LEARNING TO DEXIGN THE FUTURE

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ABSTRACT:

New design courses are necessary to teach designers the integration of long-range strategic thinking with current human-centered design methods for addressing challenges and opportunities of societal-level sustainable futures. Lessons learned from DEXIGN THE FUTURE, the first course integrating "futures thinking" with "design thinking" taught at Carnegie Mellon University's School of Design in 2013, led to the design of a three-semester sequence of courses: first, DEXIGN FUTURES SEMINAR (online) provides students with: initial exposure to concepts; opportunities to analyze and deconstruct existing futures scenarios; practice constructing scenarios. Second, INTRODUCTION TO DEXIGN THE FUTURE provides students with a framework to: explore a variety of societal-level sustainable futures-based themes; develop proficiency with new design methods and research techniques. Third, DEXIGN THE FUTURE is a semester-long project where students take a deep-dive into an authentic, real-world context (i.e., Pittsburgh 2050). Data are leveraged to inform iterative refinements to each course and sequencing overall.

Keywords: dexign, futures, scenarios

1. BACKGROUND

The world is changing rapidly. Corporations, governmental organizations, and civil associations face accelerating change in uncertain times. The recent popularity of "design thinking" opened doors to designers to integrate new ways of thinking and acting in such new domains. In complex socio-technical problems throughout private, public, civil, and philanthropic sectors worldwide, designers today are engaged as thought leaders, strategists, activists, and agents of change.

For designers trained to shape futures defined by uncertainty and change, these exponential times represent unprecedented creative opportunities for innovation. New methods and tools for design are needed to shape uncertain futures. Innovation needs to be aligned strategically with the forces that drive change in the future (i.e., social, economic, political, environmental, technological).

The forces that are likely to shape possible futures are complex and dynamic. There is no single method to articulate such a complex and dynamically changing design spaces meaningfully. We use an eclectic approach that relies on composite representations – finding the best available paradigms or set of assumptions for design problems, 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 (Simon, 1996). A design futures scenario *satisfices* when it is "good enough" to inspire discussion and iteration for the next version.

Shaping the future is a *wicked problem* (often described as difficult problems to solve due to incomplete, contradictory, and changing requirements). *Wicked problems* cannot be solved with traditional approaches where the problem is defined, analyzed, and solved in sequential steps because there is no clear problem definition (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 this paper, we provide connections between pedagogy and practice, expanding on a previous paper presented in 2015 at the Industrial Design Society of America International conference in Seattle, Washington (Wasserman, Scupelli, & Brooks, 2015). Here, make more salient the pedagogical work we are doing to teach futures design; the connection to practice through the domain expertise of Arnold Wasserman; and our iterative design process using a variety of data beginning with inclusion below of student ratings and comments for two initial courses: DEXIGN THE FUTURE and INTRODUCTION TO DEXIGN THE FUTURE.

2. DEXIGN FUTURES COURSES

In 2013, Arnold Wasserman was invited to teach "DEXIGN THE FUTURE: HUMAN-CENTERED INNOVATION FOR EXPONENTIAL TIMES" as the Nierenberg Professor at Carnegie Mellon University's School of Design in Pittsburgh. Arnold's domain expertise in futures design and his recent scenario work served as inspiration for this initial course design/prototype.

> **Learn! 2050: How We Transformed America's Learning System**: In an article he wrote for Design Management Institute Arnold Wasserman helps us to envision what learning might look like in 2050 by situating the reader into a future world and making connections to 2014 (Wasserman, 2014).

Arnold Wasserman and Peter Scupelli, Ph.D., developed and co-taught this first course in Fall 2013. Peter Scupelli has further developed the course into a three-semester sequence. In the sections that follow, we describe the various courses as they have developed over time: first, DEXIGN THE FUTURE; second, INTRODUCTION TO DEXIGN THE FUTURE, and third, DEXIGN THE FUTURE SEMINAR.

2.1. DEXIGN THE FUTURE (DTF)

The purpose of the DEXIGN THE FUTURE 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, and tools – for planning and actualizing preferred futures. We call this synthesis *"Futures Dexign".*

DTF was experimental in four ways. First, it was the first course in the School of Design at Carnegie Mellon University (CMU) to explore the intersection of Futures Studies and Human-Centered Design. Second, it was a first prototype in the School of Design for how to deliver an online-hybrid design studio course. Arnold Wasserman was "telepresent" from his laptop in San Francisco; Peter Scupelli and the students were at the CMU-Pittsburgh campus in the Design School's technology-enhanced design studio; much of the course content was delivered online. Third, every class was observed and tracked by Judy Brooks, M.Des., Director of Educational Technology & Design from CMU's Eberly Center for Teaching Experience & Educational Innovation. Fourth, Peter Scupelli won a Wimmer Teaching Fellowship to develop the technology and pedagogy aspects of the course. Marsha Lovett, Ph.D., Eberly Center Director, and Judy Brooks provided learning research insights to inform the pedagogy and use of technology in the course.

The course was organized as a student team-based semester-long project with following components:

> **Societal-level sustainability in metropolitan contexts:** The intensive urbanization of life on earth is arguably the crucial design problem of our era. According to the 2014 United Nations report "World Population Prospects": by 2050, 66% of the world's population will live in cities; in North America the urban population is already 82%.

> **Locus:** Pittsburgh served as a real-world locus for students to pursue four goals.

> **Project Goals:** First, explore the imperatives, opportunities, risks, and uncertainties of urban life on a long horizon (2050). Second, Envision goals for preferred "normative" futures. Third, backcast to define decade-by-decade milestones along pathways necessary to achieve those goals. Fourth, create a desired world of health, equity, justice, creative fulfillment, and economic sustainability for all (see course materials here: http://dexignthefuture.com).

Three teams were formed and each selected a Pittsburgh neighborhood for their field research to identify present day "Early Signals" of forces likely to drive change toward (or inhibit) their 2050 vision goals.

They each chose 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 (see student projects: http://dexignthefuture.com/student-projects).

Third year undergraduate students and graduate students enrolled in the DTF course; all students were invited to anonymously evaluate their learning experiences. In the Faculty-Course Evaluation (CMU, 2015), students rated the quality of the course 4.6 out of 5. (Response rate: 55%). Below are two students' open-ended comments:

> "*The content of the class was also absolutely amazing and it's been my favorite class at CMU so far. Hopefully you offer it or something similar again for future students.*"

> "*The class was a very good experience overall. It was thoughtfully crafted and had very interesting material.*"

In a post-course debrief, students and faculty agreed that the DTF course was very challenging due to the steep learning curve.

The steep learning curve had much to do with expert and novice approaches to engaging with complex problems. To address this, Peter Scupelli developed and taught a new course in Fall 2014: INTRODUCTION TO DEXIGN THE FUTURE (iDTF). In parallel, Judy Brooks further developed a set of frameworks and tools she designed to help lower observed barriers that futures design novices experience when managing and organizing information in ways that lead to productive questioning critical for identifying early signals and forces of change, as well as for generating futures scenarios. More details available in her Masters of Design thesis, "Wonder, Play, Learn: How Might Students Wonder and Play Their Way into Deep Learning" (Brooks, 2014).

2.2. INTRODUCTION TO DEXIGN THE FUTURE (iDTF)

The iDTF course focused on six challenges the DTF course students encountered. First, students struggled to 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, students struggled to connect global forces of change described in the literature (e.g., WBCSD, IFTF) to the Pittsburgh region. Third, students struggled to interpret and articulate early signs in the present as future signals for 2050. Fourth, students struggled to create a believable three-generation persona family to articulate generational needs credibly grounded in 2050. Fifth, students struggled to discover and understand the materials forms, emotional needs, values, and alternative worlds imagined in 2050. And finally, students were challenged to deeply explore and communicate the interconnections between forces of change, three-generation persona families, and 2050 benchmark goals (Scupelli & Wasserman, 2014).

The iDTF course was organized as a seminar-studio course with readings, videos, discussion, and applied design assignments to introduce content necessary to understand global forces of change and provide practice applying such ideas. The course had four assignments: *Alternative Worlds and Economies, Three-Generation Personas, Signs of the Times,* and *Sustainable Lifestyle Scenarios* (see course materials: https://dexignthefuture.wordpress.com/).

The first assignment, *Alternative Worlds and Economies,* explored forces of change through the lens of alternative scenarios. The assignment introduced students to Dator's four alternative futures: continued growth, collapse, disciplined society, and transformational society (2009). Alternative scenarios helped students explore how forces of change likely shape desirable or

undesirable futures. Students learned to gauge the combined impact of forces of change in four alternative scenarios. The focus of the assignment and readings were on recognizing forces of change that are likely to shape aspects of everyday life in the future (e.g., live, work, play, mobility).

The second assignment, *Three-Generation Personas,* introduced students to making three-generation personas to explore the impact of forces of change on intergenerational dynamics. The three-generation personas were a significant departure from how personas are used in interaction design to synthesize design research (Cooper, Reimann, Cronin, & Noessel, 2014). Through the three-generation personas students explored questions such as: how might extended families in the future organize themselves given the rise in healthcare costs, and decreases in public expenditures on social welfare programs? How might such forces play out in low-income families, middle-income families, and high-income families? Students created a "day in the life" future scenario for their three-generation persona families set in 2054. The three-generation personas helped students 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 a global normative futures such as the World Business Council for Sustainable Development plan for a sustainable 2050 (WBCSD, 2009). There were three challenges in this assignment: first, identifying global benchmark goals for 2054 in a sustainable normative future in a specific location; second, *backcasting* decade-by-decade from the desired normative future to the current state, articulating intermediate milestones, barriers, and risks for each decade; third, linking 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).

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 the "likely" world, barring major disasters and upheaval (e.g., financial crashes, eco-disasters, 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. It follows laws of nature and current science supports it. All other changes – political, social, economic, and cultural – are possible but need to have a credible path from today to a possible world. 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, bottom 50% of the income bracket).

Both undergraduate and graduate-level students were enrolled in the iDTF course and all were invited to anonymously evaluate their learning experiences. In the Faculty-Course Evaluation

(CMU, 2015), students rated the quality of the course 5 out of 5. (Response rate: 45%). Below are a few students' open-ended comments:

> *"Excellent course. I especially appreciate Peter giving us a mid-semester survey asking for feedback on the course. It was very evident that he read all responses carefully and incorporated it into the second half of the course. He was always available for questions and genuinely listened to anything we had to say. His readings were carefully curated and always posted ahead of time."*

> *"Peter was a great prof with this first-time-ever course. He made it accessible to those of us with little experience in design at all, and helped us to be able to do some useful future-oriented thinking. I think the most useful part was learning methods and artifacts we can create. So the first two assignments (scenarios and personas) were super useful, the third was a little more nebulous but still pretty good, but by the time we did the fourth it felt like more of the same and I didn't feel like we were learning much. But overall, I appreciated Peter's expertise, encouragement, and broad thinking. Thanks for teaching the class!"*

> *"I really liked this class. It was less designy than I thought it was going to be but I loved that it gave me a new way to approach design thinking. We covered so many topics in the class! I wish we had one less project so we could focus more on iterating on the other three. I also liked that the class attracted students from a diverse range of majors and levels (undergrad, masters, PhD). That definitely added to the class discussions."*

However, it was clear that students struggled with two fundamental aspects of Dexign Futures: information synthesis and familiarity with futures thinking. First, students wrestled with synthesis in three ways: (a) background information to be synthesized across a breadth of topics such as, demographic trends, economic theory, technological change, public policy, and so forth; (b) quickly gaining actionable critical insights; and (c) grounding their futures scenarios in research.

Second, students lacked familiarity with futures scenarios and some were particularly attracted to dystopian Hollywood type futures, such as, world war III, societal collapse, robot apocalypse, and so forth. One likely explanation is familiarity with the popular culture dystopian futures and lack of familiarity with desirable normative futures. For example, students were not familiar with the future-oriented design scenarios that might inform public policy (e.g., Kahane, 2012), and corporate decisions (e.g., Schwartz, 1991). While dystopian futures fictions entertain students, they distract from work on design-oriented futures scenarios.

Judy Brooks used one class session to conduct a workshop leveraging the tools described above designed to support practice with futures dexign methods. Students responded positively to the frameworks given in the workshop to organize information from the dense readings; and they were able to pick up on some significant signals (e.g., current disruptions in education). However, we also observed some of the same barriers persisting (e.g., students experienced difficulty envisioning alternative normative futures, mapping milestones along pathways).

We continue efforts to refine and test pedagogical approaches to teaching novices and towards this effort Peter Scupelli and Judy Brooks are developing an online course: DEXIGN FUTURES SEMINAR.

2.3. DEXIGN FUTURES SEMINAR (DFS)

Peter Scupelli and Judy Brooks, drawing on domain expertise from Arnold Wasserman, are developing an online course: DEXIGN FUTURES SEMINAR (DFS). The DFS course is conceived to address the challenges encountered in the iDTF course regarding gaining proficiency with the fundamentals of futures dexign. The course is delivered online through CMU's Open Learning Initiative (OLI), 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.

Students begin with reading Arnold Wasserman's LEARN!2050 scenario to explore different aspects of the forces of change (Wasserman, 2014). For example, in the scenario, education is described as open and free lifelong learning. Given the present situation in the United States where the costs of higher education are increasing, students are asked to imagine what combination of forces of change might converge to create free education in the future scenario. We intentionally designed this instructional activity as a way to isolate students' practice on and build proficiency with the component skills associated with "identifying forces of change."

Through a series of case studies students extract a range of funding models and relevant underlying forces of change. First, students explain how free education has been paid for in primary and secondary schools and in institutions of higher education. Second, students hypothesize how a combination of forces of change might converge to create open and free lifelong learning. Third, students link future signs in the present 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.

To deliver this course, we chose an online learning platform that supports pedagogical design best practices and collects data on student learning. This data (e.g., accuracy measures, engagement with course activities) will provide us with insights as to what aspects of the course is working for learning and what areas to target for iterative improvement. DFS online modules are being piloted with students in fall 2015. We anticipate launching the first version of the online course in 2016.

2.4. INTENDED PEDAGOGICAL SEQUENCING

In this paper, we present the Dexign Futures courses in the order we developed and first delivered them. However, to best support students' learning, we propose teaching the three courses in opposite order. First, the seminar course: intended to provide students with exposure to "Futures Dexign" key concepts and component skills practice. Second, the intro-level course: intended to provide students with a breadth of themes for deeper exploration. Third, the semester-long project course: intended as an opportunity for students to apply methods in authentic/real-world contexts. We believe with this pedagogical scaffolding (i.e., component skills practice to integrated practice to application to real-world contexts), students experience more efficient learning and fluency with

the application of Futures Dexign methodologies in practice; and we continue to collect data to inform this hypothesis and target iterative design improvements.

3. SUMMARY

Nearly every sizable corporation, philanthropic organization, nation, NGO, international organization, and most cities are engaged in long horizon strategic scenario planning. The main practitioners have been economists, scientists, academics, technology forecasters and the military. Now designers are being called upon for new ways of thinking and acting. Arnold Wasserman's experience in the field persuades us that designers have much to contribute to (and learn from) the disciplines of Futures Studies. The DEXIGN FUTURES courses explore opportunities for designers at the intersection of "futures thinking" and "design thinking".

In this paper we describe three courses that integrate "design thinking" with "futures thinking": DEXIGN FUTURES SEMINAR provides students with: initial exposure to concepts, opportunities to analyze and deconstruct existing futures scenarios, practice constructing scenarios. INTRODUCTION TO DEXIGN THE FUTURE provides students with a framework to: explore a variety of futures-based themes; develop proficiency with new design methods and research techniques. DEXIGN THE FUTURE is a semester-long project course where students take a deep-dive into an authentic/real-world context (i.e., Pittsburgh 2050).

ACKNOWLEDGEMENTS

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