

MAKING DEXIGN FUTURES LEARNING HAPPEN

A CASE STUDY FOR A FLIPPED, OPEN LEARNING INITIATIVE COURSE

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1. ABSTRACT

How do design educators make change happen to address new challenges? Currently, design educators are caught between challenges: first, teaching well-established design traditions based on craft and making; and second, training students to situate their artifact making within transitional times in a volatile and exponentially changing world. The tension design educators navigate involves teaching the core of a discipline in relation to an expanding periphery where multiple disciplines interact. The epistemic challenge is how to initiate students into the field's crystallized knowledge at the same time as fluid, emergent knowledge. Some design educators may yearn for simpler times focusing on mastery of the deep disciplinary cores. Others may discount their own core disciplinary teaching in favor of exploration of the rapidly shifting disciplinary peripheries to meet new challenges and opportunities. We acknowledge both perspectives and further posit that students need exposure to both the core and periphery of design. This introduces an interesting learning challenge: an implicit contradiction for students of design where the core/making tends to reinforce short time horizon thinking; and the disciplinary periphery requires long time horizon visioning. We try to address this challenge by aligning short-term design opportunities with sustainable development plans for long time horizons. We merge design thinking and futures thinking to create "deXign" thinking. In this paper, we discuss a flipped classroom pedagogy that integrates design studio with an online component. The class we describe is called Dexign Futures. Dexign Futures is a required design studies class for all third year undergraduate students in the products, communications, and environments tracks in the School of Design at a North American tier-one research university. Because traditional design pedagogy poorly equips designers to integrate current human-centered design methods with long-range strategic thinking, a challenge we explore through the class is how to teach designing for the long time horizon. The Dexign Futures course is built on an elective three-course sequence: Dexign Futures Seminar (DFS), Introduction to Dexign the Future (iDTF), and Dexign the Future (DTF). The term deXign indicates an experimental type of design that integrates Futures Thinking with Design Thinking. In this paper, we discuss the process of making the Dexign Futures flipped classroom pedagogy happen by: (a) describing the online class modules in detail; (b) providing examples of in-class workshop activities; and (c) reflecting on lessons learned from iterative development of the online modules and in-class activities.

1. INTRODUCTION

The world is changing at an exponential rate in increasingly uncertain times. The world is getting "flatter" due to the increased connectedness afforded by global infrastructures (e.g., Friedman, 2005). One implication is that the design of a product or service has global implications. Some leading design thinkers distinguish between small letter "d" "design" and big letter "D" "Design" (e.g., Brown, 2009). On one hand, some of the design problems are getting smaller and more specialized, while other design problems are getting bigger, connected to global supply-chains, with global social, economic, and environmental impact.

The contrasting of small design with big design has a long tradition. John Chris Jones described four levels of design – components, products, systems, and community – to advocate for new design methods that go beyond craft to cover new challenges such as traffic congestion and air quality (Jones, 1992). Jay Doblin described three levels of complexity: (a) products the simplest form of design; (b) unisystems coordinated products and the people that operate them; and (c) multisystems the sets of competing unisystems (Doblin, 1987). Meredith Davis explains that complexity expands within the field of communication design according to breadth of system and resulting

human experience (Davis, 2008). As complexity and human experience increase, communication design goes from logo design, to corporate identity, to branding, to service design. Richard Buchanan introduced the four orders of design to contrast the traditional understandings of the disciplines of communication design (symbol), industrial design (product), interaction design (action), and systems design (thought) with new understandings of design that blur the distinctions between types of design (Buchanan, 1992). Combining Meredith Davis' insight to Buchanan's first order of design, symbols, also known as the traditional practice of communication design, there is a range from simple to complex when shifting from artifacts to experiences (Davis, 2008).

Arnold Wasserman (2011, 2013) describes four versions of design to include design 1.0 as artifact centric (e.g., making and selling stuff); design 2.0 as human centric (e.g., strategic field building and embedding); design 3.0 as Socio-centric (e.g., changing the world); and Design 4.0 as the post-anthropocene (e.g., sustainable prosperity @ one planet). Elizabeth Pastor (2013) co-founder of Humantific articulated the differences between four types of design that shift as levels of complexity increase. Design 1.0 traditional design thinking, Design 2.0 Product / Service Design thinking, Design 3.0 as Organizational Transformation Design thinking and, Design 4.0 as Social Transformation Design Thinking. Others more recently add the X nomenclature to create DesignX to get beyond the number of designs (e.g., Norman, 2014). The DesignX manifesto argues for a broader version of design that shifts from a focus on products and services to a broader range of societal issues.

The School of Design at Carnegie Mellon University proposed Transition Design as an explicit framework to guide the societal level transition to sustainable futures (Kossoff, Irwin, & Willis, 2016). Scupelli described the difference between designed transitions from a current state to a desirable state and Transition Design (Scupelli, 2016). The Dexion Futures course described in this paper focuses on aligning near term design action with longer time horizons aimed at sustainable futures. We focus on *dexion*, an experimental form combining design thinking with futures thinking. While in principle most design is about moving from a current state to a preferred state that is situated somewhere in the future, in practice that future is only an incrementally improved version for the next release of a product. The distinguishing feature of *dexion* in our usage is the focus on aligning current action with long-term sustainability goals. A further distinguisher of *dexion* is a critical approach to epistemic authority concerning narratives of the future.

In this paper, we describe the Dexion Futures course that is required of all third year design students at a North American school of design in a first tier research university. It is based on the three previously created Dexion the Future courses. In Scupelli, Wasserman, & Brooks (2016) we expanded on the connections between practice and pedagogy, extending on our previous work (Scupelli & Wasserman, 2014; Wasserman, Scupelli, & Brooks, 2015a; Wasserman, Scupelli, & Brooks 2015b). First, we provided an overview of the design landscape and situate dexion futures within it. Next, we describe the online course modules. Then, we describe results from piloting of the online course modules and in class workshop activities.

2. DEXIGN FUTURES

For designers trained to shape futures defined by uncertainty and change, these exponential times represent creative opportunities to align innovation strategically with the forces likely to drive change in the future (e.g., social, economic, political, environmental, technological). To teach students to operate in this new landscape design educators need to adapt and adopt new methods and tools.

The forces of change are complex and dynamic. There is no single method to meaningfully articulate complex and dynamically changing design spaces. We use an eclectic approach that relies on composite representations – finding the best available paradigms or set of assumptions for design problems, rather than 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 a next iteration.

Shaping the future is a *wicked problem*, often described as difficult problems to solve due to incomplete, contradictory, and changing requirements. Because there is no 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). Climate change is a *super wicked problem* because time is running out, there is no central authority, those solving the problem caused the problem, and policies discount futures (Levin, et al. 2012).

Design problems often require heuristic exploration. Heuristics are rules of thumb that help to navigate problem spaces (Polya, 1945). Heuristics often help designers to explore the design space quickly (Newell, Shaw, & Simon, 1957). Heuristics help designers describe the dimensions of a space (e.g., physical, conceptual, social, cultural). Heuristic design frameworks provide conceptual constructs to reduce cognitive load in analysis and decision-making. A heuristic design framework is not a linear process; it orients exploration in a design space and helps to organize thoughts. Designers use heuristic design frameworks to create external representations and articulate aspects of the design space they are operating within. Being able to visualize and structure a design space helps designers to develop insights, make connections, and identify opportunities (Klein, 2013).

Much design education focuses on teaching students to craft products or services that can be made in a short time horizon ranging from 3 months to several years. Challenges such as societal-level sustainability require new thought, and new design action. There is a tension between ever-shortening design product cycles and long-term thinking. Examples of short product cycles in design industry include: fast fashion (e.g., Luz, 2007), continuous beta (e.g., O'Reilly, 2005), Lean Start-up (Ries, 2011). Conversely, plans for societal-level sustainability are long horizons such as 2050 (e.g., WBCSD, 2009). Our current efforts are focused on developing pedagogies to teach new skills that acknowledge design for change requires aligning near-term design actions to long-term visions.

3. THE REQUIRED UNDERGRADUATE DESIGN FUTURES COURSE

The Design Futures flipped course has two main parts: (a) online components that serve as homework to prepare for (b) in-class workshop activities. The class meets twice a week for 80-minute sessions. The Futures course covers different approaches to constructing and interpreting futures: ranging from the extrapolations of trend forecasting, through the risk assessments of alternative scenario planning, to attempts to connect the present with desirable normative futures, through backcasting and pathways of change. Students explore the future through narratives of utopian and dystopian scenarios and learn to create more useful design actionable futures. Students learn to identify “weak signals” and “early signs” in the present and to abstract forces of change that indicate likely future design spaces. Students also attempt to evaluate forces of change in terms of their longer-term consequences so as to align short-term design action with desirable longer-term time scenarios. In the next four sections, we describe the four main modules in the Design Futures course: Futures History, Futures Scenarios, Futures Factors, and Applied Futures. The main modules are subdivided into sixteen topics that map to weekly assignments and in-class activities.

1.1. FUTURES HISTORY

This module focuses on providing a historic perspective on the different futures traditions ranging from fantasy to futures studies, and design futures, and to introduce futures scenarios.

Stories of futures traces the origin of stories of apocalypse and utopia in western traditions to current techno-dystopia and techno-utopia. Students explore literary genres, comic books, and movies. Learning objectives include distinguishing between the genres, describing the context of the futures narratives, articulating the audience for such narratives, and proposing how such narratives might inform design narratives.

Futures studies helps students to explore the scholarly field of futures studies. Students learn about the different traditions in the fields of strategic scenario planning and futures foresight. Learning objectives include critically describing and comparing the approaches and objectives.

Futures scenarios describes the history of two types of futures scenarios: alternative world scenarios and normative scenarios.

Designer futures helps students explore how previous sections: past narratives of futures, futures studies, and futures scenarios inform designer futures. We focus on three traditions: critical design, design fictions, and speculative design.

1.2. CRITIQUING FUTURES SCENARIOS

This module focuses on taking apart a normative futures scenario written by experienced designers. Students experience a well designed futures scenario to: (a) explore strengths and weaknesses; (b) understand the purpose of the futures scenario with regards to a particular audience; (c) notice the features of bad futures

scenarios and improve bad futures scenarios; (d) understand why people make bad futures scenarios and practice improving scenarios.

Practice unpacking a normative scenario In this section, students experience an expert normative scenario and begin to unpack the types of questions an expert might have when interacting with such scenarios. Students focus on one feature of the normative scenario, such as free education to the learner. Students explore the questions that emerge so that they can expand the normative futures scenario in question.

Going deep into a normative scenario students explore other features of the normative futures scenario in question to practice questioning the embedded assumptions in the scenario. Students explore multiple dimensions of a scenario and practice visualizing day-in-the-life experiences associated with the normative scenario described.

Features of bad futurism are explained by futurist Jamais Cascio as three types of flaws with futures scenario: the features of the scenario itself, ignoring human nature, and the relationship engendered with the audience. Students critique each others scenarios according to the features proposed by Cascio. Students propose constructive solutions to the flaws identified.

Why people make bad futures is explained by futurist Peter Schwartz through two ideas. First, the reasons why the future so often surprises us, and second, what habits of mind make it more likely that one explore the long view. Students explore some business cases where habits of mind are associated with failures and successes.

1.3. FUTURES FACTORS

This module focuses on the four main futures factors such as future signs, forces of change, and milestones and backcasting that are necessary to create alternative futures scenarios and normative futures scenarios:

Future signs, future signals, and forces of change Students are encouraged to decode the William Gibson quote “The future is already here — it’s just not very evenly distributed” by examining a series of working research prototypes available in labs across the research university campus. Students are asked to notice the critical aspects of the prototypes that are likely to shape futures design spaces. For example, a robotic data mining application might provide hints about pervasive use of automated big data sense making.

Alternative futures In this section, students learn about how businesses, governments and civil organizations use alternative world scenarios (e.g., Shell, South Africa). Students learn to explore critical uncertainties linked to forces of change to create four alternative futures scenarios. Students create storyboards that depict user experiences in each world.

Normative futures Students learn to unpack normative scenarios such as the World Business Council for Sustainable Development plan for 2050 (WBCSD). Students are asked to explore some global forces of change as they relate to a particular zip code in North America. They explore the current state with US census demographic data and create a normative future set in 2056. Students identify future signs visible in the present and describe related forces of change linked to benchmark goals. For benchmark goals, measures of success are described.

Milestones and backcasting Building upon the normative future developed in the previous section, students begin to define intermediate milestones associated with pathways of change to connect current states with desired states.

1.4. APPLIED FUTURES

The applied futures module focuses on methods and types of designed artifacts that designers might create to provide touch points for audiences to experience futures scenarios. One contribution to futures studies that designers are uniquely qualified to contribute is their ability to create immersive sensory experiences, in this case for text-based futures stories, scenarios, and artifacts.

Persona families in futures students learn to make three-generation persona families rather than the more typical main persona and secondary personas often used in interaction design practice (Cooper, 1995). The three-generation persona family helps students to explore intergenerational issues within a family. Students are encouraged to explore how forces of change might affect the different age groups differentially.

Artifacts from futures One big challenge of futures scenarios is to be able to imagine what life will be like in the future. Students embody ideas about the future by creating artifacts from the future. This provides a platform for people to experience such artifacts and imagine using them. It shifts the discourse about futures from something to be understood intellectually to something to be experienced emotionally. Students ground the artifact from possible futures within the three-generation persona family.

Stories from futures scenarios Building upon the artifacts of the future that students created in the previous section, students embed the artifacts from the future into stories from the possible futures. The story format helps the audience to imagine what living with such an artifact might be like.

Experiential futures. The goal for a futures scenario is to create an immersive experience of artifacts, stories, and personas from the future. Students strive to create an interactive performance representing a persona from the future, with artifacts from the future, and telling stories from the futures inhabited.

4. PILOTING, ITERATIONS, STUDENT RESPONSES

We piloted the “Critiquing Futures Scenarios” module twice. Once, during Fall 2015 with ten design seniors from Industrial Design and Communication Design taking the Design Agility: Speak Lab course. And again in Spring 2016 with thirteen design for interaction masters students in the Graduate Design Studio 2 course. Students were asked to do the online module as homework to prepare for an in-class discussion and workshop. In the sections below, we describe the online module used for both courses and then describe the in-class activities for the Design Agility: Speak Lab course and the Graduate Design Studio 2 course.

Online Module for Critiquing Futures

The first version of the “Critiquing Futures” module was composed of five web-pages with practice activities: (a) Module overview; (b) Introduction to design futures scenarios; (c) How do futurists think about scenarios that are grounded in reality and not just pure fantasy; (d) Why do people make bad futures scenarios; and, (e) Extracting models to inform scenario development. This module was assigned as homework to prepare for an in-class workshop on aligning student projects with drivers of change along pathways to desirable futures.

Speak Lab workshop: current state, preferred state, benchmark goals and drivers of change

In the Design Agility: Speak Lab course students were working on a four week project where they had to propose a desirable future for an environmentally themed wicked problem with multiple stakeholders, no agreed-upon problem definition (e.g., hydraulic fracking, toxic cleaning products, toxics in cosmetics, endocrine disruptors). Students were asked to align their proposed solution within STEEP forces in the broader context (e.g., Social, Technological, Economic, Environmental and Political). We used the “The Vision 2050 Roadmap” created in 2009 by the World Business Council for Sustainable Development (WBCSD) to facilitate the discussion. The roadmap shows the strategic milestones that must be met to achieve sustainability by 2050, illustrating what has to happen decade-by-decade and identifying risks to progress. The students chose drivers of change pathways on the map that were relevant for their projects. Students benefitted from the explicitness of the framework on the WBCSD roadmap. The links from current states connect to desirable states with measurable benchmark goals through critical drivers-of-change pathways with barriers to change. This provided a conceptual structure that they could map to their own projects.

Speak Lab students were asked three questions about the online module preparing for the in-class workshop:

- (1) How did the online design futures module impact your learning experience in Speak Lab?
For the undergraduate students two themes emerged: first, videos of the futurists were helpful to frame futuring possibilities.¹ Second, the online OLI module was preferred to a traditional lecture.²
- (2) What new insights if any did the online design futures module help you uncover in your speak lab project?
Two themes emerged for undergraduate students: first, some appreciated the framing of the current state, forces of change linked to the desired state because such a framing helps to pitch a solution.³ Second, the online module and in-class workshop challenged thoughts on what futures might be.⁴
- (3) What specific suggestions do you have to improve the design futures online module? The undergraduate students had three suggestions on how to improve the online module: First, provide better pre-questions to

¹ **Videos very helpful** “The videos were helpful for framing futuring and the possibilities of futuring”

² **OLI preferred to lectures**, “I would say that i’d rather receive the information via OLI than through in class lecture however.”

³ **Framework appreciated** “just being able to identify the desired future and a few middle steps to reach the desired future (which is effective in pitching your solution to a problem)”

⁴ **Broadening views** “Challenging our thought of what the future could be.”

guide viewing of videos.⁵ Second, videos grabbed attention but the questions were tedious.⁶ Third, encourage interpretation; don't check for correct understanding.⁷ Fourth, interpretations might be better explored by asking students to list three salient quotes, write a paragraph response, and discuss those in class.⁸

Graduate Design Studio 2 workshop: Extracting models for drivers of change

Students in the Graduate Design Studio 2 course were working on a fifteen-week studio course. The design brief was part of the 2016 Microsoft Design Expo. The students were asked to: Design a product, service or solution that demonstrates the value and differentiation of the Conversational User Interface (CUI). Your creation should demonstrate the best qualities of a symbiotic human-computer experience which features an interface designed to interpret human language and intent.

One design challenge that emerges from the 2016 Design Microsoft Expo brief is that the kind of Human-Computer Symbiosis and Conversational User Interface that students are asked to explore are technically feasible but currently there are no such working platforms to experience. There are fragments of the necessary parts across many existing products but no working prototype. Hence, the symbiotic human-computer experience with foundational aspects of the conversational user interface requires situating the proposed solution within futures scenarios aligned with STEEP forces of change (e.g., Social, Technological, Economical, Environmental and Political). The goal of the workshop and online module was for students to begin to notice how forces of change shape the present and might shape alternative futures. Graduate students were asked three questions about the online module preparing for the in-class workshop:

(1) How did the online design futures module influence your learning experience?

Three themes emerged: first, some graduate students appreciated the structured manner to construct a realistic future.⁹ Second, some graduate students realized that narratives of futures move past utopian and apocalyptic tensions and blend into more balanced futures.¹⁰ Third, some students appreciated being forced to answer questions about the videos.¹¹

(2) What new insights if any did the online design futures module help you uncover in your project?

Students' comments converge on two main points: First, the online activities were a wash for some; however, the in-class activities made the content tangible.¹² Second there were obvious disconnects between theory and practice; and wholistic perspectives and partial perspectives.¹³ The comment seems to suggest binary choices framing focus on "either whole or on the parts" when a better framing from a design perspective would be how to strategically align the parts with the whole. The comment generated very lively in-class discussion after the workshop.

(3) What specific suggestions do you have to improve the design futures online module? Graduate students had three kinds of suggestions: First, stimulate critical thinking rather than checking for comprehension through

⁵ **Provide questions before videos** "Pre-questions or things to think about while watching the video would be nice. the questions afterwards seemed very specific to the videos which made it difficult to watch the video and take away what was helpful for individual projects"

⁶ **Videos helpful but questions tedious** "Videos are helpful to grab attention and explain the story better so that was the most effective but honestly I believe the questions were more tedious than helpful."

⁷ **Interpretation not correctness** "the questions after the video were tedious. It made it feel like a chore. It was weird to have to answer questions and have there be a 'correct' answer because it was based in our own interpretations."

⁸ **introducing the futuring concept.** "I think a discussion would be better in response rather than answering questions. maybe assign the videos and ask for three quotes for each video from each student? or ask for a paragraph response? and share those in class. the online module kind of stunted a classroom discussion which i think would have bridged the gap between the concepts and our projects."

⁹ **Adding structure to futures** "It helped me to envision the future more realistic and structured way."

¹⁰ **Moving past good and bad into balanced futures** "The design futures module made me think more about how to frame scenarios when thinking about design for the future. It's good to realize and recognize how people can tend to think of futures negatively sometimes, so that you can frame your scenarios in ways that will offer more options than that, which are equally good and bad potential futures."

¹¹ **Questions as forcing function** "The content was interesting. The requirement to answer specific questions about the videos made me pay more focused attention on the points in the presentations."

¹² **In-class activities helped** "At this point, I can't remember the insights ... I suppose the learning points did not exactly make it to my long-term memory. However, the in-class group activity of mapping the wicked problem of tuition helped me get a better idea of how we can take steps to design for futures."

¹³ **Disconnect between theory and practice** "Honestly, I'll need to think more about applying it to studio. I am always a little frustrated when we get these futuring lectures and then very given-solution prompts for assignments. It feels like we are already working on the wrong leverage point (the cui, technology) and the lectures just end up making me feel a little disheartened about the whole project (why are we working on this technology rather than broader social dynamics, systems issues, the cui is just fitting into already existing problematic structures) but we have to go through with it anyway."

questions with a correct answer.¹⁴ Second, they suggested that synthesis by formulating ideas might be more engaging than answering questions.¹⁵ Third, they wanted more direct connections to everyday experiences, even though they enjoyed engaging directly with videos of futurists.¹⁶

5. DISCUSSION

The comments students made about the online module tested illustrate strengths and weaknesses of our first iteration. The student feedback is being used to iteratively improve upon the module design and inform development of additional online modules. Overall, students seemed to prefer online content in the OLI module to a traditional lecture. Undergraduate students appreciated the WBCSD framework used in the class work session. It provided a frame to identify desirable futures, articulate benchmark goals and measures, and intermediate steps necessary to go from current state to desired futures.

Overall, students seemed to like the videos, but not the questions following the videos to check for comprehension and motivate students to do the homework. The in-class discussion activity following the use of the online module did not promote deeper engagement with the concepts. We are rethinking this activity to bring in more active engagement including suggestions students made such as a pre-class brief writing activity to promote synthesis of the module concepts and extract significant futurists' quotes to then discuss and expand upon in class. One of the main objectives in developing the OLI module was to: (a) provide immediate feedback to students on their comprehension of the content at home; (b) free up time in class to focus on the application of the ideas into design activities in class so that the instructor can answer questions while the students are working. We can still accomplish the goals for using the flipped class format where students receive initial exposure to the concepts outside of class, thus freeing up class time for active learning (e.g., discussion, peer learning) and application activities (e.g., applying concepts to project work).

We've responded to the student suggestions by reducing the number of multiple-choice questions where they check their understanding and by adding more generative activities where students explain their understanding of the concepts through storyboards, conceptual maps, and diagrams. Motivating students' use of the online modules by meaningfully connecting this out of class learning with the in-class activities is key to success of this approach for students' learning.

6. SUMMARY

In this paper, we've shown how to make a required *dexign futures* flipped learning design course happen in a North American school of design at a first tier research university. First, the Dexign Futures course builds on previous courses taught and in development (i.e., introduction to Dexign the Future, Dexign the Future, Dexign Futures Seminar). Second, the piloting of the online course modules and in-class activities provided opportunities to evaluate and respond to student suggestions and concerns. Third, we put together a team that covers expertise in three critical areas: design pedagogy, dexign futures content expertise, and online learning expertise. Fourth, the work presented in this paper is the culmination of four years of work so far. It builds on synergies created between a masters thesis in teaching new design methods for the long time horizon (Brooks, 2014), the development and delivery of two courses introduction to Dexign the Future (Scupelli, 2014) and Dexign the Future (Wasserman & Scupelli, 2013) and ongoing development of the Dexign Futures Seminar online course.

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¹⁴ **Stimulate critical thinking** "The question portion felt pretty didactic --like I was doing an SAT prep -- I would have preferred to have just watched the videos and discussing in class, maybe with a few prompting think-about-these-ideas questions."

¹⁵ **Synthesize by formulating opinions** "It would have been better to have critical thought questions where we could have stated opinions and arguments more based on questions and points posed in the videos, rather than just re-writing what we had just listened to."

¹⁶ **Connect to everyday experiences** "Maybe using more specific examples that we can easily see in our daily lives would help us understand more. overall, it was interesting to see the different aspects of the futurists."

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