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A New Way To Improve Design Students' Creativity - Based on Thinking Style

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Abstract: *China is developing rapidly in many areas; currently over 50% of products (including household supplies, industrial products, some raw materials) in the world are 'made in China'. However, during the past 30 years of reformation and opening, there have been very few designers, educated in China, with a global reputation. To change current situation of 'made in china' to 'created in china', re-energizing Chinese design education is important. The research focus on higher education and explores new approaches to improve design students' creativity. Thinking styles are not dictate by physical condition. This indicates that we cannot judge a person's thinking style with the standards, high or low, good or bad. In the field of Education, providing a suitable match between teaching methods and thinking styles will facilitate effective development (Sternberg, 1997). It is proposed, therefore, that to improve students' creativity efficiently it is important to identify their thinking styles and identify and facilitate the corresponding teaching methods. This article presents research exploring an 'alternating teaching method' applied in Higher Education for improving design students' creativity. The research concerns thinking styles and the relationships between design process, creative process and education system.*

Keywords: creativity, thinking styles, legislative, executive

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Idea forming

Creativity is an integral and essential part of the landscape design process. Without creativity in design there is no potential for innovation, which is where creative ideas are actually implemented (Mumford and Gustafson, 1988; Amabile, 1996). There is no exact definition of creativity, a common misunderstanding equates creativity with originality. In point of fact, there are very few absolutely original ideas. The fact that creativity is based on knowledge of previous work in one's field is the justification for teaching the history and foundations of a given field as a resource for future research and creative work. Psychologists usually consider creativity as a part of cognitive process. Thus creativity is the ability to see connections and relationships where others have not and the critical part of enhancing creativity should be improving creative thinking.

In recent years, modules that aim to improve undergraduate design students' creative thinking have been encouraged in P.R.China (following "China" in this article equals to P.R.C). For example, Tsinghua University, Central Academy of Fine Art, Nanjing University of Arts and Nanjing Forestry University (NJFU) have employed a 'project-oriented teaching method' to achieve this aim (Ye, 2007). However, research shows that these students made little progress in creative thinking (Zhang & Li, 2008). Historically, in the field of creativity development, researchers have focused on people's physical condition and innate qualities, such as intelligence. Thinking styles, however, are formed through socialization and develop in relation to living environments. The theory of 'thinking styles' argues that the 'project-oriented teaching method' only matches people with a 'legislative' style (Sternberg, 1997). Therefore, this research project aims to develop an 'alternating teaching method' supportive of a range of thinking styles to promote students' creative thinking.

The 'alternating teaching method' is supposed to match design students with a range of thinking styles, as good matches between teaching methods and thinking styles will make people develop better (Sternberg, 1997). In terms of creative thinking, three kinds of thinking styles are identified into 'legislative', 'executive', and 'judicial'. Students with a legislative style like to create ideas whereas students with an executive style prefer to be given guidance as to what to do or how to do, and students with a judicial style combine the former two styles (Isaksen & Gaulin, 2005; Sternberg, 1997). 'Project', as a student-centred teaching method, advocates self-direction and open-ended inquiry (Fried-Booth, 2002), which Csikszentmihalyi (1996) has described as 'congenial' conditions for fostering students' creative thinking. However the performances of students with an executive thinking style lead them to stop progress without guidance, especially in a long-term design project. The 'alternating teaching method' will be achieved through solving this problem. People's thinking styles are formed through socialization with complex components (Sternberg, 1999) and therefore it cannot be changed easily. Thus the 'alternating teaching method' would be based on the 'project-oriented teaching method', to provide 'congenial' conditions for promoting creative thinking, but would also use an assisted teaching method to fit with legislative or executive thinking styles. As students with a 'judicial' style are between the two opposite styles, they will not be considered as a focus in this programme.

Detail designing

It is proposed that lectures would be integrated in 'project-oriented teaching method' as an assisted teaching method to form this 'alternating teaching method'.

People will think creatively when they decide what they want to do (Kaufman, 2007), this willingness to creative thinking is easy to encourage when introducing related information like 'a concrete definition of creative thinking' in an efficient way (Cropley, 2001). For lecture's great efficiency in delivering factual and conceptual understanding (Exley & Dennick, 2004), this willingness of students with either legislative or executive thinking style would be provoked. Moreover, lecture is the most efficient method for students with an executive thinking style (Sternberg, 1999) to give them guidance of how to achieve creative thinking to reduce their limits in a project. Combination of teaching methods is being advocated for the sake of different teaching aims (Gage & Berliner, 1975). The critical point of whether this 'alternating teaching method' would be efficient or not depends on how to apply different types of teaching methods- "project" "lecture" and "discussion" in an appropriate stage.

China's particular 'test-oriented education system' encourages students to cultivate an executive thinking style. In China, students have to take unified tests for entering the schools of next level, the contents of which are entirely from textbooks and have no aspect relating to creativity (Gu, 1990). The competition is quite intense in the 'university entrance test', as an account showed in 2008 that only 25 per cent of all students participating in this test were qualified to enter universities for higher education. Students will get higher marks in tests if they obey and follow exactly what teacher tells them. Thus, a large number of students with an executive thinking style have been fostered. The 'alternating teaching method' will be tested in chosen universities in China involving undergraduate design students by conducting a long-term design project（one year/two semesters）. Through observing and analysing teaching practices and studio sessions, it will be investigated how this 'alternating teaching method' makes efforts to enhancing creative thinking of students with either legislative or executive thinking styles. 'Instructions for Stylistic Self-Assessment' (Sternberg, 1999) (attachment1) will be chosen to distinguish students thinking styles.

The aim of this programme should be included with:

- To develop a teaching method, with learning conditions, to support design students with either legislative or executive thinking style.
- To make students with either legislative or executive thinking style improve their creative thinking.

Methodology

1. Literature review and case studies

Review related literature relating to thinking styles, creative thinking and creative thinking education. "Meta-analysis" (Neuman, 2006) has been employed to manage the findings and identify related themes and explanatory-multiple-case studies has also been conducted (Yin, 2003), where qualitative data are collected and analysed (Ganhan & Hannibal, 1999) to identify best practices in encouraging creative thinking in undergraduate design students.

Csikszenmihalyi (1996) has described the creative process as comprising five steps: preparation(immersion in a set of problematic issues that are interesting and arouse curiosity), incubation (ideas are churched around, below the level of consciousness, and unusual connections are made), insight (pieces of puzzle begin to fall into space), evaluation (deciding which insight is most valuable and worth pursuing) and

elaboration (turning the insight into something real). We can find from the description of key stages of the architecture design process of Royal Institute of British Architects (RIBA) Plan of Work that these key stages are much more similar with Csikszenmihalyi's creative process: the problem area (problem definition and understand problem) has the characteristic of step one 'preparation'; the concept area (concept design and concept development) has the characteristic of step two and three (incubation and insight); detailed design and evaluation is equal to the step four (evaluation) and production/manufacture is equal to step five (elaboration). What's more, one research conducted by Howard, Culley and Dekoninck (2008) has clearly explained the similarity between the creative process and engineering design. Thus the design project process can be designed into the following five stages: preparation stage, the stage of thinking (Discovery), the stage of insight (solution), the stage of assessment, as well as production stage. On the basis of the design project, at of the beginning of each stage, according to the students' different thinking styles using "lecture" teaching method to provide specific guidance and fully arouse students' desire to create, therefore, those "executive" students in specific implementation of the design project will have a clear goal and no longer feel confused. Students with 'legislative' style will also be able to make creative thinking preparation at the beginning of each stage of the design project so as to achieve the effective implementation of the preparation, which is students' creativity development objective. Further more, appropriate thinking training course (based on Lateral Thinking, De Bono, 1970) is set before particular steps which is meant to maximize students' interest in the project practice in creative thinking. Discussions are also integrated into certain stage to achieve a specific objective.

The prototype of module using the new teaching method is designed as below [Fig1]:

The project stages and time period	The alternating teaching method	Assignment
Preparation (Information collection) 2012.9-2012.12	1. Lecture: Introduction of creativity 1 Thinking training 1 2. Lecture: Introduction of project 1 3. Implementation	To determine the core of this design project
Thinking (Discovery) 2013.1-2013.3	1. Lecture: Introduction of creativity 2 Thinking training 2 2. Lecture: Introduction of project 2 3. Implementation	To generate ideas for design concept as many as possible
Insight (Solution) 2013.4-2013.7	1. Lecture: Thinking training 3 2.Discussion 1 3. Implementation	To develop design concepts
Assessment (Evaluation) 2013.8-2013.12	1. Lecture: Introduction of project 3 2.Discussion 2 3. Implementation	To determine the design concept
Production (Elaboration) 2013.12-2014.2	1. Lecture: Introduction of project 4 2. Discussion 3 3. Implementation	Detail design and mock-up

Figure 1. the Prototype of module using the 'alternating teaching method'

2. Survey research (Neuman, 2006)

To conduct this programme, collecting statistical information of professional design teachers and students in China's universities is necessary, which relates to whether the programme could be launched successfully. More over, information about these teachers and students' understandings and perceptions of creative thinking at the present stage has been collected which is significant for samples choosing in the following experiment stage. Questionnaire was designed based on the questionnaire of 'creativity in schools: a survey of teachers in Europe'(Cachia, Ferrari, 2010) and a few questions relating to Chinese local conditions were inserted as well according to the current situation of Chinese design education. The questionnaire was designed into three parts: 1.Basic information, including gender, age, etc. 2.Learning capability and character test (only for students). 3. Information about how Chinese teachers and students understand Creativity. Each questionnaire has its Number which helps to determine participants of the following experiment. Through this investigation, 6 teachers, whose understanding of creativity has a lot in common, have been chosen to join in the experiment, and 500 students have been chosen to take part in the next test for the experiment.

3. Experimental research (Neuman, 2006):

This part should be the most important part of this programme, the testing of the effectiveness of 'alternating teaching method' are managed through a few aspects shown as below:

A. Samples choosing

The samples are chosen according to the result of previous survey and 'Sternberg-Wagner Self-Assessment Inventory on the Legislative Style and Executive Style' [Appendix 1 Table 1]. 6 teachers and 120 students are from the Nanjing Forestry University, Nanjing University of Arts, and Central Academy of Fine Arts. These 120 students are chosen from over 2,000 students from nationwide joined in the previous survey and they are similar in capability of learning and personal character. These students are divided into 6 classes, each class has one teacher and 20 students. To be more detailed, there are two classes with legislative style students, two classes with executive style students and the other two classes with both legislative and executive students. Three classes (one with legislative students L1, one with executive students E1, and mixed one M1) will join in the module applying the 'alternating teaching method', and the other three classes (L2, E2, M2) will begin module still in current teaching method, and then provide data for comparison.

B. The Module Setting

To apply to the "alternating teaching method", the module has been designed as project-centred (see Fig1). This design project is named "Nanjing 2014 Youth Olympics Stadium Landscape Design". It began with the first stage: preparation. The six testing classes began this module at the same time (Sept. 2012) and applied different teaching method-the new one and the current one. As product assessments are probably the most appropriate assessments of creativity (Kaufman, 2004), different assignment was set at the end of each stage. The assignment at the end of the first stage was "to determine the core of this design project".Student Product Assessment Form (SPAF) (Reis & Renzulli, 1991) [Appendix 2] are employed for collecting quantitative information. Every class is divided into 5 groups with 4 students each to learn and finish the assignment together.

C. Results comparison

The results of the first stage are shown in tables below. It is clear to see that the average score of design product has risen up obviously by using the new teaching method in each class. The class L1 got the highest score in average, however, compared with L2 from table 2, the degree of rise (PL) is low. In contrary, the score of E2 is the lowest, but the data (PE)shows that the degree of rise between E2 and E1 is the highest which is up to 56%. For another, it reveals a situation from tables that the highest score (up to 10) and lowest score (4) turned up in the same class M1, which means that although the mixed styles may provoke best result, it may lead to the worst result if the collaboration is in bad condition.

Class(E)	Group	Score	Average score(S)	Class(E)	Group	Score	Average score(S)
E1	Group 1	5		E2	Group 1	3	
	Group 2	4			Group 2	5	
	Group 3	5	Se1=5.6		Group 3	6	Se2=3.6
	Group 4	7			Group 4	2	
	Group 5	7			Group 5	2	
L1	Group 1	8		L2	Group 1	7	
	Group 2	8			Group 2	9	
	Group 3	9	Sl1=8.2		Group 3	8	Sl2=7.4
	Group 4	9			Group 4	8	
	Group 5	7			Group 5	5	
M1	Group 1	4		M2	Group 1	5	
	Group 2	7			Group 2	3	
	Group 3	7	Sm1=7.2		Group 3	7	Sm2=5.8
	Group 4	10			Group 4	6	
	Group 5	8			Group 5	8	

Table 1a. The result of 'SPAF' in classes   Table 1b. The result of 'SPAF' in classes

Taught using 'Alternating teaching method' taught using current teaching method

Growth rate (P)	Percentage
P_E	56%
P_L	10%
P_M	29%

Table 2. The growth rate of 'SPAF' result after applying new teaching method

$$P=(S1-S2)/S2$$

D. Conclusion

In the following four stages, each stage will take a similar approach to evaluate the effectiveness of the teaching method and finally obtain the average results of the whole programme to evaluate the final efficiency of the 'alternating teaching method', and at the same time, provide opportunities to find new problems.

Evaluating:

1. Product assessments are probably the most appropriate assessments of creativity (Kaufman, 2004), and as the aim of this research programme, Student Product Assessment Form (SPAF) (Reis & Renzulli, 1991) (Appendix 2) will be employed for 'alternating teaching method'.

2. According to this assessment and 'Sternberg-Wagner Self-Assessment Inventory on the Legislative Style and Executive Style' a 'Teachers marking criteria' has also been developed, the prototype is shown in (Appendix 1 Table 2).

Conclusion

Creativity has been studied by psychologists, educators, neuroscientists, historians, sociologists, economists, engineers and scholars of all types and considered important in many fields. From the viewpoint of psychology, creativity has been studied as a part of cognitive process, which has developed many new approaches to improve people's creativity. Sternberg's theory of Thinking styles classifies people's thinking styles according to their usual ways of thinking which applies the knowledge of cognitive psychology. His theory suggests that good matches between people' thinking styles and the work they join in lead to success more easier, thus if you have to attend those works which is inconsistent with your thinking style, then you will have to try changing your thinking style to the appropriate one advisedly. Therefore, it is quite critical to identify personal thinking style and the work one deals with.

What has mentioned above is extremely necessary in Higher Education as most of learners are adult students with mature physical conditions which is hard to developed compared with that of children. There is no doubt that not every design student is of the 'legislative' style, especially in China. Many approaches concerning with improving students' creativity have been introduced in China's universities these years, however, little progress has been made. The primary reason was that these approaches have not been taught with appropriate teaching methods which could match with arrange of thinking styles, especially the 'executive' one. The data of the first stage of this programme has shown the positive result of using the 'alternating teaching method' in a course module, though there are still other various influencing elements in teaching and learning system. More problems and inspirations will be found while the programme is going through to the end and helpfully to achieve further refinement.

References

Teresa, Amabile, 1996, *Creativity in context* Westview Press, Boulder, Colorado

Cropley, Arthur J, 2001, *Creativity in Education & Learning-a Guide for Teachers and Educators*, Clays Ltd, St Ives plc

Csikszentmihalyi, Mihaly, 1996, *Creativity: Flow and the Psychology of Discovery and Invention,* Harper Collins, New York

Exley, Kate, Reg Dennick , 2004, *Giving a lecture from Presenting to Teaching, 2nd ed,* Routledge, UK

Fried-Booth, Diana L, 2002, *Project Work,* Oxford University Press

Gage, Nathaniel L., David C. Berliner, 1975, *Educational Psychology*, Rand Mcnally, Chicago

Gu, M., "Current China Education Analysing", *China Education Journal*, 104, No 59, (1995): 59-71, China Education Institute; The Development of China Education, People's Education Press.

Isaksen, Scott G, John P. Gaulin, Robert J. Sternberg, 2005, *A reexamination of Brainstorming Research: Implications for Research and Practice,* Cambridge University Press

Kaufman, James C., Robert J. Sternberg, 2007, *Resource review: Creativity,* Cambridge University Press

Mumford, M. D., S. B. Gustafson "Creativity syndrome" *e Integration, Application, and Innovation Psychological Bulletin* Vol 103 No 1 (1988): 27-43

Neuman, Lawrence W, 2006, *Social Research Methods: Qualitative and Quantitative Approaches.*Omegatype Typography, Inc

Robson, C., 2007, *How to do a Research Project -A Guide for Undergraduate Students,* Blackwell Publishing Ltd.

Sternberg, Robert J., 1999, *Thinking Styles,* Cambridge University Press

Howard, T. J, S. J. Culley, E. Dekoninck , "Describing the creative design process by the integration of engineering design and cognitive psychology literature", *Design Studies* 29, (2008): doi:10.1016/j.destud.2008.01.001, 160-180

Ye, Ping., 2007, *Primary Teaching of Form Design,* Jiangsu Fine Art Press

Yin, Robert K., 2003, *The Application of Case Study Research. 2nd edn.* Thousand Oaks, CA: Sage.

Zhang Li., "Survey on Chinese Undergraduated Design Students Development of Creative Thinking," *China Education Journal* 15 No104, (2008): 37-49

Reis, Sally M., Joseph S. Renzulli, 1991, *The assessment of creative products for gifted and talented students. Gift Child Quarterly*.

Cachia, Romina, Anusca Ferrari, "Joint Research Centre" 2010, http://ftp.jrc.es/EURdoc/JRC59232.pdf

Appendix 1

Table 1: Sternberg-Wagner Self-Assessment Inventory on the Legislative Style and Executive Style (Sternberg, 1999)

Scores criteria: 1= Not at all well 2= Not very well 3= Slightly well; 4= Somewhat well 5= Well; 6= Very well 7= Extremely well

Self-Assessment Inventory on the Legislative Style

1.When making decisions, I tend to rely on my own ideas and ways of doing things.

2. When faced with a problem, I use my own ideas and strategies to solve it

3. I like to play with my ideas and see how far they go

4. I like problems where I can try my own way of solving them.

5. When working on a task, I like to start with my own ideas.

6. Before starting a task, I like to figure out for myself how I will do my work

7. I feel happier about a job when I can decide for myself what and how to do it

8. I like situations where I can use my own ideas and ways of doing things.

Self-Assessment Inventory on the Executive Style

1. When discussing or writing down ideas, I follow formal rules of presentation.

2. I like projects that have a clear structure and a set plan and goal.

3. Before starting a task or project, I check to see what method or procedure should be used.

4. I like situations in which my role or the way I participate is clearly defined.

5. I enjoy working on things that I can do by following directions.

6. I am careful to use the proper method to solve any problem.

7. I like to figure out how to solve a problem following certain rules.

8. I like to follow definite rules or directions when solving a problem or doing a task.

Table 2: Teachers marking criteria for students' work (develop from the questions of Self-Assessment Inventory on Table 1), Total scores = 100%

(Note: the percentage distributed to each question of assessment depends on the degree of ideas expression)

1. Has the student shown evidence of reliance on their own ideas and ways of carrying out their design work? (30%)

Criteria: Ideas not seen in other student work or work of other designers before. /Using approaches not seen used before by other students or designers.

2. Has the student shown evidence of doing better in those problems being solved by his own way? (20%)

Criteria; Problem solved by his own way seen carried out completely and efficiently. /Problem solved by using directions seen carried out roughly.

3. Has the student shown evidence of the importance of his idea to the task? (10%)

Criteria: Task not seen achieved without student's idea. /The student's idea makes this task more successful.

4. Does the final work reflect student's general idea from the beginning to the end? (5%)

Criteria: The work has been achieved by the direction of student's idea.

5. Has the student shown evidence of using a special presentation to express his ideas? (10%)

Criteria: Presentation not seen used by other students or designers. /The approach of this presentation seems efficient in expression of ideas

6. Does the project show evidence of being solved by restructuring? (20%)

Criteria: Project not seen achieved following original structure, plan and goal. /The restructuring makes the project be achieved much easier.

7. Has the student show evidence of not being as what others expect to in a task? (5%)

Criteria: student's behaviour in the task seems different from what others expect. /The student does better when asked for being what others expect.

Appendix 2

Accordingly, each completed form should be assessed by experimenter and another two experts. They need to rate the first 8 factors separately, and rate the factor 9 together with discussion.

Student Product Assessment Form
Summary Sheet

Name(s) _____   Date _____

District _____   School _____

Teacher _____   Grade _____   Sex _____

Product (Title and/or Brief Description) _____

_____

Number of weeks students worked on product _____

Factors	Rating*	Not Applicable
1. Early Statement of Purpose	_____	_____
2. Problem Focusing	_____	_____
3. Level of Resources	_____	_____
4. Diversity of Resources	_____	_____
5. Appropriateness of Resources	_____	_____
6. Logic, Sequence and Transition	_____	_____
7. Action Orientation	_____	_____
8. Audience	_____	_____
9. Overall Assessment	_____	_____
A. Originality of the Idea	_____	_____
B. Achieved Objectives Stated in the Plan	_____	_____
C. Advanced Familiarity with the Subject	_____	_____
D. Quality Beyond Age/Grade Level......................	_____	_____
E. Care, Attention to Detail, etc.	_____	_____
F. Time, Effort, Energy	_____	_____
G. Original Contribution	_____	_____

Comments:

Person completing this form: _____

*Rating Scales:

Factors 1-8:	Factors 9A-9G:
5-To a great extent	5=Outstanding
3-Somewhat	4=Above average
1-To a limited extent	3=Average
	2=Below average
	1=Poor