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The Cultural Construction of Creative Problem-Solving: A Critical Reflection on Creative Design Thinking, Teaching, and Learning

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Abstract While people around the world constantly come up with ingenious ideas to solve problems, the expressions of their ingenuity and their underlying motivations and experiences may vary greatly across cultures. Currently, the role of culture is often overlooked in research and practice aimed at understanding and promoting creativity. The lack of understanding of cultural variations in creative processes hinders cross-cultural collaboration in problem-solving and innovation. We challenge the unexamined American perspectives of creativity through a systematic analysis of how ideas, policies, norms, practices, and individual tendencies around creative problem-solving are shaped in American and East Asian cultural contexts, using the culture cycle framework. We share initial findings from several pilot studies that challenge the popular view that only agentic change-makers are seen as creative problem solvers. In the context of design, designers are culturally shaped shapers who are motivated to solve problems in creative ways that resonate with their cultural values. Our research seeks to empower designers from non-Western societies. We urge design educators and practitioners to explicitly incorporate culturally varied ideas about creative problem-solving into their design processes. Our ultimate goal is to ground the theories and practices of design thinking in cultural contexts around the world.

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1   Introduction

As soon as winter begins, locals in Harbin, a city in the northeast part of China, cannot wait to stock up piles of napa cabbage on their porches and balconies. As the temperature quickly falls below zero Celsius in the dry winter, the perfect conditions are created to keep the cabbage fresh and tasty for several months. Stews with cabbage, glass noodles, pork, and tofu make this perfect dish throughout the dark winter. For people in northeast China, the tradition of eating this dish in winter dates back to thousands of years ago during the Tang Dynasty. To Harbiners, storing stacks of cabbage is not just a casual tradition, it is a cultural practice that bridges millions of families and connects the young with the old and the present with the past. In Harbin, such connection to the past and to people is a prevalent element in everyday life, manifesting itself in both material and symbolic cultures.

In San Francisco, by contrast, the experience of food is an ever-changing fashion. People seek diverse dining experiences—from unique menus to unconventional dining occasions. Chez Panisse, a popular high-end restaurant, for instance, is famous for its distinct culture and cuisine, whose menu "changes everyday" (Chesbrough et al., 2014). High-tech companies in Silicon Valley are venturing into new territories to reimagine food production and consumption (e.g., Dance, 2017). In San Francisco, people discover novel sensations and constantly seek to break with tradition.

These food practices in San Francisco would be considered creative in the USA, because creativity in the USA has been represented and exercised as "defying the crowd" (Sternberg & Lubart, 1995) and "breaking tradition" (Lubart, 1999). As a consequence of reinforcing such cultural ideas in practice, creative idea generation is widely perceived as serving to instigate change: coming up with *new* ideas to *change* the status quo, stand apart from the past, assert control over their surrounding environment, as well as establish their uniqueness from other people.

If we were to adopt such a theory of creativity, Harbin chefs who do not seek changes in their food tradition would be seen as less creative. The role of culture, however, is not explicitly discussed either in deriving the theory or in promoting certain creative practices. For example, the amplification of radical change and transformation as a goal and attitude is widely observed in various settings of design education and innovation practice regardless of the participants' cultural backgrounds. Creative idea generation is widely understood as "a structured way of breaking out of structure," as Tim Brown, chair of IDEO, famously quoted in his book *Change by Design* (Brown, 2009). "Enable change in Japan through design and creativity," is the mission of IDEO Tokyo (IDEO, 2021). Culture is too often overlooked, such that the interpretation of East Asian behaviors and practices becomes rather a projection of American ideas. This in turn leads to misunderstanding and misjudging East Asian creativity. Online discussions of "Can Asians be creative?" and popular book titles such as *Can Asians Think?* (Mahbubani, 2002, cited in Morris & Leung, 2010) provide a glimpse of such stigma.

Does creative behavior have to be associated with changing, breaking, and seeking freedom? Instead of advocating change and disruption, many places in East Asia promote connection and preservation. The contrast between food practices in San Francisco and in Harbin is an example of the broad cultural difference. While American society tends to be centered on instigating agentic change-making in the environment, East Asians place importance on preserving continuity with good practices in the socio-physical environment, and adjusting the self to changes that occur in the environment. Therefore, the predominant cultural value in East Asia may activate a different creative process that is associated with returning to, pre-serving, sustaining, and connecting. People who exemplify such a different creative process are less talked about or known in the USA.

In design thinking, teaching, and learning, when our design educators and managers celebrate some American cultural values and restrict others, either con-sciously or not, this puts people with different values and tendencies at a disadvan-tage. With the salient power dynamics between educators and students, managers and junior employees, this means alienation, misjudgment, and disconnection. If these cultural differences are ignored, valuable mindsets and practices that originated in the USA, such as design thinking, cannot expand to East Asia.

To address this issue, we examine how crucial differences between American and East Asian cultural values affect why and how people come up with ideas for problem-solving. In Sect. 2, we review prior cultural and cross-cultural perspectives on creative problem-solving in design. In Sect. 3, we apply the culture cycle framework (Markus & Hamedani, 2019) to systematically reveal differences in historically derived ideas, policies, norms, cultural practices and products, and beliefs around creative problem-solving. In Sect. 4, we focus on examining some cultural differences using pilot studies. In Sect. 5, we reflect on why there is a lack of attention to East Asian creative processes and the consequences of this, address the relevance of our work for design education and practice, discuss some of the limitations in our studies, and describe future directions. Our paper concludes with Sect. 6.

Our work furthers the current understanding about the different, but equally valid and meaningful motivations and behaviors that underpin creativity across different cultures. In doing so, we hope to inspire educators and practitioners to adopt a more culturally resonant approach to design thinking, teaching, and learning.

2 Critical Reflection on Design Thinking Based on Designers' Cultural Needs

We would first like to revisit design thinking development and research by putting on a pair of cultural perspective goggles. The underpinning role of culture was made visible in design thinking from the very beginning. John Arnold (1913–1963), the founding father of design thinking at Stanford, conceived designers as other-directed

Fig. 1 Life Magazine captures John Arnold's unconventional teaching (Hunt, 1955)

rather than inner-directed, and recognized that culture has a direct influence on how designers view the world (Clancey, 2016). Yet Arnold's view on culture is also a product of his own cultural experience—he criticizes other-directedness and calls for a recognition of one's unique individual mind—the so-called Uncommon Man (Clancey, 2016). This is consistent with the mainstream belief in the USA that motivation and action spring primarily from desires, beliefs, and attributes of the independent self (Markus & Kitayama, 1991), which can be activated by freeing individuals from constraints of the environment and of tradition.

Arnold's iconic, unconventional course at MIT in the 1960s also set an example for this (Fig. 1). He presented students with design problems for clumsy birdlike inhabitants on an imaginary planet called Arcturus IV, which was based on the belief that creative problem-solving could be trained by temporarily freeing students from their accustomed environment and placing them in a new imaginary one (Clancey, 2016). In his study of Arnold's philosophy, William Clancey concludes that, in Arnold's view, "the creative individual is a positive non-conformist." Such a view of creativity is reflected in the recent development of design methods and tools, such as the rules of brainstorming (Sutton & Hargadon, 1996) and methods for breaking free from "blocks" in problem-solving (Adams, 2019). In the early years, visitors of Stanford Mechanical Engineering Design Group were sometimes taken to drag racing competitions to understand the "American design" and engineering (masculine) creativity. These tools and practices were designed to allow designers to systematically free themselves from institutional and cultural constraints. However, they do not address designers' cultural and emotional needs and motives, especially outside of the context of America. Could it be that creativity is fostered by self-sacrifice rather than individual freedom in certain cultural contexts? Rolf Faste's work offers some insights on this question.

In the development of design thinking, Rolf Faste played an important role in bridging Zen and Japanese esthetics with Western thinking of design (Kelley, 2003; Irani, 2019). The design thinking adage of bearing a beginner mindset is partly influenced by Zen (Irani, 2019). In his unconventionally visual essay (Faste, 1995),

where "poached egg" is used as a metaphor for understanding innovation and culture, Faste inquires into the nature of Japanese creativity. He reflects that "Professor Koxvai, widely regarded as Japan's first Jungian psychologist, suggested that I look at Japanese myths and fairy tales if I wished to understand attitudes about creativity, whether in Japan or elsewhere." What is perceived as good, creative, desirable, and meaningful in Japan? Faste observes that Japanese stories communicate a very different set of cultural values than Western stories do—

> Western myths, be they older tales like Andersen's Ugly Duckling or newer ones like Segal's [sic] Jonathan Livingston Seagull, all involve heroic and macho images of individual separation and triumphant return. In comparison, Japanese stories are striking for their images of feminine and nurturing self-sacrifice.

Faste's analysis suggests that Western creativity is strongly associated with masculine individuality and expressing self-direction, whereas Japanese creativity seems to suggest the exact opposite. For the last 10 years of his life, Faste worked on an unfinished book titled *Zengineering*, which incorporates Japanese ideas of "engaging life in real-time" and "non-judgmental mindfulness" into American engineering design practices (Rolf A. Faste Foundation for Design Creativity, n.d.).

Consistent with Faste's hunch, some design creativity scholars in Japan propose that the desire for creating design concepts is essentially led by an *inner sense*, a sense of resonance in the mind with the product one is working on (Taura & Nagai, 2013; Nagai & Taura, 2017). They argue that design artifacts, although different from what is found in the natural word, "nevertheless, 'naturally' *resonate* with the human mind" (Taura & Nagai, 2013). Notably, what is often regarded as an important criteria of design in the USA—novelty, is conceived to be "implemented as *a by-product of concept generation, but not as a causal factor of creativity*" (emphasis added). Moreover, the scholars argue that "if a new concept is pursued merely on account of its uniqueness, we say that this pursuit never approaches an *ideal*" (Taura & Nagai, 2013).

As an example from other cultural contexts, Panagiotis Louridas has addressed the cultural needs of designers, using "bricolage" as a metaphor to illustrate how traditions and norms which are accumulated over thousands of years define, forge, and guide the French ways of design and tinkering (Louridas, 1999). A systematic approach for researching design culture is brought in through the ethnographic work of Pamela Hinds and colleagues (Hinds & Lyon, 2011; Kim et al., 2012; Liu & Hinds, 2012). Notably, the analysis of the cultural construction of design behavior acknowledges forces from different cultural layers (Hinds & Lyon, 2011). Their exploratory work suggests that Asian designers tend to blend in, whereas European and North American designers prefer to stand out, and that design qualities, such as creativity, are conceived differently across cultures. However, how modern conceptions, or implicit theories, of creativity are different across cultures has not been adequately tested empirically. In the field of engineering, creativity is an increasingly popular topic in engineering education research and is considered a core component of globally engineering competencies (Lucena et al., 2008), yet little cross-cultural research has been done (Ge et al., 2021). Overall, research evidence is still too scarce

to draw any conclusive remarks about the cultural needs of designers in creative problem-solving.

3   Creative Problem-Solving: A Culture Cycle Analysis

The desire to create ideas seems to be universal, yet beliefs and experiences about the *what* (new and different, or similar and connected), *how* (independent with passion, or interdependent with hard work), *who* (male or female), and *why* (instigating transformation or preserving connection) may differ across cultural contexts. We take the perspective that culture shapes ideas, practices, interactions, and beliefs around creative problem-solving. In delineating how creative problem-solving is culturally constructed, we use a culturally responsive analytical framework, called "culture cycle" (Markus & Hamedani, 2019; Plaut et al., 2012), to frame and analyze prior research on creativity and problem-solving. Where the word "culture" is used, we intend to align with Adams and Markus (2004) in understanding culture as consisting of:

> explicit and implicit patterns of historically-derived and selected ideas and their embodiment in institutions, practices, and artifacts; cultural patterns may, on one hand, be considered as products of action, and on the other as conditioning elements of further actions (Adams & Markus, 2004, p. 341).

In this conceptualization, culture can be found both in the psychological tendencies of people and in the material and symbolic representations that people create (Plaut et al., 2012). Culture cycle is a framework that delineates and simplifies the many vectors of culture as "dynamically interacting and interdependent layers... made up of ideas, institutions, and interactions that guide and reflect individuals' thoughts, feelings, and actions" (Markus & Hamedani, 2019).

In this paper, we organize the culture cycles into three interacting layers: historically derived ideas and philosophies, institutional policies, norms, practices, and interactions, as well as psychological tendencies—all of which are important in understanding the cultures of creative problem-solving. Figure 2 gives a visual overview of our culture cycle analysis. It delineates two different possible realities of creativity; one is American linearity and the other is East Asian circularity (Biao, 2001). The line in the USA independent model of creativity not only represents the divide between human and nature, subject and object, and mind and matter, but also stands for the linearity of creating—it is about progressing forward. The circle in the East Asian interdependent model of creativity represents oneness and an integration of these elements, as well as the circularity of creativity—it is about returning to the origin. While our goal here is to characterize differences, we acknowledge that these differences are relative and that cultures are dynamic, complex, interacting, and changing.
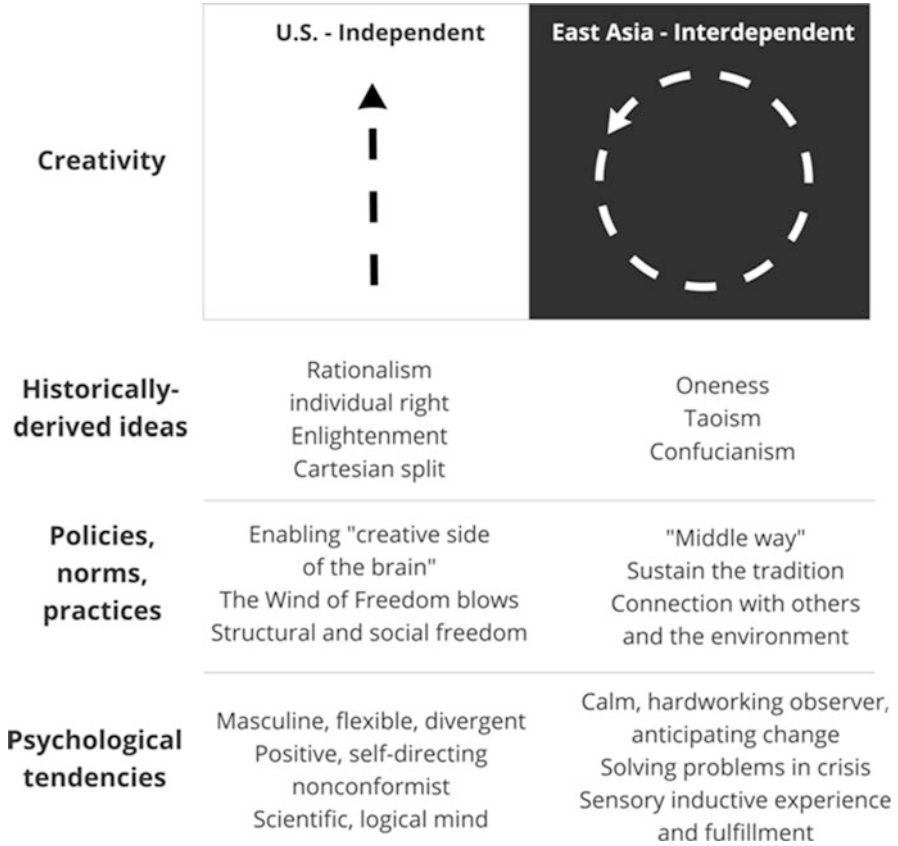
Fig. 2 Line and circle, as a metaphor (Biao, 2001) for two different possible cultures of creativity and a summary of culture cycle analysis. This model is built upon an earlier version of the figure in Misaki and Ge (2019)

3.1 Historically Derived Ideas of Creative Problem-Solving

3.1.1 Historically Derived Ideas in the USA

The modern American concept of creativity has a philosophical tradition of inquiry into "the origin of new entities and new ideas" (Weiner, 2000). In the West, people have the long tradition of valuing precise, conceptual knowledge and systematic sciences, which can be traced back to Descartes. Western epistemology tends to value—place truth in—abstract ideas and theories, rather than concrete personal experiences or the embodiment of knowledge. This tradition of inquiry reflects the Western epistemology that humans are separate from others and objects, and that humans as rational thinkers obtain knowledge deductively by reasoning.

Historical events and movements such as the Enlightenment have influenced the modern American conception of creativity—a process through which people can

direct their own destiny. Freedom of choice is therefore often regarded as a prerequisite to enable solving problems creatively. According to Wight, the Western idea of "individual creativity"—whereby new ideas originate in the human mind and in the ability of the individual (Wight, 1998)—became widely acknowledged during the Enlightenment. At this time, people started to emphasize the importance of individual rights and elevate individual rights in order to understand the universe and to direct their own destiny (Szczepański & Petrowicz, 1978; Albert & Runco, 1999, cited in Niu & Sternberg, 2006). As a result, Westerners tend to consider creativity as an ability that one unleashes from within and expresses outwards. Because the modern concept diverges greatly from the ancient divine beliefs of creativity in the West, the latter is not reviewed here (for more, see the philosophical roots reviewed in Niu & Sternberg, 2006).

3.1.2 Historically Derived Ideas in East Asia

In contrast, creativity in East Asia emphasizes a reliance on situated experiences (unseparation of mind and body) and a deep connection with other people and things (unseparation of self and others; unseparation of humans and things). East Asians have a tradition to believe that knowledge can be attained inductively from sensory experience (Nonaka & Takeuchi, 1995). The clear distinctions between humans and objects and between embodied experiences and conceptual knowledge can be found rather exotic by East Asians. Instead, what is historically valued is their indistinction, or the so-called oneness—oneness of humanity and nature ("Tian Ren He Yi"), of body and mind (Biao, 2001), and of self and other (Markus & Kitayama, 1991). Oneness is a central idea in Taoist philosophy. Fundamentally, each thing contains within it the entire universe; each thing contains the universe by "feeling with" (having sympathy with) the universe (Chang, 1970). This philosophical view was particularly reinforced during the neo-Confucianism movement. From the neo-Confucianism perspective, things and people in the world are indistinct from one another in that they share the same nature or substance. The shared substance supplies a deep connection among people, creatures, and things, which has been documented to partly explain East Asians' interdependent construal of the self (Markus & Kitayama, 1991).

These ideas are inevitably evidenced in East Asians' understanding of creativity. Cultural research of creativity broadly accepts that Taoism has a great impact on Chinese creativity (Niu & Sternberg, 2006; Kuo, 1996). Yan (2015) argues that while Western creativity is associated with conquering nature, East Asian creativity is about seeking harmony with nature ("Tian Ren He Yi"). The Chinese ancient military treatise, *The Art of War* (Tzu, 1971), provides ample examples to substantiate the view that a deep understanding of particular situations is the foremost important capability of creative military strategists or problem solvers (Yan, 2015). Ancient creative problem solvers in China are often depicted as situation-attending "observers" (Langer, 2009; Rudowicz & Yue, 2000) who can draw connections from the past (Niu & Sternberg, 2002) rather than being "bolt from

the blue" unconventional thinkers. According to the Taoist classics, the creative process is a process of "the inner apprehension of dao, when all the distinctions between subject and object vanish" (Niu & Sternberg, 2006). Chu argues that, "[Chinese] creativity is related to meditation, because it helps one to see the true nature of the self, an object, or an event" (Chu, 1970, p. 340). In Japan, the creative process is broadly recognized as entering into a free state of "pure experience" (Yuasa, 1987; Nishida, 1960) that transcends body-mind and subject-object distinction. This has been used to explain, for instance, the critical social process of crystallizing new products (Nonaka, 1994) and the superior stage performance of master actors (Yuasa, 1987).

Oneness is also exemplified in what has become known as "dialecticism," a form of folk wisdom in Chinese and other East Asian countries' cultures, which is seeing oneness of—and seeking a balance between—contradictory propositions in problem-solving. Peng and Nisbett (1999) argue that Chinese ways of dealing with seeming contradictions often result in "retaining basic elements of opposing perspectives by seeking a 'middle way'." Partly because of seeing a shared nature with others and the environment, people consciously experience facilitating and restraining forces (Lewin, 1999), to borrow Lewin's words, from the external, active environment, which act upon them and induce constant changes. A "middle way" is perceived to best handle constant changes. The Chinese Proverb—"Sai Weng Shi Ma," for instance, tells a story of an old man who finds good in the bad, yet also foresees misfortune in an apparent fortune. Interestingly, although Chinese people admire the versatility that is embedded in ambivalent attitude or a lack of clear position-taking (e.g., "Bian Yi," in Yan, 2015), such an attitude and behavior can be considered quite undesirable in the USA.

3.1.3 Cultural Ideas Between the USA and East Asia

According to linguist Liu (1995), "创造力(chuang zao li)" or "chuang zao xin" (both words mean creativity in Chinese) comes from a modern Japanese word, "sozosei," which was translated from the modern English word, "creativity" (Note: Niu and Sternberg cited the Japanese word as "kozosei," which might be a typo, e.g., in Niu & Sternberg, 2006). In Chinese history, the terms "chuang zao li" and "chuang zao xing" are rarely used (Yan, 2015). Nowadays, although "creativity" is no longer a rare word in China, it is relatively new and carries the meanings and cultural ideas of Western creativity. In Hui and Lau's investigation of educational policies on creativity education in four Asian societies, they find that mainland China is the only place where creativity is not clearly defined (Hui & Lau, 2010). As Yuanqiang Zhou at Tsinghua University contends, "'creativity' is a product of the West, of course it's a Western thing" (via personal communication).

Many efforts have been made to reconcile the cultural differences. For instance, in analyzing the philosophical roots, Niu and Sternberg (2006) argue that Chinese natural creativity and Western divine creativity share many similarities. And although Western conceptions of creativity may go against the notion of oneness,

they match well with Taoism in terms of the pursuit of mental freedom. Many argue that while Confucianism presides over Chinese social life, Taoism presides over their own mental life (e.g., in Lu Xun's 1918 Letter to Xu Shou-tang; Zhang & Chen, 1991; both cited in Peng et al., 2006). "Obey publicly and defy privately," as Hwang (2000) puts it.

This may explain why many great minds in history are free from conventions and pragmatic concerns despite their Confucian practice. For example, Wei and Jin Dynasties (CE 220–420) are known as a mental freedom era. Poet Li Bai (CE 701–762), arguably the most famous poet of Chinese history, is also known for his high-level pursuit of mental freedom. The Japanese Physicist Nobel laureate Hideki Yukawa (1907–1981) greatly attributes his creativity to his systematic study of Taoism in his book *Creativity and Intuition* (Yukawa, 1973). He remarks that he is personally docile but mentally rebellious—"I can never work on a problem that I've been told to solve by someone else. My subconscious always rebels against being ordered to do something. Personally, I look on myself as a docile kind of man."

In the USA, the co-existence of social conformity and mental freedom may posit tension and contradiction and induce eventual separation spatially in content and temporally in process. This reflects an Aristotle's "either/or" frame (Li, 2014). Yet from the Chinese philosophical perspective, contradictions are meant to co-exist in harmony. To some extent, "mental freedom" in Taoist tradition also suggests a meditative practice of losing oneself (therefore, the self is set free mentally) to connect and fuse with every other thing. Csikzentmihalyi has also mentioned that people can experience this "flow" during the utilization of Eastern styles of meditation (Csikzentmihalyi, 1997). Yet the experience of "flow" is not unique in the East and can be found across many cultures.

3.2 Policies, Norms, and Practices Around Creative Problem-Solving

3.2.1 Policies, Norms, and Practices in the USA

In the USA, creative ability is considered essential in revitalizing the economy (Bilton, 2010) and breaking up established systems (Lubart, 1999). As such, creativity-conducive policies and regulations emphasize the provision of autonomy and freedom. For example, Simonton argues that creativity favors a civilization that is composed of a large number of peacefully coexisting independent states rather than dominated by empire states (Simonton, 2000). Policies and practices about creative ability value the creation of the new, whereas connection with the old is less relevant. Amongst others, Venturelli (2005) argues that, "the challenge for every nation is not how to prescribe an environment of protection for a received body of art and tradition, but how to construct one of creative explosion and innovation in all areas of the arts and sciences." To the opposite, in many fields, distinction from the

past or tradition is viewed as a sign of creative behavior. In entrepreneurship practice, for instance, entrepreneurs are often regarded as a force of "creative destruction" to destabilize the established business and disrupt the control of the mainstream industry to enable the formation of new ones (Webster, 1977; Levitt, 2002).

We are in the "creative economy," as Richard Florida puts. According to Florida, about 30% of the workforce are in the creative sector today, in comparison to only 10% in 1990 (Florida, 2007). "The creative sector accounts for nearly half of all wage and salary income in the United States. That's nearly $2 trillion, almost as much as manufacturing and services combined" (Florida, 2002, 2007). In recognition of that, modern work environments have started to encourage autonomy, freedom, and management empowerment. For example, Google's 80/20 rule grants its employees free time at work. "This empowers them to be more creative and innovative," write Larry Page and Sergey Brin in their Founders' IPO letter in 2004. Today at Google and Moonshot Factory, creativity is represented as "10X thinking." Frederik G. Pferdt, Chief Innovation Evangelist at Google, encourages Google employees to think big, and to go for monumental change, not incremental improvement (Lafargue, 2016).

No question about it—creativity is increasingly recognized as an essential goal of K-12 and college education in the USA. As Obama remarked at the ESSA signing ceremony, "we're going to have to have our young people master not just the basics but also become critical thinkers and creative problem solvers." Educational practices that push for tests and standardization, especially through repeated training, face growing criticism of killing creativity. Sir Ken Robinson's talk *Do Schools Kill Creativity?* (Robinson, 2006) has remained the top viewed TED talk since 2006. Since the No Child Left Behind Act was initiated in early 2000, it has received numerous criticisms about how it kills creativity (Goldstein, 2017). In response to these problems, the Every Student Succeeds Act was proposed, which emphasizes more creativity-conducive measures, such as creating more access and choice for students (Goldstein, 2017). As an example of college education, Stanford University's Viewbook (2009) begins with the statement—"The wind of freedom blows." It continues that the university gives students "the freedom to be themselves: innovative, creative, and unconstrained by any predetermined look or affect" (p. 22, cited in Plaut et al., 2012). In school and at work, "creativity" has become a desirable way of interacting and a new norm of being—it is confidence, self-expression, scientific pursuit, and leadership. Popular books—*The Adjusted American*, a classic from the 60s and more recently *Orbiting the Giant Hairball*, to name a few— promote nonconformism and address how to seek one's freedom to attain a sense of self, to remain creative in bureaucratic work environments and ossified society.

Who are creative geniuses in the USA? In the technology fields, Steve Jobs is often recognized as the most creative person of all time. At age 20, the non-conformist cofounded Apple and at just 29, he introduced Apple Macintosh, which soon radically transformed the personal computer industry. In science, often referred to as the most creative genius of the last century, Einstein is one of the few who perfectly bridged, what is perceived in the USA as the intuitive side of

creativity—art and the rational side of creativity—science. Creative individuals such as Einstein are believed to be creative not because of their hard work (Lin-Siegler et al., 2016). Images of creative people in the USA (e.g., young Steve Jobs) highlight their vision, ability, and passion—"obsessive interest," as Richard MacCormac puts it (Lawson & Dorst, 2013), not efforts or experience per se.

The American pursuit of reason, such as in creative science, gives rise to theories and structured processes of creative idea generation, based on the belief that "creative potential" can be systematically acquired. At Stanford d.school and IDEO, the educational practice of sticking to a structured process (Kelley, 2012) and some brainstorming rules reflects such a notion in the USA. By following these general creativity-nurturing principles, creative ideas can be unleashed from the independent and confident human minds. Creative problem-solving is understood as confident self-expression and quantity. Self-expression is widely believed to signal independent thinking (Kim & Markus, 2002), whereas quantity suggests quality. The Father of Brainstorming—Osborn made popular the idea that "quantity helps breed quality" (Osborn, 1953). Quantity of ideas (fluency) has been a standard measure of creativity in empirical studies in the USA (see more in Sect. 3.3). "Go for quantity," as one of the brainstorming rules says. According to David Kelley, founder of d.school and IDEO, the emphasis on quantity of ideas is to "generate more ideas so that they can *choose*" (Kelley, 2012).

3.2.2 Policies, Norms, and Practices in East Asia

As discussed above, the East Asian words of creativity come from the West and inevitably carries with it the Western cultural ideas. Despite its relative short history in Chinese language, the word has been quickly incorporated into formal documents and daily use, especially among the younger generations. China's government has played a big role in the promotion of creativity. However, little research is done and therefore little is known about how much of its meaning and cultural practices get carried over to the East and internalized by the East in its translingual practices (Liu, 1995). Government statements and news reports seem to suggest an acculturation. Specifically, driven by advancing technological and economic development, scientific and technological creativity is the major concern in mainland China's policy (Hui & Lau, 2010). Creativity as an individual's ability is often described as "innovative spirit." As the Higher Education Law (Ministry of Education, China, 1998, cited in Hui & Lau, 2010) states, "cultivating an innovative spirit in the personality development of young talents is an important strategy."

In the last 15 years, China's government has been greatly advocating the cultivation of creativity and innovation, as reflected in its five-year plans. According to Wang (2015), the state documents of five-year plans from 1949 to 1996 primarily described creativity as the potential of individuals or a way in problem-solving (we should "creatively" solve the problem), and innovation-related creativity only appeared in science and technology sections, serving as the synonym of scientific research. The term "self-independent innovation" first appeared in the ninth five-year

plan (2001–2005), which, according to Wang (2015), was an official signal of China joining the "creativity warfare" in competition with the West. Yet, the contextual meaning of "self-independence" in "self-independent innovation" emphasizes a collective effort to be independent from the West, rather than suggesting individualism. This notion of being less reliant internationally is reinforced in China's 14th five-year plan as well (Mallapaty, 2021).

Since 2009, numerous innovation and entrepreneurship demonstration zones have sprung up across cities and provinces, under the direction of China's State Council. These strategies are driven by the needs of economic development and global competitiveness. Although these official policy documents borrow concepts of creativity from the West, the emphasis of creativity and innovation almost always comes together with preserving tradition, as well as sustaining and strengthening the classics and the cultural roots. For instance, in the recent series of five-year plans (e.g., Xinhua, 2021), innovation has been regarded as a savior to revive the bankrupt traditional industries and as a promising way to sustain Chinese traditional cultural products and practices, such as historical villages, Chinese medicine, and traditional handcrafts, highlighting the collectivist goal of social contribution and utilitarianism.

The Chinese political system and social structure of today have a direct impact on what messages are promoted in social media. "Innovation" and "tradition" are often paired in news reporting, such as:

继承传统、创新经典 (Sustain the tradition; Innovate the classics)
　　正确传承比盲目创新更重要 (Correctly passing ideas to next generations is more important than blindly innovating)
　　传承是基础、创新是生命(Inheriting ideas from the past makes the foundation, based on which innovation offers [new] life)
　　传承不泥古、创新不离宗(Inheriting tradition flexibly; Innovating without going far from the root)

In East Asia, modern designs often emphasize preserving the past, connecting with traditional cultural values, and finding consistent meanings in modern practices of traditional ideas. New architectural designs would be endowed with traditional values—Kengo Kuma's design of the JP Tower is such an example (Kengo Kuma and Associates, 2012). JP Tower was a project to preserve and renovate the historic Tokyo Central Post Office Building by adding a new skyscraper structure. The architect behind JP Tower is Kuma, a renowned Japanese architect who most recently designed the Japan National Stadium for the Tokyo 2020 Olympic Games. A New York Times interview with Kuma (Saval, 2018) describes Kengo Kuma's design vision as "a story of returning to the values of traditional Japanese architecture." In Kuma's mind, architectural design should "through acquaintance with local materials and methods, relate itself harmoniously to its surroundings."

Who is the Steve Jobs in Japan? The name that comes into many Japanese people's minds is Gunpei Yokoi, known as the "father of handheld games." Yokoi founded the product philosophy of "lateral thinking of withered technology (枯れた 技術の水平思考)" at Nintendo (Yokoi, 2021). The idea behind this philosophy is to refrain from cutting-edge technologies, and instead focus on past technologies and develop ideas by viewing these ancient technologies through the lens of lateral

thinking. This philosophy has not only shaped Nintendo's product development policy, but also influenced generations of designers and technologists in Japan.

The Chinese TV show *National Treasure* featuring stories of past creations is yet another example that emphasizes the importance of bridging the past and the present. Started in 2017, now in its third season, it has remained one of the highest rated shows in mainland China. It received the best TV show award in the 24th White Yulan Prize of Shanghai TV Festival in 2018. The show allows the audience to admire the hardworking creators' superb skills and high-level experiential state that the creators were able to achieve. The depiction of superb craftsmanship often highlights the creators' ability to merge themselves with their creation and become one with it.

Indeed, although the word "creativity" is relatively new in Chinese history, there are many Chinese characters, terms, and phrases that entail the idea of solving problems in creative ways, such as "Xin Ying" (新颖), "Jiang Xin Du Yun" (匠心独运), "Qi Si Miao Xiang" (奇思妙想), and so on. Yet, the contextual meanings of these words, terms, and phrases diverge from American conceptions of creativity. A thorough review of anthropological, philosophical, and psychological literature suggests that while American conceptions of creativity focus on novel solution/product outcomes and individual autonomy and uniqueness, East Asian conceptions of creativity, as consistent with the message of *National Treasure*, emphasize the creator's inner processes and fulfillment (Lubart, 1999; Paletz et al., 2011; Shao et al., 2019).

East Asians tend to value the embodiment of direct, personal experiences during the process of creation, where ambiguity is preserved yet logic is unquestioned. The emphasis of "on-the-spot" personal experience, rather than reliance on abstract theories in Japanese management, is a manifestation of such an epistemological tendency (Nonaka & Takeuchi, 1995). The Chinese character *wu* (悟) depicts such a creative mental process that uses metaphorical, intuitive imagination to jump from the known to the unknown (Li, 2012). According to Peter Ping Li, "almost all Chinese leaders prefer *wu* in their thinking process to rational analysis. In particular, Yun Ma, the CEO of Alibaba, is an excellent example of a *wu* leader. He practices Zen as well" (cited in Sundararajan & Raina, 2015).

In China, every child grows up learning legends about Zhuge Liang, and classic stories about Effendi, Cao Chong, and Sima Guang, to name a few. For instance, the old tales about Sima Guang, who saves a drowning child by quick-wittedly breaking the water tank, and Cao Chong, who creatively solves the problem of weighing an elephant with a boat and rocks, are part of the required reading in the first and second grade of elementary school education. These people are depicted as capable of creatively and calmly solving impossible problems in urgent situations. The Chinese saying "急中生智 (Ji Zhong Sheng Zhi)" depicts a calm thinker who comes up with ingenious solutions amid crisis. Ingenious problem-solving acts are associated with calm and keen observations with few words, as opposed to passionate, eloquent expression of outside-the-box ideas. The East Asian cultural value of silence rather than speaking is more thoroughly examined in Kim and Markus (2002).

In addition, creative people in East Asia, from business magnate Yun Ma, to famous songwriter and singer Jay Chou, to the great chefs Tetsuya Saotome and Jiro Ono, consistently place far greater emphasis on their effort and experience as opposed to ability or passion as the cause of achievement. For example, great effort is needed in the disciplined, embodied creative practice of Japanese ink painting, called sumi-e (or Suiboku-ga), which has a philosophical origin in the Taoist notion of "uncarved block." Artists in Japan would spend years applying sumi-e ink brush painting to attain higher states of creative experience—the so-called creativity of no mind (Mushin) (Steinbock, 2013). As Yan (2015) argues, "'aha' moments in East Asians' creativity come from hard work, great effort, and long-term accumulation of knowledge and experiences."

3.3   Psychological Tendencies of Creative Problem-Solving

Culture can also be found in people's psychological tendencies. Partly because of holding different ideas, norms, practices, and interpersonal interactions across cultural contexts, those who are believed to be creative people, and what are perceived as creative activities and traits, also vary from place to place as do what motivates people to create and solve problems.

Unfortunately, most cross-cultural empirical research employs methods and theories of the American models that are derived from independence-embracing ideas, norms, and practices (Lubart, 1990). Consistent with such perspectives, creative people are considered those who have independence of judgment (Barron & Harrington, 1981), freedom and choice (Robinson, 2006), risk-taking boldness, and conspicuous behaviors (Simonton, 2000), choose to be in the creative mode—divergent thinking (Guilford, 1967; McCrae, 1987) and exhibit out-of-the-box thinking (Weisberg & Markman, 2009; Sternberg & Lubart, 1995). These people are considered nonconformists (Sternberg & Lubart, 1995; Grant, 2017), good at expressing self-direction and agency (Amabile et al., 1996; Hennessey & Amabile, 2010; Glăveanu, 2014)—"belief in yourself" (Kusserow, 2012), represented as heroic and masculine, especially in business domains (Bilton, 2010). They are perceived to actively seek loose environments that endow freedom and autonomy (Amabile et al., 1996) and hold positive and activating emotions (Baas et al., 2008).

Figure 3 provides an overview of the empirical research paradigm of creativity in America. Researchers often operationalize creativity using standardized measures of fluency, originality, and flexibility (Guilford, 1967; Torrance, 1966), such as the Torrance Test of Creative Thinking. Modern creativity studies in the USA also typically define creativity as the generation of ideas that are both novel and appropriate or useful (Amabile et al., 1996; Oldham & Cummings, 1996). Here, creativity is measured through Consensus Assessment Technique (CAT) or external judges' evaluation of idea outcomes. The famous Duncker's candle problem (Duncker, 1945) is based on the idea that to be creative, people must think flexibly (i.e.,
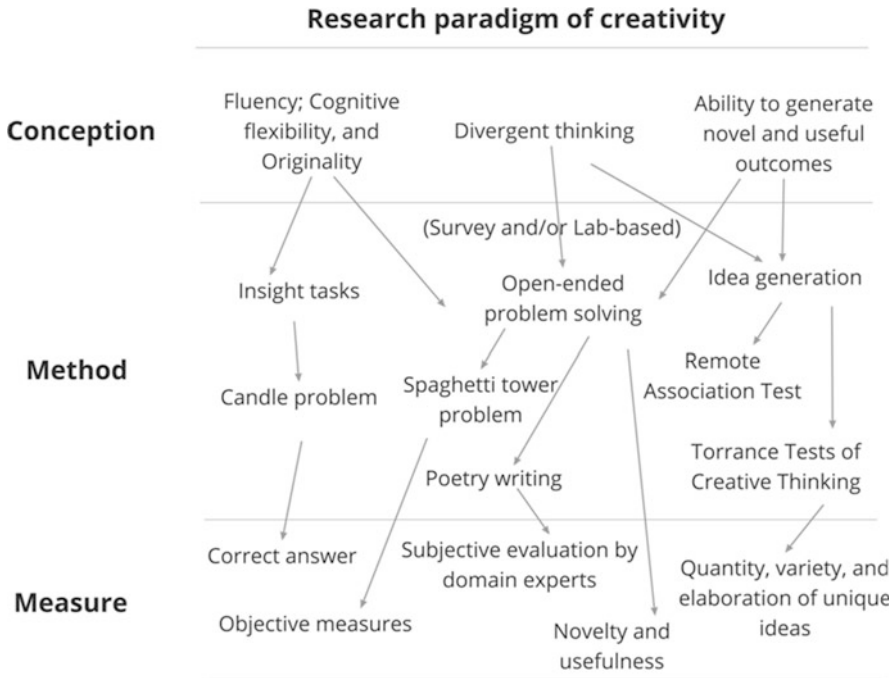
Fig. 3 Empirical research paradigm of creativity in the USA

cognitive flexibility) and be able to break free from their setting (De Dreu et al., 2008).

In the independent self-construal, the environment is largely perceived as inert, or as the background against which the self stands out (Nisbett et al., 2001). From this perspective, the role of the self is to influence the environment and to enable change (Markus, 2016; Nisbett et al., 2001; Markus & Hamedani, 2019). The motivation to promote change—radical transformation—is widely held to underpin the generation of new ideas and value creation. As the motto of Stanford Graduate School of Business goes, "change lives, change organizations, change the world."

Implicit theories about other creative processes, such as focusing on inner processes, oneness, or connection with others, are less examined. Where dialectic one-ness (Peng & Nisbett, 1999), holistic thinking (Nisbett et al., 2001), or other associated tendencies are examined, research on the relation between these tendencies and creativity is extremely limited. Conflicting findings and opinions, for instance, in the research about the relation between dialectical thinking and creativity, build up more roadblocks for pushing forward new theories of creativity (Paletz et al., 2018). Implicit theories that may be more relevant in East Asia still, unfortunately, mostly stay at the theoretical and philosophical level.

For instance, creativity research often takes for granted the supposedly positive relation between self-directed autonomy and creativity and, as a result, attributes

other-directedness as a negative signal of creativity. Consider the following quote: "I believe creativity is born by pushing people against the wall and pressuring them almost to the extreme." This remark, which can be frowned upon in the USA, is from an executive at Honda, famously quoted by Hirotaka Takeuchi and Ikujiro Nonaka (Takeuchi & Nonaka, 1986). Underlying this message is a belief that making people work harder would produce more creative outcomes (Forrester, 2000). The admonishment-based approach (Kitayama et al., 1997) is embraced in Japan where other people and group relation is a big source of agency (Markus & Kitayama, 1991) and motivation and action are grounded in a sense of self as interdependent with others and with the environments (Markus, 2016; Nisbett et al., 2001; Markus & Hamedani, 2019). However, people in the USA would think such a practice would kill the enjoyment, interest, and satisfaction that are considered necessary for unleashing creativity from within individuals.

Similarly, people in the USA that champion "change" to solve social problems may be puzzled at East Asians' resistance to change. East Asians take the demanding job of preserving the past and sustaining the connections seriously, where "change" can be seen as an unconstrained, irresponsible mission that requires less effort. For East Asians, the context is more likely to be perceived to constantly produce changes. As a result, the role of the self is to contextualize, observe, connect to, and adapt to changes that come from others and the environment.

Empirical studies that solely employ an American perspective can lead to mixed findings about East Asian creativity with highly questionable validity (see a review in Morris & Leung, 2010). In their research to identify people's concepts of creativity among Mainland, Hong Kong and Taiwanese Chinese, Rudowicz and Yue (2000) surveyed associative adjectives of the word "creativity," which admittedly carries American ideas and practices, rather than addressing it from an East Asian perspective. Niu et al. (2007) assessed both Hong Kong and U.S. participants' creativity in terms of appropriateness, humor, and originality based on the Consensus Assessment Technique (CAT) (Amabile et al., 1996). Interestingly, while "humor" and "originality" are possibly valued dimensions of creativity in some American populations, they may be largely irrelevant based on Rudowicz and Yue's (2000) observation of mainland Chinese participants and Taura and Nagai's prediction (2013). In addition, some studies find that Chinese personality is incompatible with creativity (Hui & Rudowicz, 1997; Rudowicz & Yue, 2002), yet in some other studies, Chinese students performed better (Saad et al., 2015; Wang et al., 2018) or similarly (Riquelme, 2002) as their American counterparts in carrying out creative idea generation tasks. Other problems include cross-cultural survey in the English language (Zha et al., 2006) and biased sampling (Sundararajan & Raina, 2015). Problems have also emerged in cross-cultural studies that involve other countries and contexts. For instance, quantity was found to be an irrelevant factor of creativity in a study of Moroccan students (Peng et al., 2021).

The overreliance on these standardized measures of creativity is not only inappropriate in cross-national studies, but also problematic in studies within the multicultural nation of America (e.g., Brannon et al., 2015; Jackson et al., 2019). For example, in Brannon and colleagues' research (2015) of the double consciousness of

African Americans (i.e., independent and interdependent self-schemas), they examine whether engagement in African American culture improves students' academic fit and performance for African Americans. However, the evaluation and measurement of academic performance based on which the studies were run solely reflect an independent schema (e.g., flexible thinking, excitement).

Creativity researchers have started to criticize the application of Western tests to different populations because rather than uncovering culturally valued and culturally varied traits and characteristics, such traits may be overlooked (Mistry & Rogoff, 1985; Runco & Bahleda, 1986; Runco & Johnson, 2002; Glăveanu, 2010). The lack of culturally responsive conceptions and measures of creativity is partly responsible for our confusion and continuous misconceptions about East Asian attitude, behavior, cognition, and emotion around creative problem-solving.

4   Overview of Exploratory Studies

Instead of adopting standard creativity measures developed in WEIRD contexts (Henrich et al., 2010), we have deviated from the standard but biased measures. We want to examine paradigms of creativity from culturally relevant perspectives. In this section, we share initial findings from a few pilot studies, which are part of our ongoing efforts to explore the cultural differences of creative problem-solving. Specifically, we use survey studies to examine across cultures the desirability and applicability of the American views, which encourage being agentic change-makers in creative problem-solving.

In the first study (Sect. 4.1), we posit that instead of seeing the self as the source of agency, people tend to gain agency from context (such as the past, other people, and the physical environment) in East Asia. Our initial findings suggest that there is a cultural difference in people's perceptions about the context's agency in producing good ideas, creating changes, and performing human-like tendencies. In addition (Sect. 4.2), people's evaluation of ideas is affected when their perceptions about the role of the context are manipulated. In the next section (Sect. 4.3), we hypothesize that instead of "change," "preservation" (e.g., connection with the context) is likely to fuel idea generation in East Asia. The finding suggests that indeed, culturally resonant narratives (e.g., change versus preservation) affect people's perceptions and motivations in creative problem-solving. Most recently (Sect. 4.4), we are building a new composite measure to examine in different countries people's perceptions around which make an idea better, specifically—"breaking" or "connecting."

We are still in the iterative design process of the cultural creativity surveys, including balancing contextualization and generalizability, refining the scales, and improving reliability and validity for both American and East Asian participants. The findings shared here are meant to stir conversation and reflection, rather than making assertions about cultural differences.

4.1 Cultural Variations in Perceptions of the Agency of Context

In the USA, creative problem-solving champions individual self-direction, agency, and autonomy. In comparison, East Asian creativity highlights the agentic roles of the context (e.g., other people, past ideas, and the physical environment). Therefore, we hypothesize that East Asians tend to perceive the context (i.e., factors external to individuals) has more agency than individuals and that the opposite is true for Americans.

In a series of exploratory surveys, we incorporate measures to examine beliefs about the source of change, the source of good ideas, or the source of a broad range of tendencies (e.g., kindness, authority, wisdom) on Likert scales from $1 =$ completely from individuals to $7 =$ completely from context. The source of change and the source of good ideas are both examined through a one-item measure, and the source of animated tendencies is based on a composite measure that has high internal consistency. Through iterative survey design, in the surveys about the source of good ideas and the source of animated tendencies, we have provided examples, such as cultural practices, history, and natural environment, to clarify what "context" or factors external to individuals consists of.

Since 2019, we have distributed these surveys among USA (adult samples recruited online from Prolific, Mturk, and college student samples), Chinese (adult samples from online survey platform Wenjuanxing), and Japanese participants (adult samples recruited from the online survey platform Lancers and college student samples). Across the board, American participants are less likely to see context as a source of change, good ideas, or various animated tendencies than their Chinese and Japanese counterparts. These differences are all statistically significant. For instance, in one study (Fig. 4), we use an adult sample recruited from Prolific in the USA ($N = 187$, mean age $= 32.3$, 86 women and 6 others) and Wenjuanxing in China ($N = 176$, mean age $= 32.2$, 74 women and 2 others). We find that compared with U.S. participants, Chinese participants indicate a stronger belief that "change" comes from context, $t(361) = 2.974$, $p < 0.01$. In another study (Fig. 5), we recruited participants from Mturk in the USA ($N = 150$), Wenjuanxing in China ($N = 87$), Lancers in Japan ($N = 165$), as well as Japanese engineering college students ($N = 124$). Similarly, online participants in China ($t(236) = 2.522$, $p = 0.012$) and in Japan ($t(314) = 2.448$, $p = 0.015$), as well as Japanese engineering students attending a university in Japan ($t(273) = 3.736$, $p < 0.01$) are more likely to believe that "good ideas for solving problems" come from context than their American counterparts. Another study on the source of change can be found in our previous conference presentation in Ge et al. (2021).

To sum it up, compared to Americans, East Asians are more likely to see a connection with the context and impart agency to factors external to the self. This difference carries important implications for creative problem-solving. We suggest that in East Asian societies, practices to elicit a more generative mindset would be more effective if they placed a greater emphasis on the role of the context and
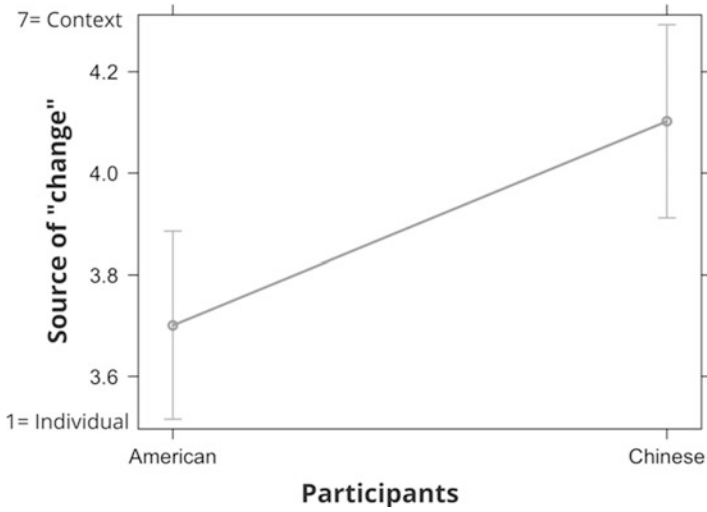
Fig. 4 Compared with U.S. participants, Chinese participants indicate a stronger belief that "change" comes from context, $t(361) = 2.974$, $p < 0.01$
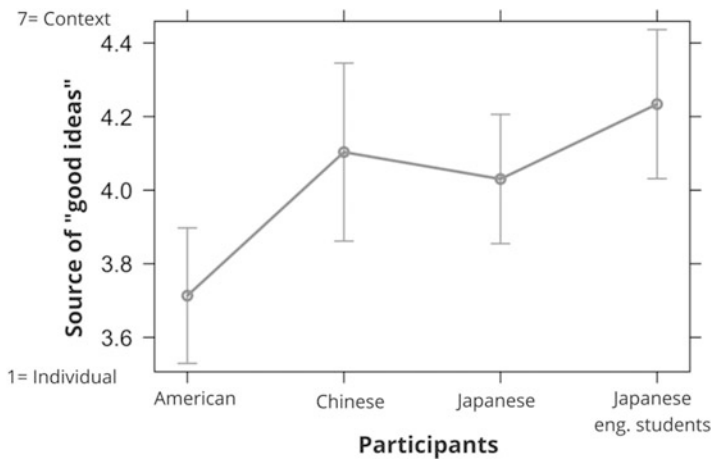

Fig. 5 Compared with U.S. participants, online participants in China ($t(236) = 2.522$, $p = 0.012$) and in Japan ($t(314) = 2.448$, $p = 0.015$), as well as Japanese engineering students ($t(273) = 3.736$, $p < 0.01$), indicate a stronger belief that "good ideas for solving problems" come from context

actively involved factors external to the self (e.g., tradition, other people, situations) in motivating people to come up with sound ideas for solving problems.

4.2 Relation Between Perceived Agency of Context and Other Factors and Its Manipulation

In addition to engaging in a comparison between American and East Asian samples, we have also conducted analyses within the U.S. population. Using an online sample of American adult participants, we find that locating the source of change within the context correlated negatively with identifying as being an American, $r(277) = -0.20$, $p < 0.001$, as well as trust in American institutions, $r(277) = -0.17$, $p < 0.01$. Perceived sources of change, however, do not correlate with participants' demographic or political orientation, thus suggesting that this is a more general psychological phenomenon.

In addition to measuring people's perceptions of the context, we also experimented with providing materials to directly affect people's perceptions, which allows us to study the downstream consequences of shifting perception and to understand the direction of causality involved. We recruited 325 U.S. participants from Prolific (mean age = 35.69, SD = 13.38, 204 women, 115 men, and 6 other, 6 did not pass attention checks). Participants were randomly assigned to one of the two conditions. In one condition, they were informed that change comes from individuals. In the other condition, participants read that change comes from context or factors external to individuals. The source of change manipulation was successful, $t(318) = 9.26$, $p < 0.001$. After the manipulation, participants were asked to evaluate a series of products or ideas (see examples in Fig. 6) and indicate their perceptions of these ideas.

Our empirical findings suggest that people's perceptions about the relationship between the self and the context (e.g., others and the environment), such as the context's agency, can partly explain how they understand product ideas. Specifically, participants who were informed that the individual (rather than context) produces change perceived ideas to be more unique, $t(319) = 2.21$, $p = 0.03$, and were also likely to believe that these products serve the purpose of change rather than preservation, $t(319) = 1,72$, $p = 0.087$.

(a) Hippo Water Roller   (b) Multi-purpose Tent in Desert

Fig. 6 Examples of ideas and products used in the manipulation survey to examine how people's perceptions of an idea's purpose and uniqueness are affected by their beliefs about the agency of the context. (**a**) Hippo Water Roller (2022). (**b**) Multi-purpose Tent in Desert (Seikaly, 2015)

4.3   Engineering Students' Motivation for Problem-Solving

Technological companies in Silicon Valley promote the notion to change, transform, and disrupt the status quo for the better. We examine whether this notion is culturally specific to the context of the USA. Based on our theorization, what drives engineers to create and solve problems could vary across cultures. We hypothesize that engineering students in Japan are more motivated to generate ideas when a task is framed to preserve rather than change a certain situation. In contrast, American engineering students are more motivated by a task frame characterized by change as opposed to preservation. To test this hypothesis, we recruited two different engineering student samples—one from Prolific in the USA ($N = 209$, mean age $= 24.3$, 80 women, 128 men, and 1 other) and the other from an engineering university in Tokyo, Japan (N $= 158$, mean age $= 19.96$, 7 women, 149 men). Participants were randomly assigned to come up with a new idea to solve a problem, randomly assigned from a corpus of problems, the goal of which was either to change or to preserve a certain target. After writing down their ideas, participants reported their levels of motivation during the idea generation.

We found that Japanese engineering students are more motivated to generate ideas when the goal is framed in terms of preservation (e.g., come up with ideas to preserve local transportation) rather than change (e.g., come up with ideas to change local transportation), $t(151) = 1.88$, $p = 0.062$. However, no statistically significant difference between conditions is found for American engineering students, $t(202) = -0.6$, $p = 0.5$. However, there is a trending moderation effect. This means that the effect of problem framing on participants' motivation level is moderated by their perceptions about where change comes from, $t(357) = -1.63$, $p = 0.1$. Within the American sample, some participants also hold similar views as Japanese participants and perceive context as a source of change. These subsets of American participants also tend to be more motivated by preservation than by change.

These initial findings thus suggest that people's perception of the context affects their motivation to solve problems. This psychological link holds whether we compare people from two different cultural groups or analyze the diversity of people's perceptions and motivations within the American group. More details about the methods, analysis, and results of this study can be found in our recent conference paper in Ge et al. (2021).

4.4   Which Makes an Idea Better: "Breaking" or "Connecting?"

We are currently focusing on the temporal dimension of connecting with or breaking from context. What characteristics make an idea better? What relationships between current ideas and past ideas do people in different cultures desire? We hypothesize

that Americans tend to evaluate ideas more positively when these ideas are perceived as breaking away from past ideas, whereas East Asians may prefer ideas that are connected with practices and ideas people had in the past. Based on our culture cycle analysis, the process of creation that emphasizes continuity with the past and the environment in East Asia is idealized in a dramatically different way than in the USA where such connection is often missing.

Through iterative design and pilot testing based on U.S. participants, we have designed a 12-item composite measure that looks at the characteristics of ideas for problem-solving: six items characterize "continuity" and describe current ideas as connecting with, grounded in, and revitalizing past ideas; another six items capture "discontinuity" and picture current ideas as departing from ideas in the past. We believe that the current empirical approach is promising and can pave the way for discovering systematic cultural differences. We will continue to investigate the perceived desirability of ideas that stand away from or build upon past ideas in different cultural contexts.

5   Discussion

Based on our comprehensive analyses of how creative problem-solving is shaped in American and East Asian cultural contexts, we discuss the problems and societal consequences of solely relying on a singular view of creativity. We also offer some implications of our work for creative (design) thinking, teaching, and learning. Finally, we reflect on ongoing empirical efforts and summarize several of the other directions that we are pursuing.

5.1   *Embracing Diversity Inherent in the Human Processes of Creative Problem-Solving*

The dominant ways of creativity assessment (e.g., in Fig. 3) not only dominate scientific research, but also decide who excels in school. This essentially rejects diversities that are inherent in the human processes of creativity and creative problem-solving. Why does research on implicit theories that may be more relevant in East Asia still mostly stay at the theoretical and philosophical levels? Is it because we lack exposure to other perspectives and ways of being? In the increasingly globalized society, culture clashes are supposedly abundant. Yet it is difficult to overcome the confusion and rejection when one is confronted by a different reality of creativity. "It is the conventional way of defining creativity that prevents us from measuring it beyond the rigid frame we use in research," argues Lutz Eckensberger (cited in Sundararajan & Raina, 2015). As Gustav Ichheiser (1970) eloquently writes:

> [W]e fail to understand that people whose personalities are shaped by another culture are psychologically different—that they see the (social) world in a different way and react to it as they see it. Instead, we tend to resolve our perplexity arising out of the experience that other people see the world differently than we see it ourselves by declaring that those others, in consequences of some basic intellectual and moral defect, are unable to see things "as they really are" and to react to them "in a normal way."

Without resolving the confusion and rejection of other ways of creative being, however, empirical studies that employ an American perspective will continue to reinforce misleading conclusions, such as the lack of creativity in Chinese and Japanese people (Riquelme, 2002; Rudowicz & Hui, 1997), and that individualistic culture outperforms collectivistic culture in cultivating creative talents (e.g., Goncalo & Staw, 2006), and so on.

On the positive side, there is an emerging effort to resolve the tension between the East and the West. Amongst others, Averill et al. (2001) propose the notion of emotional creativity to incorporate the East Asian perspective of situated experience into the Western model of creativity. There is an emerging consensus in management research that researchers should adopt an interdisciplinary and multiperspective approach in general (see Suddaby et al., 2011 for a review). We urge creativity research across cultures to employ a beginner mindset on what creativity really means and entails for different cultural contexts.

On the practical end, the booming "creative economy" (Florida, 2002) continues to evolve without critical reflection on the current evaluation of people's creative processes and performance. Creativity should be one of the inclusive educational and managerial targets. Schools such as Harvey Mudd College (Cheryan & Markus, 2020) have started launching programs to increase the belongingness and cultural fit for underrepresented individuals and groups. This is not enough, as long as our evaluation of students' or employees' creative performance is still narrowly defined by the WEIRD (Henrich et al., 2010). We should not leave underrepresented members with the default option to struggle and adapt to the dominant cultural values (Choi, 2010) or drop out (Felder & Brent, 2005). Embracing diverse cultural ideas and practices is a grand challenge. The independence-based educational and organizational settings, as well as the ideas, policies, norms, practices, and products within such settings, all need to be re-imagined, in such a way that people of all backgrounds are truly equally welcomed.

5.2   Critical Next Steps in Design Thinking, Teaching, and Learning

The current paper's title is named as an allusion to Dym and colleagues' iconic design education paper (Dym et al., 2005), and the discussion here indeed is to extend their efforts to broaden design thinking (from rational to inclusive), design language (from math to multimodal), design behavior (from individual genius to group effort), and design participation (from male dominance to diversity and

inclusion, e.g., Agogino's work, cited in Dym et al., 2005). Importantly, Dym et al. (2005) criticize the teaching practice of equating divergent thinking to creativity and urge a critical reflection on "what defines creativity." We build upon their work by providing a critical cultural perspective. Specifically, we argue that what defines creativity is culture.

Culture and global context are part of the fundamentals of design. This is reflected in the multicultural student composition of globalized design classrooms (Fruchter & Townsend, 2003; Daniels et al., 2010; Carleton & Leifer, 2009). We also see an increasing exchange of best practices, especially one-directionally from the USA to the rest of the world. For instance, creative learning process and methods stemming from the best practices of the Stanford d.school and Design Group, IDEO, SAP, and MIT D-lab, to name a few, have influenced educational practices and organizational management in many places around the world (e.g., Misaki et al., 2020; Ge & Maisch, 2016; Drain et al., 2017). For decades, MIT Creative Capacity Building program at D-Lab has provided creativity training for rural communities around the world (Drain et al., 2017). However, for educators and creativity training ambassadors, the consequences of holding false assumptions that certain types of people lack creativity based on certain selected beliefs in the USA, are dire. International students may get culturally biased grades and undergo psychologically difficult times. For instance, in the popular Stanford class ME310—Global Design Innovation, Japanese and Chinese students coming for a co-final presentation with their U.S. student partners may be poorly evaluated for insufficiently explaining how their ideas break the status quo, which is considered desirable in the USA but not so in East Asia. The situation is problematic given that student evaluation is based less on traditional exams of fundamental science knowledge, and increasingly more subject to culturally shaped subjective opinions. A critical next step is to fight against the long-term stigma about the creative ability of certain student groups.

A good design teacher today should have a nuanced understanding of the various cultural values and norms that shape designers' creative behaviors. The current paper has offered a comprehensive analysis with promising study outcomes to potentially expand the understanding of creativity among design educators. An open mind to understanding creative diversity is critical to addressing the remaining question of how to truly fulfill the cultural needs of students of all backgrounds in creative problem-solving.

By conceptualizing designers as culturally shaped shapers, we call for design educators and practitioners to explicitly incorporate cultural values into their design processes. We hope to stimulate reflections on principles and practices of design thinking that are widely applicable, as well as to uncover assumptions about design that are culturally specific.

5.3 Reflection on Studies and Future Work

5.3.1 Study Limitations

We have shared initial findings from several directions of our ongoing empirical efforts. Potential issues of reliability and validity may exist in the current four exploratory directions. For instance, in the study of culturally varying perceptions of the context's agency, although clear definitions and instructions are given, we mostly use a one-item, 7-point Likert-scale question—where do you think change (or good ideas) come from? In a more recent version, we start examining human-like tendencies with multiple-item questions, which have reached good internal consistency.

In the study of motivations underpinning creative problem-solving, we have framed the problem-solving question as "Come up with a new idea for...". In reflection, we recognize the use of the word "new" resonates with and possibly elicits independent ideas of creativity for both American and East Asian participants. We have adopted "good" instead of "new" or "novel" in later versions of our survey exploration. Additionally, we have learned to adopt neutral-to-positive words. For instance, "sustain" and "connect" may be better words than "preserve," the latter of which could have a negative connotation among some U.S. participants.

5.3.2 Future Work

We are currently extending this line of work to develop a more comprehensive framework to examine people's perception of the location of a host of different psychological states and tendencies. Further investigation of cultural differences in this aspect would shed light on the psychological mechanisms by which people are motivated to either pursue continuity or discontinuity when generating ideas. We are hopeful that this body of knowledge would inform the design of interventions or educational materials to best tap into people's motivation for solving important personal or social problems. For instance, while educational systems in different societies are similarly confronted with the challenges posed by the COVID-19 pandemic, people may respond quite differently to different definitions of the social problem. "Come up with ideas to transform the educational system" and "find ways to sustain learning" are two distinctive calls for solutions to the educational challenges posed by COVID-19. The former resonates with cultural values of instigating agentic change-making, while the latter appeals to people valuing continuity. We maintain that such differences in the framing of problems matter for crafting culturally resonant materials to motivate people to come up with ideas to tackle pressing societal problems.

Our theorization will continue to guide future designs of new surveys, and the findings will be examined against belief systems—historically derived ideas, norms, practices, and cultural products across different cultural contexts.

5.3.3 Other Potential Empirical Approaches

In parallel to the survey study, we have explored other empirical approaches. For example, how to take advantage of naturally-occurring materials designed to motivate people to solve problems? In this regard, we are considering leveraging the IDEO Open Innovation—a platform that encourages people worldwide to collaborate and build on each other's capabilities and ideas.

Our plan is to extract texts of various problem descriptions from the online archives of IDEO Open Innovation and a comparable web platform in East Asia to discover the extent to which descriptions of problems reflect culturally relevant values of creativity. For example, one current problem in IDEO Open Innovation is framed as "Agents of change: Atopic Dermatitis challenge." The purpose of the task is described in the following way: "Let's work together to increase the understanding of atopic dermatitis (AD), help break social stigma, and put a stop to the bullying faced by those with AD." We see this example as representing a problem that is framed mainly in terms of changing and breaking the status quo. We suppose that if the same task were to be framed to reflect an East Asian value, it would read: "Preserving the dignity: Atopic Dermatitis challenge." Accordingly, the purpose of the task would be described as "Let's work together to help people with atopic dermatitis (AD) to continue leading their normal lives, support public understanding of AD, and keep the sympathy towards those with AD."

The difficulty with this method is to find a counterpart of IDEO Open Innovation Platform in East Asian Contexts, such as in Japan or China. We have collected some design prompt course materials in Japan. However, the materials are limited and not ideal for text analysis. In parallel, we have been looking for appropriate social media data, website archives, and newspaper articles that are comparable to one another in East Asian and American societies.

Another source of data are the archives of popular TV shows in which entrepreneurs pitch new ideas to a panel of potential investors. Based on our initial observation about the winners of funding from the two shows, it would be fruitful to compare the popular Japanese TV show "Dragon's Den" with the American TV show "Shark Tank." We are still seeking proper analytical tools to examine this archival data.

We also plan to examine cultural variations in theories of creativity through field experiments. Online competitions, for instance, would be a good avenue to crowdsource ideas for solving real-world problems. The outbreak of the global COVID-19 pandemic has made health and well-being a central issue around the world. In this case, both participants in the USA and in East Asia would be recruited to take part in our competition to solve real-world problems related to health and well-being.

Multimodal data of body movement, speech, and text could be collected and utilized to distill different cultural signals in participant responses.

6 Conclusion

Does creativity have to be associated with changing, breaking, and seeking freedom? We argue that it does not. We take the perspective that creativity is constructed by culture. In other words, culture underpins creativity, and therefore, the processes of creative problem-solving can vary across cultures. We have conducted a systematic analysis of how historically derived ideas, norms, practices, and psychological tendencies around creative problem-solving are shaped in American and East Asian cultural contexts, using the culture cycle framework. We also share preliminary findings from a few pilot studies. For design thinking to benefit people across the globe, it is crucial to consider the role of culture. We construe *designers as culturally shaped shapers* who are motivated by ideas that are resonant with their cultural values. Ultimately, our goal is to ground theories and practices of creativity and design thinking in cultural contexts around the world, encourage an empathetic understanding of designers from all backgrounds, and discover and promote culturally resonant creative practices for solving problems.

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