significant departure from how personas are typically used in interaction design to synthesize design research (Cooper, 2014). Students explored futures questions such as: how might extended families organize themselves given the rise in healthcare costs, decreases in welfare and social security expenditures? How might such forces play out in low-income families, middle-income families, and high-income families? Students made a "day in the life" future scenario for the three-generation persona family to empathize with the impact of forces of change on everyday life in a future scenario.

In the third assignment, *Signs of the times*, students explored how forces of change shaped the past, present, and hypothesized preferable futures. Students began with global benchmark goals for a sustainable 2050 such as the World Business Council for Sustainable Development plan ([WBCSD](#), 2009). There were three challenges in this assignment: first, identifying how global benchmark goals for 2050 might unfold in a specific location. Second, *backcasting* with decade by decade milestones, barriers, and risks from the normative scenario to the present day. Third, link each benchmark goal to *Future Signs*

in the present. *Future Signs* are clues visible today that enable anticipatory action. A *Future Sign* consists of three dimensions: the signal, the issue, and the interpretation (Hiltunen, 2008).

In the fourth assignment, *Sustainable Lifestyle Scenarios*, students created scenarios for sustainable lifestyles exploring the redesign of urban centers and suburbs. Students had to distinguish between five points in time: present, probable, plausible, possible, and preferable (Voros, 2001). Design scenarios in *preferable* normative futures were to be distinguished from the *present*, today (e.g., what we know, where we are now) or a linear extension of the present. The *probable* is where most designers operate and it is how the world will be without disasters and upheaval. It is the likely world without financial crashes, eco-disasters, or war. The *plausible* is the realm of scenario planning and foresight. Examples include the Royal Dutch Shell alternative scenarios that helped Shell to prepare for a number of large-scale global, economic, or political shifts. The *possible* is within the realm of possibilities, follows the laws of nature, and current science supports it. For a *possible* world to become reality credible paths of change in multiple domains are necessary linking the status quo to the future world (e.g., political, social, economic, cultural). The *preferable* is the world we would like. It intersects the *probable* and the *plausible*. Students explored for whom the futures were *preferable* (e.g., top 1% income bracket in the United States, workers in developing countries).

The *iDTF* course received very good student reviews from both undergraduate and graduate students. However, students struggled with two fundamental aspects. First, students were overwhelmed by the quantity of background information to synthesize (e.g., demographic trends, economic theory, technological change, public policy). Second, some students were more familiar with dystopian Hollywood futures and relatively unfamiliar with future oriented scenarios that might inform public policy (e.g., Kahane, 2012), and corporate decisions (e.g., Schwartz, 1991). Judy Brooks conducted a workshop on designing for the long time horizon in the *iDTF* course. Students gained great benefits from the workshop, but it was clear that students struggled with three aspects: quickly synthesizing large quantities of content, applying design futures methods, and articulating criteria for successful futures scenarios.

4.3 DESIGN THE FUTURE SEMINAR

Peter Scupelli and Judy Brooks, drawing on domain expertise from Arnold Wasserman, are developing an online course called *Dexign the Future Seminar (DTFS)*. The *DTFS* course is conceived to address the two challenges described above encountered in the *iDTF* course. The course is delivered through an online course module on Carnegie Mellon University's Open Learning Initiative platform (OLI). The online module is self-paced and combines practice activities with targeted feedback to help students learn the mechanics of future scenarios. Students experience three underlying aspects of scenarios to understand how successful design futures scenarios work: forces of change, future signs and future signals, and backcasting from a desirable benchmark goal to the present state.

For the online module, students begin with reading the LEARN! 2050 scenario described earlier in this paper. In the online module, students explore different aspects of the forces of change underlying scenario. For example, in LEARN! 2050 scenario, education is described as open, lifelong learning, and is free to students. Given the present situation in the United States where the costs of higher education are increasing and access decreasing, students are asked to imagine what combination of forces of change might converge to create free education in the future scenario.

Students work through a series of case studies to extract funding models and relevant underlying forces of change. First, students are asked to synthesize across a series of case studies from around the world that explain how free education has been paid for in daycare, elementary schools, secondary school, university. Second, students create their own hypothesis of how a combination of forces of change might converge to create the open, free, lifelong learning described in the LEARN! 2050 scenario. Third, students explore existing future signs in the present and link them to benchmark goals in the future. Fourth, students backcast a pathway decade by decade from the future benchmark goal to the present day and establish milestones, barriers, and risks for each goal in the future scenario.

5. SUMMARY

Alice: Would you tell me, please, which way I ought to go from here?

The Cheshire Cat: That depends a good deal on where you want to get to.

— Lewis Carroll, *Alice in Wonderland*

This Alice quote pretty much sums up LEARN!2050 and DEXIGN FUTURES. If you Google “2050 scenarios” you get 19.5 million hits. Nearly every sizable corporation and philanthropic organization, every nation, NGO, international organization, and most cities are doing long horizon strategic scenario planning. Until now, the main practitioners have been economists, scientists, academics, technology forecasters and the military. Rarely are designers involved. Arnold Wasserman’s experience in the field persuades us that designers have much to contribute as well as learn from the disciplines of Futures Studies. The DEXIGN FUTURES courses explore opportunities for designers at the intersection of Future Thinking and Design Thinking.

In this paper we describe, LEARN!2050 a future of learning scenario written by Arnold Wasserman for the Design Management Institute. We also describe three courses that introduced design students to the integration of Design Thinking and Futures Thinking at the School of Design at Carnegie Mellon University: DEXIGN Futures Seminar, Introduction to DEXIGN the Future, and DEXIGN the Future. The DEXIGN Futures Seminar is an Open Learning Initiative online course that teaches students to critique and deconstruct existing futures scenarios. In the Introduction to DEXIGN the Future course students explore futures based themes, design methods, and research techniques. The DEXIGN the Future course deep-dives into a semester long project set in 2050.

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