

ENHANCING CREATIVITY IN CHINESE CLASSROOMS:  
MODULE AND TECHNIQUES

By

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## ABSTRACT

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The project addresses the need for a creativity curriculum in Chinese education provides a creativity development module designed to work effectively in the Chinese culture and educational environment. Drawing on an extensive cross-domain literature review of creativity research, the project concludes that individual creativity is best promoted through an interdisciplinary, self-reflective and holistic approach. Based on this research, a flexible creativity module is designed that creates a framework which can be used across disciplines to improve individual creativity in a diverse and complex environment like Chinese society.

Keywords: creativity, Chinese culture, development, curriculum design

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## CHAPTER ONE

### INTRODUCTION

“Education is not preparation for life; education is life itself”, says John Dewey, one of the educational pioneers in the United States. Follower of his teaching or not, every educator has to strive for the ultimate goal of education: to lift the human race from its savage nature of cruelty and brutality and enlighten the souls of all people for self-improvement. Creativity as one of human niches is indeed part of the pursuit of education (Kleiman, 2008; McWilliam & Dawson, 2008).

China has witnessed its economic booming when its gross domestic productivity has risen at a record-breaking rate annually for more than 10 years. However, creativity has been missing in the Chinese national education for such a large rising economy, which impedes its healthy development and potentially leads to a societal turmoil (Li & Gong, 2011; Maddison, 2006). Meanwhile, Chinese culture promotes collectivism and convergence and undervalues individualism and divergence, which inhibits the individual creativity on a system level (Hofstede, 2012). Without incorporating creativity education into the curriculum, the healthy development of Chinese society and its members would ultimately suffer.

Different definitions of creativity have been proposed throughout the history of creativity studies (Sawyer, 2012). Some proposed creativity was a gift that individuals are born with or without. Some referred to creativity as alternative of novice products or performances contingent on the social trends and fashion of the time. However, more

studies have concurred on the following definition: creativity is a trait that individuals are born with in varying degrees, and a thinking process that combines divergent thinking and convergent thinking in a delicate balance. This balance provides a mechanism through which an insight can lead to a novel and valued product.

Creativity research in the field of education is limited. Given a diverse understanding of creativity as a construct, some Educational researchers limited their efforts to finding creative individuals and educating them by developing gifted education in the United States (Cramond, Matthews-Morgan, Bandalos & Zuo, 2005; Lopez, 2000); others focused narrowly on defining or fostering creativity in limited disciplines that manifest novelty and diversity, such as art and music (Sawyer, 2012). Basic educational research on the nature and pedagogy of creativity development is rare. While there is a shortage of fruitful research in creativity development in the domain of education, other disciplines have examined creativity in ways that further the goal of developing an effective creativity curriculum (Csikszentmihalyi, 1988a, 1988b; Florida, 2002; Sternberg, 1999).

Psychologists have studied creativity development using a variety of different lenses leading to a relatively comprehensive definition of creativity: Vygotsky's Zone of Proximal Development is particularly useful as a theoretical framework for a creativity curriculum. However, other work in human development including the 4-P framework: Person, Process, Press, and Products (Rhodes, 1961), Historiometrics, personality studies and work in cognitive psychology on divergent and convergent thinking inform this

work. The domain of psychology, especially developmental psychology, offers guidance for selecting effective methods of education to promote creativity development (Birney & Sternberg, 2011).

Sociology has also yielded useful results in creativity studies. Sociologists have identified several environmental factors that influence creativity development among individuals (Simonton, 1975, 1984b). Research has shown that societies which promote individuality or embrace cultural diversity are better at nurturing individual creativity, while different ways of thinking and open-mindedness are highly valued in group creativity (Sawyer, 2003).

While the research in sociology and psychology examining the nature and facilitation of creativity is an excellent foundation, there is still a lack of educational research on programs that foster creativity development, especially in societies where there is an urgent need for higher levels of creativity such as China (Fan & Lu, 2012; Prasad & Ye, 2012; Wen, 2009). China, with its cultural norms as a society that values harmony and conformity and where pro-creativity cultural factors are historically missing is suffering from the lack of creativity in many areas of society (Kim, 2009, 2010).

This project thus tries to provide an educational module that bridges the gap between research in various domains of knowledge and Chinese educational practices. In the next chapter, the literature review provides a evaluation of the needs and constraints of the Chinese culture and educational system as it relates to creativity followed by a detailed examination of the related research in psychology, sociology and education; in

the Methods chapter, the assembly and analyses of methods for developing a creativity curriculum in the Chinese educational environment; In the Content chapter, a creativity module is proposed to be implemented into a typical Chinese classroom with effectiveness and practicality. This project presents a working model for creativity development in Chinese Education.



## CHAPTER TWO

### LITERATURE REVIEW

#### *Introduction*

This literature review examines studies on creativity across disciplines and establishes a platform for enhancing creativity through education, specifically in Chinese education. The first section examines China's need for enhancing creativity and what is being done about it, with a focus on Chinese educational policies and practices. The second section synthesizes research on creativity and applications in three disciplines: psychology, sociology and education. The last section expands the western conceptualization of creativity by introducing cross-cultural considerations in analyzing and applying the concept in a global context. Thus the literature review as a whole tries to capture the essence of creativity studies for future application.

#### *China's Need for Creativity*

As well as being one of the largest developing economies, China has become the world's second largest economy following the United States (Prasad & Ye, 2012). Based on the export-driven model of development and substantial foreign investment, Chinese economy has managed to keep its Gross Domestic Product (GDP) growth rate higher than 7% for years (Fan & Lu, 2012; Wassener, 2012). However, the export and foreign investment driven model of development has encountered challenges in sustainability and

equality (Fan & Lu, 2012; Li & Gong, 2011; Maddison, 2006). In response to those challenges, the Chinese policymakers proposed a national policy of fueling economic development in 2009 to foster indigenous innovation across the nation (Crooks, 2009; Wen, 2009). In practice, it centered on the scientific and technological development with more than a dozen megaprojects in a joint effort of central and local government, fields of knowledge, and industries (McGregor, 2010).

Such enormous efforts in securing the nation in the development of leadership turned out not to be promising (McGregor, 2010). China's research and development sector, a key factor of science and technology development, remained insignificant in its ratio to GDP compared to that of United States and Japan (Schaaper, 2009). More damagingly, China's research and development lack intensity and tend to be hypocritical, judging from the grandiose goals set without a practical implementation, as well as the surging cheating in high-profile research and development projects (Dodgson & Xue, 2009; McGregor, 2010; Schaaper, 2009). Some influential factors leading to the current weakness of China's research and development include the struggle of research institutions (especially universities) in coping with the industrial need, the lack of innovation in risk management, the unbalanced resource distribution by the top-down governance, the clash between open minded innovational projects, and the closed system for evaluating and promoting the projects, which relies more on the opinions of government officials whom in most cases are not the experts in the field (McGregor, 2010).

Education appeared to be one possible solution, providing the potential and propensity for innovation, a culture of valuing innovation and development, and the cultivation of human capital (Johnson & Chuang, 2010). However, in comparison with other innovative economies like Japan and the U.S., China lacked investment in education in preparation for a strong human capital propelling innovation (Crookes, 2009; Schaaper, 2009). More severely, China's educational shortcomings in enhancing creative problem-solving and thinking handicapped its innovation development, which led to a slower development of institutional change and sustainable industrial development, and formed a vicious circle of social deterioration (Crookes, 2009; Johnson & Chuang, 2010; Lu, 2008).

Several features of Chinese creativity education contributed to its insufficiency. Compared to other homogeneous societies that stemmed from the same mother culture, Chinese education lacked both vision and practices in enhancing creativity (Hui & Lau, 2010). Lacking academic freedom and creativity in the classroom hindered the development of Chinese innovations on both the macro and micro levels (Johnson & Chuang, 2010). Meanwhile, though endorsing creativity education, mainland China limits its efforts in tertiary physical science education with few pedagogical practices (Hui & Lau, 2010; Schaaper, 2009). Universities were kept from conducting research until very recently which limited university graduates in developing their creative potential (Lu, 2008). As a result and part of the vicious circle of deterioration, China is suffering from a severe brain drain, a loss of highly skilled and educated individuals, largely due to the limitation on multifaceted values and higher tolerance of difference (Lam, 2010). Census

data revealed more than 700,000 highly skilled Chinese-born individuals resided outside of China, about 50% of whom live in the United States (Schaaper, 2009). Such a huge loss of highly educated and ` creative individuals has a large impact on innovation development.

In summary, China's economy has been in the transition from an export and foreign investment driven economy that is low in efficiency and sustainability to an innovation development which demands a rich human capital in a sustainable system of support across industries, knowledge, and policy making. Creativity education stands out as a multi-functional solution to China's innovation development. However, creativity in Chinese education is limited and insufficient for various reasons including a lack of both macro and micro level enhancement. The following section will focus on the literature on the definition of creativity, the research on creativity in relevant disciplines, the process of the creative thinking and problem solving, and the social connotation of creativity in different cultural contexts.

### *The History of Creativity Studies*

Despite a long history of philosophical portrayal of creativity, creativity research as a scientific domain was not launched until the middle of the 20<sup>th</sup> century (Albert & Runco, 1999; Brown, 1989; Sawyer, 2012). The Post World War II world witnessed the debut of creativity science (Guilford, 1950). Limited by the cultural norms descending from humanism, the research first started in the domain of psychology and took its first approach in the field of arts (Sawyer, 2012).

Also influenced by Western philosophy, the research was often found in a pendulum sway between rationalism and romanticism that caused an unusual variation among creativity conceptions (Sawyer, 2012). In the 1990s, the emergence of cognitive neuroscience among other significant developments across the field of human knowledge brought creativity research into an interdisciplinary and application-orientated focus (Sawyer, 2012). With personality and behavior psychology collaborating with biology, neuroscience, and computer science (e.g., artificial intelligence studies, etc.), creativity research is in its prime (Boden, 1999; Mayer, 1999; Sawyer, 2012).

#### *Various Conceptualizations of Creativity*

The first challenge the modern creativity research encountered was, and continues to be, the difficulty of defining the concept (Mayer, 1999; Morris & Leung, 2010). The complexity of the nature of creativity led to an interdisciplinary and multifaceted effort of research and analysis which resulted in various conceptualizations of creativity. The following section will dissect the concept of creativity from the major approaches of research in the literature.

##### *Personality psychology: personal traits and individuality.*

Creativity research was first evaluated through the lens of psychology (Sawyer, 2012). Various forms of research have been done to better understand the personal traits of creative individuals. Some research included historiometric analyses in which life-long creators and individuals who had done significant creative work were assessed and analyzed in quantitative methodology (Simonton, 1984a, 1984b). Other researchers conducted longitudinal bibliographic studies in which exceptional individuals were

followed over years as to the development of their creativity (Getzels & Csikszentmihalyi, 1976; Howe, 1999). Finally, there came into the literature some case studies with implementation of experimental measurements of creativity (Gruber & Davis, 1988; Wallach & Kogan, 1986). Those types of research attempted to validate the independence of creativity from intelligence, as typically measured by IQ tests and to provide evidence of the existence of divergent thinking in creativity, ultimately resulting in the creation of several prominent models of creativity (Sawyer, 2012).

However, this kind of research paradigm limits its focus on individuals who are thought to have extraordinary creative potential or capability (Sawyer, 2012). Research in this paradigm often found its application to a limited population (e.g., in gifted education where a small proportion of children who are assessed to be talented) (Esquivel & Nahari, 2000); other external factors that could influence individual creativity development are often omitted in the personality psychology paradigm (Sawyer, 2004).

#### *Cognitive psychology.*

Starting in the 1970s, cognitive psychology emerged from its parent domain and gained its independence with a distinguished psychoanalytical methodology (Sawyer, 2012). Cognitive psychology studies helped bring significant models of creativity which established the platform for subsequent creativity research (Sawyer, 2012).

One of those platforms is the 4-P framework: Person, Process, Press, and Products (Rhodes, 1961). Acknowledging the significant results of previous personality psychological research on creativity, the 4-P framework went beyond the personal traits and brought cognitive thinking and communicating (i.e., Process), interaction between

individuals and the environment (i.e., Press), and tangible forms of ideas (i.e., Products) as associate factors in creativity (Rhodes, 1961). The 4-P framework was one of the earliest conceptualizations of creativity that laid a solid platform for future development in both theories and practices across disciplines (Sawyer, 2012).

For cognitive psychology researchers, the most fertile part of the paradigm came to be the Process (Mumford, 1991; Sawyer, 2012). Various hypotheses included a mental self-government (Sternberg, 1988) whereby individuals perform on different meta-cognitive levels, whom are thus subjected to different creative potentials. Or the Process was a 2-step model including ideation, forming ideas to tackle the problem out of an individual's knowledge database, and elaboration that brings possible information of use together and work out a feasible solution (Simonton, 1984a). One hypothesis also suggested the creative Process could be a mental process with two specific characteristics: explanatory, defining the problem and analyzing the nature of it, and transforming, taking the analyses one step further and transforming it into a solution (Boden, 1999).

Meanwhile, other research saw a parallel between the creative process and the problem solving process, with a specific condition that the solution to the problem is unknown to all (Getzels & Csikszentmihalyi, 1976). From this parallel, stage models of the creativity process brought creativity research to a higher level (Csikszentmihalyi, 1997; Sawyer, 2012). One stage model separates the creativity process into problem construction, information encoding, category selection, category combination and reorganization, idea generation, idea evaluation, implementation planning, and solution

monitoring (Mumford, Mobley, Reiter-Palmon, Uhlman & Doares, 1991).

Creativity employs two specific types of thinking: divergent thinking and convergent thinking (DeYoung, Flanders & Peterson, 2008; Getzels & Csikszentmihalyi, 1976; Sawyer, 2012). Creativity research on divergent thinking explored its features of breaking pre-existing schemes and associating different domains of knowledge (Gruber & Davis, 1988; Sawyer, 2012, Wallach & Kogan, 1986); research on convergent thinking addressed its key processes including improvising, devising, evaluating, and implementing (Glaxton, 2006; Maker, 1993). Based on the increasing results of research on both thinking processes, researchers gradually agreed: It was the interplay of divergent thinking and convergent thinking that made creativity a cognitive entity (Mumford et al., 1991).

#### *Divergent thinking.*

Divergent thinking showed up in the literature under various aliases. In the early stage of creativity studies, research disclosed a habit of pre-eminent creators: they tended to think around rather than of a topic or a problem in hand; their thinking process contained a certain degree of deviation which was usually higher than that of other individuals (Gruber & Davis, 1988). Researchers later found incubation, a period of conscious or unconscious idea formation, stimulated insight of problem solving and ultimately led to creativity (Csikszentmihalyi, 1997). Thus, Incubation became the focus of creativity research for its indispensable contribution to the creative process in which divergent thinking surfaced as the key factor (DeYoung et al., 2008; Sawyer, 2012).

Divergent thinking contains several features. It entails a cross-domain general



system that goes beyond the instant situation a problem or a topic is in, and breaks away from the inclination to the most accessible solution prewired in the brain (Mumford et al., 1991). These features defined divergent thinking as an unstructured, unpredictable, inaccessible, and heritable trait (Boden, 1999).

Interdisciplinary research related to creativity that focused on attempting to unravel the complex concept of divergent thinking reinforced its mythical characteristics (Dietrich & Kanso, 2010). Neurology research indicated that when people are involved in divergent thinking, their brains tend to have a defocused attention and low conscious activity; such thinking activates different parts of their brain, including the prefrontal cortex where most of cognitive functions are carried out (Dietrich & Kanso, 2010; Richard & Jung, 2008). Although contradictions and disagreements about the nature of divergent thinking exist in the literature, interdisciplinary research on creativity helped clarify the significant existence of divergent thinking.

Along with the interdisciplinary efforts in exploring divergent thinking, various sets of divergent thinking tests emerged to evaluate the complex concept (Sawyer, 2012). Torrance Tests of Creative Thinking (TTCT) stands out in the literature for its comprehensiveness and predicting ability (Clapham, 2004; Cramond et al., 2005; Kim, Cramond & Bandalos, 2006). Updated and modified through the time, TTCT set up a comprehensive measurement of individual intelligence and divergent thinking ability operated in a two factor-four sub-score system: Verbal and Figural divergent thinking abilities scored in fluency, flexibility, originality and elaboration (Kim et al., 2006; Sawyer, 2012). A 40-year longitudinal study showed a significant consistency of TTCT

scores in measuring individual creativity and its prediction of individual creative production (Cramond et al., 2005). An internal validity analysis also showed invariance of TTCT scores between gender groups and among various grade levels of student participants (Kim et al., 2006).

Such validity appealed to researchers for utilizing TTCT scores in their own research for measuring divergent thinking. A significant proportion of creativity research implemented TTCT as a main method to further explore the nature of individual creativity from various perspectives (DeYoung et al., 2008; Kim, 2009, 2010; Rudowicz, Lok, & Kitto, 1995). However, cautions for reification never died away; neither did the questions on the ability of one set of tests in measuring a construct as complicated as divergent thinking or creative thinking (Baer, 2011). The unbalanced predictive ability among subs-cores in TTCT and its lack of external validity, measured by its consistency with other valid divergent thinking test scores, also reasonably limited the tests from further application (DeYoung et al., 2008; Sawyer, 2012).

*Convergent thinking.*

Alongside the development of divergent thinking research was an emerging literature on convergent thinking's role in creativity (Blair & Mumford, 2007; DeYoung et al., 2008; Mumford et al., 1991). Closely related to the concept of intelligence, convergent thinking is the type of thinking usually occurring in response to a known or well defined problem or issue; it is a comprehensive process of utilizing individual intelligence and working memory. (DeYoung et al., 2008; Sawyer, 2012). Based on the

concept above, research on convergent thinking addressed key processes including improvising, devising, evaluating, and implementing (Glaxton, 2006; Maker, 1993).

Due to its common applicability in creative and non-creative problem-solving, convergent thinking did not appeal to many researchers interested in creativity studies. However, convergent thinking is indispensable in the creative process for its focus on a feasible product or solution (Sawyer, 2012). By processes including evaluation and implementation, convergent thinking is a process of analyzing closely related ideas and solutions to a problem, choosing the best one, and then using it to solve the issue.

Although both convergent and divergent thinking are involved in the process of creative thinking, they are also potentially in conflict with one another (Blair & Mumford, 2007). People prefer ideas that are safe and consistent with social norms; only under time pressure that leads to disruption of the evaluation process, part of convergent thinking, do people prefer original and risky ideas which are usually highly ranked in divergent thinking (Blair & Mumford, 2007). Creativity encompasses both divergent thinking and convergent thinking in a delicate balance, and other modifiers out of the Process help define creativity in an operational sense (Sawyer, 2012).

#### *Insight.*

Cognitive psychology research on creativity generally acknowledged the necessity of insight in the process of creative thinking (Sawyer, 2012). However, few conclusive results exist on this momentary activity in the human brain (Glaxton, 2006). Among many indications on insight made in creativity research, one with a larger agreement was that insight was relevant to the individual knowledge base: the insight

must be made utilizing a broad range of subjects that ultimately contribute to insightful problem solving (DeYoung et al., 2008; Sawyer, 2012).

In conclusion, psychologists see creativity either a heritable or cultivating trait blended in a certain personality, or a hybrid mental process of convergent thinking and divergent thinking switched back and forth by insight. Although there has been no consensus on the concept of creativity across the sub-disciplines of psychology, a general agreement of its complexity and comprehension was reached within the field. However, other facets of creativity omitted by psychology aroused in other fields, which led to more approaches to analyze this complicated concept.

#### *A Socio-cultural Perspective*

Creativity is considered an individual property from the psychological perspective, while in reality creativity occurred under certain socio-cultural circumstances. The socio-cultural environment fostering or inhibiting creative performances are thus under discussion in the following section.

#### *A systems model of creativity.*

An indispensable part of the process models of creativity is the application of creative ideas in the real world, whether it is Press in the 4-P model, implementation planning and solution monitoring, or elaboration in contrast with ideation (Mumford et al., 1991; Rhode, 1961; Simonton, 1984a). Thus, the sociocultural approach to creativity studies emerged in the literature as researchers argued creativity was not just a mental process (Csikzentmihalyi, 1999).

Among all creativity research from the sociocultural perspective, one model of conceptualizing creativity surfaced to lead the field known as the Systems (Sawyer, 2012). It defines creativity as a social phenomenon that rises from the interaction of three systems: Person, the creative individuals; Domain, cultures of different domains of knowledge; and Field, the societies in which creative products are put into use (Csikszentmihalyi, 1988a, 1999). Research from the Systems perspective elaborated on the sociological characteristics of creativity by analyzing the historical contexts of pre-eminent creators who made significant breakthroughs in various domains, and the ways in which specific cultures of domains, social values, and conventions directed and shaped the course of creativity demonstrated in their individual works (Sawyer, 2012).

Historical research on influential creators also endorsed the significance of Domain and Field in creativity (Csikszentmihalyi, 1997; Simonton, 1975, 1984b): Outstanding creativity in certain domains tended to occur in specific historical contexts, for example, international or domestic wars, in which societies were short of specific kinds of talents to keep functioning; the socio-cultural factors that have an influence on individual creativity development include domestic or international political instability and role model availability (Simonton, 1975, 1984b).

*Domain and Field in developing creativity.*

Acknowledging the importance of Domain and Field in the Systems perspective of creativity, researchers explored how Domain or Field could promote or discourage creativity by interfering with Person (Csikszentmihalyi, 1997; Sawyer, 2012; Villalba, 2010). In the socio-cultural model of creativity, Domain and Field often times curb the

momentum that drives the Person system in a certain direction in the creation process.

Creative ideas that are highly evaluated by the Domain and Field might not have the same significance in personal creativity; Domain and Field prefer creative ideas that are intermediately original but highly feasible and/or beneficial (Blair & Mumford, 2007).

Based on the disagreement among Field, Domain, and Person on the evaluation of creative ideas and products, two different streams of research developed (Blair & Mumford, 2007; Cooper, 2012; DeYoung et al., 2008; Getzels & Csikszentmihalyi, 1976; Schmidt, 2011). On one hand, some researchers took the evaluation of Domain and Field as the ultimate criteria for creativity, and they further developed creativity assessment measurements including Consensual Assessment Technologies (Sawyer, 2012). Those creativity assessments evaluate the creativity of ideas and products based on the rankings given by a panel, constituted of well-established members in the Domain and relevant practitioners in the Field (Getzels & Csikszentmihalyi, 1976). Consensual Assessment Technologies and their modifications produced the most reliable evaluation of creativity ideas and products which were largely used in creativity research (Blair & Mumford, 2007; DeYoung et al., 2008). On the other hand, researchers also analyzed the characteristics of the creativity promoting Domain and Field, one among which had won the widest agreement: a relatively high tolerance of variety and difference (Cooper, 2012; Csikszentmihalyi, 1997; Schmidt, 2011; Villalba, 2010).

#### *Group creativity.*

The sociological perspective of creativity studies indicates that creativity is not only an individual property, but it has characteristics of socio-cultural variables. One of

the variables is inter-subjectivity: multiple individuals contribute to the process and products of creativity simultaneously (Sawyer, 2003, 2012). Therefore, because it is characterized by collaboration, the concept of group creativity emerged in the literature of creativity studies (Sawyer, 2003).

Group creativity research indicated that there are three processes in a group creativity development: improvisation, emergence, and interaction (Sawyer, 2003). While improvisation is the process in which individuals in the group conduct their own analyses of the problem or issue, emergence occurs when an insight comes to one or more of the group, and interaction occurs when all members of a creative group share the insight simultaneously (Glaveanu, 2011; Sawyer, 2003).

The significance of the socio-cultural concept of group activity was to offer a parallel and yet distinctive process model of creativity from a sociological perspective. Different from the Systems model operated in an environment centered around the individual, the socio-cultural model of group activity emphasized its collaborative feature, as well as its unpredictability and thus dynamic productivity (Glaveanu, 2011). The research results and conclusions of group activity, for its intersubjective nature and high applicability in the real life, have had influential implications for further research and practices in various Domains and Fields (Sawyer, 2012).

In summary, conceptualization of creativity as the first step of creativity studies has not proven to be easy. With more and more approaches taken in interpreting and analyzing this complicated concept, there is more work to do in order to incorporate many of those truthful and significant conceptualizations into an operational full-

dimensional definition, so that applications of creativity development would directly benefit from the creativity research. The next section focuses on one of the most fruitful field in creativity development: education.

### *Creativity and Education*

The various conceptualizations of creativity laid a foundation for further application in various fields, and education was one of the earliest to undertake this potentially challenging task. The value of creativity towards human development as well as social revolution inspired a significant amount of research in fostering creativity through education. The following section presents the literature of creativity in the field of education in both theoretical development and practical application.

#### *Gifted education.*

The application of creativity development in the field of education initially and principally exists in gifted education (Sawyer, 2012). Defining creativity as a personal trait of talented individuals, gifted education seeks to fully understand the creative psychology and develop an effective means of nurturing creative individuals in response (Esquivel & Nahari, 2000; White, 2010). Students are eligible for gifted education programs in the United States based on their IQ scores at an early age, and some of the programs distinguish talented children according to their specific potential as assessed by such widely used creativity tests like Torrance Tests of Creative Thinking (Cramond et al., 2005; Grinder, 1985; Wallach, 1985).

Although gifted education is an integral part of creativity studies in education, the methods for developing creativity in public education remain limited (Fox & Washington,



1985; Wallace, 1985). Gifted education's aim is to identify individuals of extraordinary talents at an early age and fully develop their potential for self-enrichment or social contribution (Fox & Washington, 1985). The assumption is that that creativity manifests itself at a certain age of individuals' lives (Fox & Washington, 1985). Therefore, gifted educational programs often implement paradigms and methods from personal psychology to nurture talented children, while creativity development is not a part of adult or vocational education programs or is viewed merely as a pleasant byproduct of gifted education itself (Lopez, 2000; Wallace, 1985).

*Compatibility of institutional education and creativity.*

While gifted education's efforts in nurturing creativity is questioned for its effectiveness, compatibility of the institutional education in modern societies and creativity development is also under review (Craft, 2003). Institutional education is first and foremost a social institution that assimilates people with different backgrounds into an overarching culture with the common norms and conventions, no matter how diverse or homogeneous the social culture is (Brint, 2006; Lewis, 1986). Creativity in its transitional and dynamic nature is not necessarily in line with the convergent and disciplinary practices of institutional education (Crème, 2003).

Besides the regulative characteristic of institutional education, it also bridges the demands of other social sectors for human capital and the self-enlightenment of individual learners (Crème, 2003; Hammershøj, 2009; Villalba, 2010). Creativity development in educational practice thus lacks accountability for achievement (Burnard & White, 2008; Craft & Jeffrey, 2008).

*Creativity enhancement in education.*

Despite the increasing emphasis of creativity in educational theories, the practices of enhancing creativity in either curriculum design or activity reform are quite rare and sporadic (Feldman & Benjamin, 2006; McWilliam & Dawson, 2008; Villalba, 2010). The existing practices that focus on improving creativity in education have the similar characteristics in that they are limited in application, single-dimensional, ambiguous (Burnard & White, 2008; Clouder, Oliver & Tait, 2008; Glaxton, 2006).

Many curriculum designs involving creativity enhancement are subject or grade level specific case studies that are limited in application (Clouder et al., 2008; Barry & Kanematsu, 2008; Dawson, Tan & McWilliam, 2011; Ferch, John, Reyes & Ramsey, 2006). Pedagogical renovations of creativity education tend to address on one facet of the complicated process of individual creativity, e.g. on incubation for novelty or on breaking from the frame for divergent thinking (Glaxton, 2006; Hackbert, 2010). Those methods omit the multi-dimensional interaction among different factors in the creative process, and thus fail to reach any systematic achievement (McWilliam & Dawson, 2008). Finally, some curricula and activities which are well supported by creativity theories, leave both practitioners and learners cautious and ambivalent towards taking upon those new approaches (Burnard & White, 2008; Clouder et al., 2008; Seo, Lee & Kim, 2005; Simmons & Thompson, 2008).

*Creativity and Cross-cultural Consideration*

No matter in which paradigm creativity development is situated, culture consistently plays a significant part in fostering or diminishing it. Different societies, due

to their specific cultural values and conventions, have demonstrated unique features of creativity development. The following section will analyze some of the cultural specifics that influence creativity development, and further unravel the unique environment of modern Chinese societies and their practices of developing creativity.

*Cultural influence on creative personality.*

A proportion of creativity literature tried to define the creative personality, following the personality psychology doctrine of creativity as an individual property (Eysenck, 1995; Sawyer, 2004). Some personal traits are identified as contributive to the creativity process and product: individuality, moderate risk-taking, excitement at challenges, and enjoyment of novelty (Csikszentmihalyi, 1994; Dollinger, 2006; Maker, 1993; Sternberg, 1988). In this paradigm, cultural influence on developing individual creativity is inevitable: social cultures, on different levels and from different perspectives, cultivate and promote some personalities over others (Braden, 1995).

One of the cultural dialectics relevant to creative personality is the dialectic of individualism versus collectivism (Hofstede, 2012; Mok & Morris, 2010). Cultures that embrace more collectivism than individualism tend to consider transgressing from norms a shameful behavior and emphasize the group endorsement for an individual action (Hofstede, 2012). In the contemporary world, most Asian cultures including Chinese culture are more collectivist than individualist compared to their Western counterparts like the United States culture, and that leads to a deficit of Asians and others cultivated mainly in Asian cultures in the creativity process (Mok & Morris, 2010).

*Cultural influence on creative process.*

Besides shaping the members' personality development, societal culture is also correlated to creativity in influencing several processes of creativity in both cognitive and sociological paradigms (Morris & Leung, 2010; Sawyer, 2012). Cultural norms and conventions influence the cognitive process of creativity on promoting, tolerating or prohibiting diverging from the traditional or first-emerging idea, and developing a novel idea without a hierarchical approval or group endorsement (Morris & Leung, 2010).

In evaluating creative products, the societal culture gains an even bigger influence (Seo et al., 2005). In a cross-cultural contrast, eastern and central European cultures as well as Japanese culture rank higher on the dialectic of uncertainty avoidance, the societal tolerance of ambiguity, than most English speaking countries and Chinese cultures (Hofstede, 2012). This result indicates a large tolerance of creative products being accessed and evaluated in practices, leading a higher chance of survival in those low uncertainty avoidance societal cultures (Florida, 2002). Meanwhile, different cultures might value different characteristics of the creative products in the same field, which also makes culture an inseparable part of creativity development (Hammershøj, 2009; Hong & Kang, 2010; Lubart, 1999; Morris & Leung, 2010).

One particular cross-cultural comparative analysis in creativity research is on Confucius philosophy's influence in most eastern Asian cultures, mainly Chinese and Korean cultures (Kim, 2009). Several principles in Confucianism, including hierarchical order and regulation, family loyalty and orientation, and minimization of verbal interaction, have in practice prohibited creativity development by obstructing idea

collaboration and transformation, as well as slowing down the acceptance of the creative product in the field (Mok & Morris, 2010).

*Cross-cultural creativity.*

As modern societies develop their multicultural characteristics, cross-cultural creativity also becomes more and more appealing to researchers who acknowledge the significance of culture in creativity development (Reyes-Carrasquillo, 2000). Cross-cultural creativity emerges in the field for its high fertility and social adequacy (IP, Chen, & Qiu, 2006; Mok & Morris, 2010). Several interesting implications in cross-cultural creativity are worth noting. Multilingual/multicultural individuals tend to perform more creative behaviors than their monolingual peers, possibly because their multilingual and multicultural background fosters a higher degree of tolerance and flexibility towards ambiguity and novelty (Furlong, 2009; Li, 2011). Cross-cultural transformation on a frequent base triggers more room for divergent thinking, as well as application of creative ideas (Furlong, 2009; Li, 2011).

The literature on creativity shows a great dispute over how this complex concept was approached to in various disciplines from psychology, sociology to education. A large quantity of research indicated creativity was both a cognitive process carried out by individuals of specific personality or thinking habits, and a socio-cultural process inspired and shaped by the specific environment it occurred. Education among all fields emphasizing promoting creativity had certain incentive techniques in practices, yet a systematic and productive pedagogy of creativity as well as its application is yet to be proposed.

## CHAPTER THREE

### METHODOLOGY

#### *Introduction*

The literature splits on whether creativity is a cognitive outburst of convergent and divergent thoughts , or a social product fostered by interpersonal interaction and incremental thinking. Both individual cognitive and social performances of creativity demonstrate the developmental nature of creativity. The multifaceted concept of creativity is thus responsive to a variety of instructional approaches . Using developmental and cognitive psychology as the two fundamental theoretical platforms, this project identifies basic principles of cognitive and social creativity development in order to produce a pedagogical design that facilitates the development of creativity in the context of Chinese education.

#### *Systems developmental psychology*

Modern research on the concept of creativity began with the exploration of the psychological attributes of creative individuals who demonstrated extraordinary abilities to “think outside of the box” (Guilford, 1950). Building on this early work in psychology which revealed the characteristics of creative individuals, the field expanded beyond individual traits. Developmental psychology made groundbreaking contributions in

affirming the role of environment in either activating or inhibiting latent creativity (Bronfenbrenner, 1979; Sternberg, 1999; Vygotsky, 1978).

Based on, but diverged from, Piaget's classic theory of human development, Lev Vygotsky's social development theories emphasized the critical significance of the environment individuals interact with (Vygotsky, 1978). *Zone of Proximal Development*, one of Vygotsky's most influential developmental mechanisms, refers to the existence of a gap between the current state of an individual's understanding/skills and the potential cognitive performance the individual is capable of. The Zone of Proximal Development theory offers a comprehensible and operational platform for the pedagogical adaptation of social development theories (Gredler & Shields, 2008). Built upon the theoretical foundation above, developmental psychology diverged from the classic reductionist approach of psychology studies and gained its academic independence by fostering the positive development of individuals and its application orientation (Lerner, Lewin-Bizan & Warren, 2011). The major principles of developmental psychology encompass the key criteria for nurturing creativity, including the plasticity of cognition and the integration of multiple levels of social organization. Plasticity refers to the ability of individuals to change throughout their lifespan. Cognitive plasticity means that human cognition is able to change given efforts, and that old thinking habits can be rewritten with new ones when given enough practices. Integration of multiple levels of organization refers to the status of organizations in human life (some examples could be parenting, family life, and social

justice functions) collectively influencing the individual development by interacting with the individual and with each other in various ways.

Among all schools of developmental psychology that share the general principles such as plasticity and integration, especially in consideration of the Chinese social context, Bronfenbrenner's bioecological systems of human development might be the most illustrative and applicable one to the practices of creativity curriculum design (Bronfenbrenner, 1975): An individual's bioecological systems include the inner social circle. Those systems can include intimate relationships, loosely tied acquaintances, coworkers and the institutions that play a big part in an individual's development, (e.g., parents' working conditions, school environment and neighborhood). In addition to an individual's circle of contacts, macrosystems also affect the individual's development. These macro influences can be deeply embedded through generational transformation of mainstream culture, activation of a significant national policy, or even historically honored events and traditions (Birney & Sternberg, 2011). Along with the maturation of the individual internally, the developmental environment operates through the tunnel of time, shaping the individual's development collectively.

According to the bioecological theory, people's environment and therefore their Zone of Proximal Development differs. This, combined with the unique nature of individual biological foundation results in the unique development of each individual. (Birney & Sternberg, 2011). Therefore an effective creativity curriculum has to be built with the following characteristics. First and foremost is the flexibility to adjust to the needs of



individuals and situations. The second is taking a holistic approach in teaching methods reflecting the broad ecosystem of human development to avoid the effect of tackling a few factors that inhibit creativity while having the effects of that effort washed if the integration of other factors interfere. The third is taking an interdisciplinary teaching approach to content. According to creativity research, the interdisciplinary approach is necessary to creative thinking for the following reasons. First, cross-domain knowledge relevant to the problem/topic on variable levels might help cultivate the insight that is critical in the process of creative thinking (Sawyer, 2012). Second, creative performances often times emerge when the individual breaks the disciplinary boundary of knowledge domain and tackles an insight problem with a multidisciplinary knowledge base (Simonton, 1984b). Third, an interdisciplinary approach of problem solving and an interdisciplinary knowledge base also improve the individual's divergent thinking, which is critical for creativity development (Gruber & Davis, 1988; Wallach & Kogan, 1986). Instead of being subject-bound, an environment that incorporates many areas and perspectives of life provides greater flexibility in problem solving and allows an individual to build on their idiosyncratic base of knowledge and understanding while contributing to the community's collective efforts. This is where creativity is bred.

In summary, the implications of bioecological theory for designing a creativity curriculum are as follows

- The curriculum should be adjustable to the specific developmental status of the students it serves, especially catering to the specific zone of proximal development they have.

- The curriculum has to take on holistic methods of teaching connected to students' environments for the bioecological systems to amplify the teaching effects.
- In order to fully use the advantage of a theory such as individual bioecological systems, the curriculum has to take on an interdisciplinary approach to content.

Another implication specifically related to the bioecological theories of human development is the need to foster an intrinsic motivation of thinking and problem-solving with extrinsic inspiration that is cognitively comprehensible. Research in cognitive development has indicated similarities between the cognitive process of creative thinking and that of effective problem-solving (Birney & Sternberg, 2011). In accordance with this understanding, a successful curriculum of creativity development has to create an environment where cognitive abilities of individuals would be activated rather than inhibited, which leads to another component of the methodology: cognitive psychology.

#### *Cognitive psychology*

With breakthroughs in the domain of cognitive psychology, our understanding of creativity development has improved (Barry & Kanematsu, 2008; Dawson, Tan & McWilliam, 2011; Ferch, John, Reyes & Ramsey, 2006). Historiometric and longitudinal research on creative individuals clearly illustrates the influence cognitive advancement has on individual creativity regardless of age and education level (Simonton, 1984a,

1984b; Wallach & Kogan, 1986). The current state of cognitive psychology research provides an effective platform for creativity development through education. Specifically, theories related to detailed processes for cognitive coordination in information perception, analysis, and internalization (Birney & Sternberg, 2011) are helpful. Among the cognitive abilities relevant to creativity development, meta-cognitive ability, the ability to analyze one's own or others' thinking processes, has been recognized as a fundamental skill (Sternberg, 1988). Many researchers have attempted to improve meta-cognitive abilities using various approaches, among which deliberate curricular and pedagogical approaches that require retrospective thinking is among the best supported (Sawyer, 2012). Several longitudinal research studies showed the practice of retrospective thinking, which refers to thinking about and evaluating one's own thinking, brought developmental advantages (Birney & Sternberg, 2011; Ip et al., 2006; Simonton, 1984a). These research results support the feasibility of developing meta-cognitive abilities through practicing retrospective thinking, and indicate the necessity of self reflection practices in a creativity development curriculum.

Besides emphasizing the retrospective thinking practices, the literature suggests that it is also critical to achieve a balanced performance of convergent and divergent thinking. While the creativity literature attributes creative thinking to a delicate balance of convergent thinking (the funnel approach to thinking), and divergent thinking (the lateral approach to thinking). Divergent thinking is a particularly important skill in creativity (Sawyer, 2012). Unfortunately, theories of divergent thinking in cognitive

psychology have yet to fully unravel its multifaceted nature or demonstrate mechanisms that help develop it, and that has left the literature on educational practices for divergent thinking local, anecdotal and sporadic (Feldman & Benjamin, 2006; McWilliam & Dawson, 2008; Villalba, 2010). However, given the available research, educators advocate a cross-domain base of knowledge, and the use of interdisciplinary and /or cross-cultural information perception and reorganization process(Sawyer, 2012).

Cognitive psychology research provides guidance for an effective creativity development curriculum: the curriculum should promote retrospective and divergent thinking of students by maintaining a structure that is flexible and reflective in nature and also fosters interdisciplinary and cross- domain knowledge acquisition and integration.

Many educational curricula that claim to promote creative thinking, including Edward de Bono's *Six Thinking Hats* (1985), set up instructions that each address a single defined thinking process (e.g., metacognition). This artificial compartmentalization reduces the whole brain coordination that is essential in creative thinking (DeYoung et al., 2008; Sawyer, 2012). The holistic approach discussed earlier along with the clear need for an interdisciplinary base from which to develop divergent thinking are often missing in single subject teaching (see Barry & Kanematsu, 2008) and learning activities often seen in subjects such as science (see Ferch et al., 2006). Those curricula and programs are accordingly fail to promote longer term habits of mind (CITE) because they fail to promote the cognitive development embedded in creativity development, which requires a pro-reflective, divergent and interdisciplinary structure and content.

In summary, the implications of cognitive psychology for a creativity development curriculum are:

- To foster the development of meta-cognitive ability critical for creativity, the curriculum has to include self-reflective practices as much as possible. A habit of thinking retrospectively should be emphasized throughout the curriculum
- To promote not only convergent but also divergent thinking among students, the curriculum has to take a generic structure that is flexible and responsive to the students' authentic thinking. The facilitation of teachers and professors should be flexible enough not to ruin the authenticity of student-orientated divergent thinking.
- To enable students in thinking divergently, the curriculum must include an interdisciplinary knowledge base and promote abundant information resources when they are needed.

Given the criteria above, a creativity development curriculum would ideally seek an open environment open to freedom of thought and change. The challenges of implementing such a curriculum in a largely collective culture such as the Chinese culture are thus inevitable. The strong cultural preference of harmony at the expense of unconventional thinking and inconvenient truths in current Chinese society imposes a great challenge for Chinese education to break through and embrace the necessity of creativity. Given cultural norms in many parts of China teaching creativity may initially engender some resistance from students, parents and educational practitioners. Adjusting

the blueprint of a creativity development curriculum to the social/cultural environment of Chinese education is what is addressed next.

### *Chinese education*

When it comes to applying the principles of creativity in the design of curricula for Chinese education, an understanding of the current conditions is needed to successfully guide the proposals through such a distinct culture and system. Some “Chinese characteristics” hold a significant stake in the fate of a large reformist curriculum design required by the need for creativity development. The following are characteristics that might create challenges for designing a creativity development curriculum for Chinese education.

Chinese culture is by and large collectivist, even currently in the economic and social transformation: the cultural conventions remain largely pro-conformity and anti-divergence (Hofstede, 2012). The field of education is no exception in endorsing the mainstream values, which reflects on every aspect of the field from policy making to evaluating learning outcomes (Hui & Lau, 2010; Johnson & Chuang, 2010; Schaaper, 2009). In this particular environment, any proposal of reform or significant adjustment would be met with suspicion and caution.

China stands for a geographically and economically diverse nation where centralized governance is written into the constitution (Hui & Liu, 2010; Li & Gong, 2011). This creates a tension between national standards and local priorities. Creativity education therefore faces the dilemma of adjusting to a standardized environment of

institutional education while striving for localization and diversity (Lerner et al., 2011; “The 9th 5-year plan”, 2009; Wang, 2011). This conflict manifests especially in primary and secondary education where curricula, textbooks and assessments are designed or chosen by relevant bureaus according to provincial (equivalent to state-wise) if not national standards (*The compulsory education law of the People’s Republic of China* “中华人民共和国义务教育法”, 2006). This particular characteristic of Chinese education has left creativity education limited room for development. As a result most of the efforts to develop and use curricula designed to improve creativity occurs in the higher education or in the small number private schools (Wang, 2011).

The standardized assessments in Chinese education present an additional barrier to introducing new goals such as creativity. These assessments are high stakes for the students and teachers, which leads to rigidity in teaching throughout elementary and secondary education. The summative assessments in Chinese education include several high-stake assessments with profound effects on the opportunities students have and ultimately lead to a process of social stratification (Woronov, 2008). The inequity of comparing students from all different areas of China using common assessments has disempowered students, especially students of low socioeconomic status, in self-improvement through education, and further lessened the intrinsic motivation of active learning. While the importance of developing higher levels of creativity is acknowledged in the national educational objectives, there is a lack of any creativity assessment in high-stake exams (Hui & Lau, 2011, “The 9th 5-year plan”, 2009). As in

the United States educational practitioners are held accountable for their student's performance on the high stakes tests and this has inhibited their efforts to create a learning environment that promotes creativity development (Dollinger, 2006; Gibson, 2005; Kim, 2009).

The cultural norms of convergent thinking that define current educational practices, the standardized and centralized curricula for the majority of educational institutions, and the inflexibility of teaching driven by high-stake tests all present challenges for successfully introducing new curricular priorities and methods. Based on the Chinese educational environment, the following should guide the creativity curriculum design for the greatest opportunity to succeed:

- Considering the limited flexibility of the public education system under the rigid regulation of curriculum and assessment, systematically changing the centralized policies of educational practices that could result in significant social criticism due to the conventional values increases the risk of bureaucratic suffocation. Therefore, it is more promising to start the reform from the bottom up, which despite the rigidity of standardized curriculum and assessment is subject to less bureaucratic regulation and social judgment. In areas of China where local customs are less rigidly conformist and more entrepreneurial, it may be possible to find opportunities to institutionalize creativity curricula. Faculty members as well as individual school boards will have to find the room for creativity development according to their own



environment, despite the national laws and regulations which tend to create inequality instead of equity in education due to China's complicated political geography.

- Given the constraints of the Chinese Education system, possibly the most effective approach will be to integrate creativity education in ways that support core subjects.

## CHAPTER FOUR

### CONTENT

Based on the requirements for developing a creativity curriculum in the context of Chinese education, an adjustable module that fits the distinct classroom culture is more practical than any system-level reforms that would challenge current orthodoxy. According to the research presented above, an interdisciplinary hybrid curriculum module aimed at developing individual creativity within Chinese educational environment should be possible.

Given my analysis of best practices (see literature review) the curriculum modules should contain the following three phases described more fully in the next sections:

- pre-class : define and organize the teaching objectives and map out a problem-solving cluster
- in-class : facilitate a student-orientated, problem-solving project based on the defined cluster;
- post-class: Foster ongoing work on the project and reinforce the active learning

#### *Pre-class phase*

The purpose of this phase is to organize the knowledge needed for thinking in a creativity-provoking way and set up an operational project prompter that inspires creativity among students. The key is to keep an interdisciplinary approach throughout

the section. As described earlier, interdisciplinarity is particularly effective in cultivating the insight that is critical in the process of creative thinking (Sawyer, 2012); tackling problems through cross-disciplinary insights that can be applied in novel ways with a multidisciplinary knowledge base (Simonton, 1984b); and improve the individual's ability to engage in divergent thinking (Gruber & Davis, 1988; Wallach & Kogan, 1986). Besides promoting an interdisciplinary approach, the pre-class section of the proposed curriculum also needs to connect to the lives of students in order to motivate students to engage in active learning. These connections are especially important since the Chinese educational environment tends to inhibit students' intrinsic motivation of learning by its rigidity and inequity. Intrinsic motivation of students is an important condition for the success of a non-conventional curriculum (like the creativity development curriculum) in the change-avoiding culture of Chinese society (Kim, 2009).

To achieve the goals of being interdisciplinary and relevant to the individual's life, teachers or professors that have specialties in different domains of knowledge should ideally get together and develop a cross-subject teaching plan. Here is a practical guideline for the plan development:

- assemble the current syllabi of different subjects for the same group of students on the same grade level
- reiterate the teaching objectives and refine them to the most generic form
- discuss the logical relationships between those objectives until consensus is reached

- Based on the teaching objectives of all subjects and the logical connections discussed and agreed upon, consider knowledge that deviates from the generic objectives; organize a cluster of it in the same logical order as the objectives as a visual reminder for further steps.
- Develop a problem-solving task that is localized and appropriate for the cognitive abilities of the students in question. For example, it can be a hot issue of local development, a student affairs policy in the school, a social event among the students, etc
- Each teacher/professor takes the group plan and the task into their own classroom, modifies it to generate more depth in the specific subject, but still keeps it open and flexible

With the knowledge cluster that integrates the cross-domain information, teachers with different specialties could work as a team to create a pro-divergent thinking environment, while conforming to the rigid educational system of subject separation and teaching specification.

#### *In-class section*

The in-class section of the module requires flexibility. A teacher or professor first and foremost needs to ignite the students' intrinsic motivation to participate in the active thinking that creativity is triggered by. The steps to motivate the students may vary greatly due to different developmental status of the students, local resources, the particular subjects, the classroom setting, etc (Birney & Sternberg, 2011; Sawyer, 2012).

A sample plan for an in-class section of the present module in a typical Chinese classroom is offered in the appendix.

After the initial introduction of the open ended problem-solving project, the teacher/ professor has to work as a facilitator, withholding the knowledge they have or prepared themselves in the pre-class section to maintain the authenticity of thinking process. However, they should present themselves as a resource available for all the students, and may encourage students to make full use of the resources available inside and outside of the classroom. The end product should be open and free to vary from the teacher's ideas or solutions.

Teachers should carefully observe the students' personalities and interactive behaviors, and assign pro-creativity groups that represent the diversity of those traits among students. According to group creativity studies, a group with diverse perspectives and interacting approaches can help individuals, become more sophisticated in their own thinking in ways that nurture their own creativity, as well as fostering a creativity product as a group (Glăveanu, 2011; Sawyer, 2003).

Before the end of the in-class section, students keep track of their work process and their thinking process individually. This can be done in a variety of ways including keeping a journal of work progress, operating a blog with video clips of each class session, writing self-reflective reports along with the records of the project progress, etc. The records students generate each class session are a stepping stone for the continuity of

creativity practices. They serve as a prompt for metacognitive processes and provide a form of assessment in the future.

*Post-class section*

Post-class section has an emphasis on reflecting and reinforcing the creative thinking practices during the in-class section. Teachers help students solidify their report on the project process. One approach might be to compile the students' reports from the previous class session, summarize them and give feedback. To further motivate their retrospective thinking, it is better to present the feedback as open questions or constructive suggestions rather than evaluative comments. The point is to make the feedback as interactive as possible, and teachers thus have to speak in a peer tone and take the role of a consultant to the project.

Another way to reinforce the students' problem solving skill is to create the chance for the students to take their efforts beyond the class. In terms of both intrinsic motivation and valued contributions, using class projects to the betterment of the community will strengthen student engagement. This requires an active search for local needs that connect with the projects. For example, a project undertaken in the high school physics class could bring their project explaining earthquakes and safety into use with local schools.

In summary, this module is aimed at improving the individual creativity of students through classroom instruction in Chinese education. The cluster of knowledge approach offers a platform, for collaborative cross-subject teaching. Maintaining an open

ended cross disciplinary approach should facilitate in-class discussions, self reflection on individual's creative processes and result in useful work generated by the students.

### *Assessment*

The products students produce will be one source for their creativity assessment. The students' level of self-reflection and awareness as well as an evaluation of process through journals, presentations, etc. It provides a process assessment that can be used to improve both individual performance and the teacher's approach to creativity invoking activities. Due to the unique features of creative thinking and performances including but not limited to the authenticity and unpredictability of the process, the large variety of presentations, and the divergent approaches to the thinking process, it is inevitable to assess the students' creativity in a performance-based form. The literature of creativity studies solidly endorses the use of peer panel evaluations for the products. These panels are an assembly of experienced individuals with expertise relevant to the theme of the product (Getzels & Csikszentmihalyi , 1976; Sawyer, 2012). Following this approach, an assessment for the creativity of students throughout the grade level would have to be inclusive and flexible as much as reliable.

For primary students, due to their stage of cognitive development, most of their creativity projects will reflect their scope of information and depth of thinking with a limited level of sophistication and flawed demonstration (Birney & Sternberg, 2011). At the early grade levels, it is adequate to form the panel among teachers who have relevant academic experiences related to the product. The panels do not have to be formed by

academics, individuals and organizations from the community such as, parents association, staff members, and community organizations will all appreciate commitment and creativity of the students.

Although the logistics of the panel assessments might present challenges, technology can also be used to create a virtual assessment system that reaches out to the participating experts while keeping the costs as low as possible.

Currently, many programs are available at a minimal cost for basic internet service, which opens the door for schools and students in underdeveloped districts to use this type of assessment. Accessible programs and websites in the mainland China are listed in the appendix.

While it requires certain organization and coordination to put on the performance-based evaluation panel assessments for primary and secondary school students, it tends to be logistically simpler to operate a panel/performance-based assessment for the products of university students. Most of the universities in China ensure an unlimited internet service covering different sections of the campuses, which eliminates the costs of a panel assessment similar to the one for primary and secondary schools. Meanwhile, the very fact that Chinese students tend to build a more interactive relationship due to the behaviorist norms of collectivism make the peer evaluation locally feasible. College students are expected to reach a certain level of abstract thinking which will provide a richer opportunity to develop creativity and will result in more sophisticated products (Birney & Sternberg, 2011; Hofstede, 2012).



## CHAPTER FIVE

### CONCLUSION

Creativity development has been an important topic in business, economics, science, technology, arts and humanities. However, Chinese education as the principle public mechanism for improving human beings and freeing individual potential has not established a practice to nurture creativity. The present project offers an initial curricular module that addresses the need for a creativity development curriculum.

As identified in the literature on creativity in education, sociology and psychology, interdisciplinarity, self-reflection and holistic perspectives are critical elements of the creativity module this project has proposed. Interdisciplinarity provides the foundation for divergent thinking, reflection offers a cognitive process for convergent and self-corrective thinking and a holistic perspective integrates element and provides iterative processing to bring the divergent and convergent thinking to a successful conclusion.

The structure of the proposed module uses these foundational elements by providing key steps in developing an interdisciplinary, holistic and self-reflective teaching and learning environment in a typical Chinese classroom. With the pre-class section, education practitioners are able to collaborate in an interdisciplinary manner which brings out a set of knowledge that students they work together for can refer to when inspired to design a life-relevant project from scratch; The in-class section

promotes a flexible and self-reflective environment where students with genuine interest in their projects can bounce off ideas with each other and/ or the instructor, meanwhile keep practicing self-reflective thinking about their own thinking process; the post-class section emphasizes on continuing practices of the thinking skills by requiring the students to keep track of the project, their own thinking process and feedbacks from each other; the assessments for the module focus on the implementation and practicality evaluation of the student projects from the real life parties of interest in the community, with the aim of attaining feedback for the further development of the creative projects.

By designing a flexible framework based on current understanding of the psychology of creativity and the social framework for its development, this project provides the tools for Chinese teachers to design and implement a creativity curriculum within the confines of the national curriculum and testing regiment.

Limitations of the module include the lack of assessments to evaluate the development of individual creativity, the heavy reliance on the individual and group dedication of educational practitioners for its successful implementation, and the need for significant collaboration among schools, local communities, students and parents. These limitations also open the door for further research in creativity curriculum design and implementation.

APPENDIX

CREATIVITY MODULE IMPLEMENTATION IN A 12-GRADE PHYSICS CLASS IN  
CHINA

This is a sample plan for a 12-grade physics class in a typical public school in Jiangsu Province, China, of which the economy to China is proportional to California to the United States (Center for Continuing Study of California Economy, 2012; Zhang, 2012). The class size is on average 40 per class in comparison with 30 of California (Wang, 2007; Winthrop, 2013). In reference to the comparability between the local development level between Jiangsu and California, the class sample largely adopts the nuances in Californian education system for the readers' convenience.

Before the course instruction begins, the physics instructor has participated in the pre-class section faculty meetings and mapped out the cluster that logically connects the teaching objectives for 12-grade physics to the objectives of 12<sup>th</sup> grade Mathematics, History, English, Literature, Biology and Geography. The interdisciplinary project is researched and agreed upon among faculties of the three subjects for all 12<sup>th</sup> grade students in school A, a typical public high school in Jiangsu Province of China: Design and implement a survival kit for students, faculty and staff members under circumstance of an earthquake. Students in the same class are divided into groups of 10 based on their academic strength compatibility, where every subject is mastered by at least one member.

The sample class plan for Grade 12 Physics addresses the following teaching subjects: Motion and Force; Conservation of Energy and Momentum; Heat and Thermodynamics; Waves (Bruton & Ong, 2003). All the relevant information to those topics are made available through handouts, uploaded powerpoint slides, encyclopedia pages or Youtube Science & Education Channels and Ted videos. Before each class session, the instructor keep updated with the progress of the students' projects under the topic of earthquake survival kit design with instructors of other subjects and finalize the unit-long creativity prompter according to the possible challenges students might face moving forward in their projects: It could be the facilitation in understanding the improbability of earthquake forecast when some project approaches to the survival kit by trying to design a easy-to-use earthquake sensor; It could be introducing the relation of wavelength and strength and interference when some project tries to set up a specific earthquake watcher in hope to warn the rest of the school by texting or emailing through a wifi internet, etc.

The class session starts with a section of a whole class Q & A when the students of different projects exchange updates of their project progress. Questions and challenges as well as successes of each project addressed by the students should be acknowledged by the instructor and give students time to bounce ideas off each other. Then it goes into a group by group discussion when the instructor interacts with students of a specific project, further inspire them to conduct retrospective thinking in concerns with the

challenges they face right now. For example, the students who tried to design a wireless earthquake alarming system might argue for its instantaneous coverage and low costs of implementation since “everyone has a cell phone nowadays”. The professor might inspire them to think about their thinking process and analyze it step by step: To make more people survive an earthquake, it is better to make everyone know and run as soon as possible (is this the only way? Why or why not? What about other ways of surviving the earthquake instead of running away?); to let all people on campus know instantaneously about the earthquake, a massive text message or email should be sent (Why text messages or emails? How texting and emailing work on the regular days? Would they work as well as they usually do when there is an earthquake coming? ); To send a massive text message, someone has to pay attention to the earthquake information throughout the hours the campus is open (Why does it require a specific person to watch out for the earthquake? Why a person not two people? How is the person supposed to know the earthquake is coming? How feasible is it to hire a person to do the job since it requires that person to stay focused on sending text messages/emails instead of running for his own life?); So on and so forth.

The last thing before the class session is over is that instructor requires the groups to keep track of the project progress during the class session and each member conduct a report of self-reflective thinking based on the class discussion. The prompters for the writing are offered through the English/ Chinese/ Language arts classes and evaluated based on their quality.

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