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Instructional Design of Creating Creative and Imaginative Works

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ABSTRACT
The purpose of this study was to explore instructional design experiment regarding the different performances and influential factors of reflection and assessment on creating creative and imaginative works. This research adopted the quasi-experimental research method with non-equivalent pretest-posttest designs. The 218 college students as samples were randomly assigned into the experimental groups and control groups. The Questionnaire of Creative Thinking (QCT) and Works Analysis Form (WAF) were conducted as assessments in this research. The conclusions of the findings are as followings: 1. the students' performances of creating creative and imaginative works were better after receiving the creative instructional design of Lotus Blossom Technique (LBT). 2. more excellent imaginative works can be produced, if the students can be provided with specific creating steps. The college students' creativity performances can be promoted with offerings of creativity courses and methodology by the qualified college teachers with instructional design.

Keywords: instructional design, creativity, imaginative work, assessment

INTRODUCTION

Imagination is the continuation of creative thinking for more wonderful ideas in design, and a strong network for creative concept forming. Therefore, scientific inventions are derived from the rich imagination. Through the operational process of imagination, the students were able to develop innovative thoughts and were more possibly to manipulate their imaginative thoughts into products or the actual objects (Eckhoff, & Urbach, 2008). Creativity is teachable and human beings' creativity is growing unless the restrictions on the gene (Davis, 1986; Markley, 1988). Creativity can be inspired through teaching strategies (Zimmerman, 2009), and can increase the students' professional knowledge and ability in the creativity teaching in some specific areas (Csikszentmihalyi, 1996; Gardner, 1999). Creativity is a powerful propellant for social transformation and economic growth (Shneiderman, Fischer, Czerwinski, Myers, & Resnick, 2005), and the continuing products and potentiality of service innovation need creative performance (Howard, Culley, & Dekoninck, 2008). Teaching for creativity will be able to promote the students' performances on more creative and innovative learning to show the imagination works. Based on the perspective that creativity is essential in instruction, it is expected that teachers could create students' creativity and always want their students to produce creative products or outputs.

Through the comparison and contrast educational policies on creativity education in four Asian Chinese societies, mainland China, Hong Kong, Singapore, and Taiwan (Hui & Lau, 2010). It was believed that creativity education is made available to every student; efforts have been made to identify highly creative students and provide them enrichment opportunities, mainly using performance assessments and performance in creativity competitions in these societies. Especially, Taiwan has an official document the "*White Paper on Creative Education*" published in 2003. It had been promoting multiple levels of creativity development (individual, school, societal, industrial, and cultural). China, Hong Kong, and Singapore do not sufficiently emphasize creativity education in the larger community. However, Asian countries certainly expect students to hold creative thinking, imagination and creative problem solving through the creative curriculum and instruction.

Teaching is compatible with knowledge of science and art, and the instructor must guide the learners to complete the teaching objectives through scientific and effective procedures of methods with changeable arts (Shen,

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Contribution of this paper to the literature

- The students can truly elaborate creative potentiality and action performances to produce the diverse imagination works through creative techniques of instructional design course.
- With providing the specific discussion forms of creating steps, offering the students opportunities of practices of convergent and divergent thinking, inducing students to elaborate their imagination, conducting panel discussion on creative cases and classroom sharing on creative projects, the students' abilities of awareness, observation, strategy and reflection levels would be raised.
- The researchers suggest the students will contribute to the needs of industries if the universities can offer creativity courses and carry out creative thinking training, instructional design for planning product design and development.

2017). Students should be challenged to think creatively about subjects by discovering, understanding, analysing and applying creativity in new situations. When teachers can integrate creative techniques and instructional design knowledge to guide students in creative thinking, problem solving, familiarizing social context, specific scenarios, linking system and internal values and knowledge, and carrying out the creative ideas for practical works, they would help students develop creative thinking and implemental competitiveness. Thus few have addressed assessment on instructional design of creative curriculum among current literature, especially in the context of using creative technique teaching. In summary, the purposes of this study are as the followings:

1. To plan instructional design for creating imaginative works.
2. To evaluate imaginative works of creative thinking.
3. To analyse influential factors of teaching creative thinking.

LITERATURE REVIEW

Instructional Design for Creative and Imaginative Works

There are many different definitions of instructional design (Shen, 2017), most of scholars emphasize instructional design is a planning process of teaching (Richey, 1986; Seels & Richey, 1994). Definitions are varied from different instructional design based on teaching approaches. Many educational instructors and practitioners mostly accepted that students should construct their own knowledge. From comparison of traditional instructional design and constructivist instructional approach, the traditional instruction proposed that knowledge is external to learners and can be objectively specified through representations of various forms. Knowledge acquisition is static, linear, and systematic. Learning is to transfer some mind independent entities into the learner through mediation of fixed cognitive structures like plan or schema. Teaching is systematic transmission of knowledge and skills progressing from simple to complex, maximizing the communication of fixed concepts. By constructivist view, knowledge is subjectively perceived by learners through an active process of construction. Knowledge acquisition is dynamic, multidimensional, and systemic. Learning is to construct an internal representation of knowledge, a personal interpretation of experience, and therefore an active process of sense-making. Teaching is to enable learners to experience and manipulate knowledge construction process and to appreciate multiple perspectives (Merrill, Drake, Lacy, & Pratt, 1996; Mayes, 1994; Law & Wong, 1995).

A good constructivism of instructional design can be viewed as providing learners with practical opportunities after completing learning environment design, and this is to provide learners with the greatest feedback and control authority. Gagn'e, Briggs and Wager (1992) proposed the conditions of learning and hierarchy of learning, and argued that instructional design is a solution system to solving teaching problems, and teaching events should be planed based on learners' psychology from the behaviourism and constructivism.

Instructional design is to respond to the varieties of teaching objects oriented and to develop instructional design models as systems approach model (Dick & Carey, 1990; cognitive learning design model (Kemp, 1985); ARCS, Attention, Relevance, Confidence, and Satisfaction (Keller & Sherman, 1974), and system dynamics model of instructional systems development (Tennyson, 1997; Tennyson & Foshay, 2000). It depends on which teaching objects, goals, assessments, etc.

This study recognizes that instructional design is the systematic process of designing, developing, evaluating, and managing the entire instructional process to ensure learning. It is based on what we know about instructional and learning theories, systems design, information systems, and management (Morrison, Ross, & Kemp, 2001). Its basic assumptions are that creating creative and Imaginative works' knowledge is actively constructed by students during instructional design process and that learning is most effective when situated in some authentic task contexts.

Table 1. Experimental design

Group	Pre-test	X	Post-test
Exp.	QCT	Creative instructional design of Lotus Blossom Technique	QCT WAF
Con.	QCT	N/A	QCT WAF

Creative Thinking and Problem Solving in Creating Works

To integrate the definition of the relevant literature of creativity, creative assessment can generally be divided into creative thinking and creative works of the assessment. The former tends to assess the potential creative thinking; latter to integrate work performance and problem solving abilities. Creative assessment regulations adopted pursuant to assess the purpose for which, including fluency, flexibility, originality, elaboration, usage, novelty, relevance, etc. (Cropley & Cropley, 2010; Cropley & Kaufman, 2012; Treffinger, Isaksen, & Dorval, 2003; Sternberg, Kaufman, & Pretz, 2002; Zeng, Proctor, & Salvendy, 2011). The research will focus on creative thinking and problem solving of creative and imaginative works.

Thus, imagination can be the connection between the unknown in the fantasy world to the known world to seek all possibilities, and to apply the known phenomenon of life experience or intuition in the variety of unknown creations. Imaginative and creative products and concrete outcomes can be formed to produce specific civilized and cultural creativity. Scientific inventions derived from the rich imagination by the operation of imagination, and students can develop innovative and creative ideas, and then many actual products or objects can be produced and interpreted (Eckhoff & Urbach, 2008). Nowadays, the development of science and technology has made the imagination possible to produce concrete results (Vygotsky, 2004; Zhang, 2011). Through the observation of the history regarding the representativeness of the inventions such as lights, cell phones, perfume as well as the designs such as furniture, utensils, clothing, that is because of more imagination and creative practice. These inventions and designs appear to enrich human life. Both of creativity and technological inventions can solve the human beings' problems in life (Peterson, 2002). Students were encouraged and inspired to develop their creative thinking and problem solving ability in creating works.

Creative Thinking and Lotus Blossom Technique

The Lotus Blossom Technique deriving from the creative techniques developed from Japan (Michalko, 1998; Shen, 2016). This idea is primarily based on theme mapping with the concept extending based on diversity themes with large, medium, and small size. Firstly, applying divergent and convergent thinking, get ideas and put core theme into core square of Jiugongge. Secondly, try to extend the other eight squares' ideas from core theme by imaginations of jumping frames or reasoning ideas. Thirdly, move the other eight squares' ideas to create new Jiugongges as every core theme. Every eight Jiugongge must repeat and again repeat the second step; facility of diffusing ideas will come with creative thinking. Lastly, using dynamic, integrated thinking to combine all ideas, and to make it as concrete graphics by hand or software, do it by 3D printer or implementation by different kinds of materials. In brief, the steps of Lotus Blossom Technique are as the followings: 1. establishment of core theme; 2. development of outward vision; 3. diffusion extending vision; 4. dynamically complete creative ideas. Application of Lotus Blossom Technique keeps continuing to extend ideas as the spindle of instructional design.

RESEARCH METHOD

This research was expected to receive the findings regarding the following questions.

1. How was the instructional design to be planed for creating imaginative works?
2. How were the imaginative works of creative thinking to be evaluated?
3. What were the influential factors of teaching creative thinking?

Method

This research adopted the quasi-experimental research method with non-equivalent pretest-posttest designs. Experimental design was as **Table 1**. The experimental treatment was used creative instructional design of Lotus Blossom Technique. Pre-test was to survey questionnaire of creative thinking (QCT) before teaching, Post-test was to survey QCT again and to do work analysis form (WAF) after teaching. The research conducted the experimental treatment and compared the differences of results between Pre-test and Post-test.

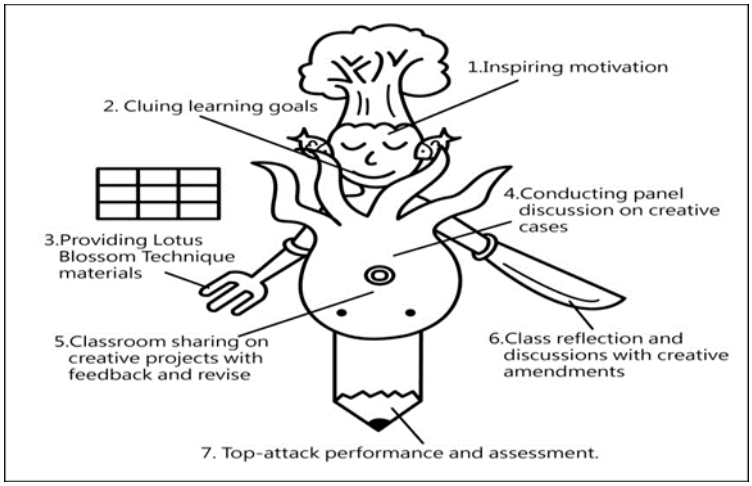


Figure 1. Instructional design of creating imaginative work

Instructional Design

The instructional design integrated teaching subjects, materials, creative techniques, teaching methods and assessments. The teaching steps are as the followings: 1. inspiring motivation, 2. cluing learning goals, 3. providing Lotus Blossom Technique materials, 4. conducting panel discussion on creative cases, 5. classroom sharing on creative projects with feedback and revise, 6. class reflection and discussions with creative amendments, 7. top-attack performance and assessment.

The researchers integrated creative thinking of instructional design, discussion teaching method, Instructional events design of R. M. Gagne, mastery learning, inquiry teaching as well as the researchers' practical teaching experiences in creativity courses shown as **Figure 1** instructional design of creating imaginative work. Analogical comparison was conducted to create the creative teaching techniques. The process of accomplishing the techniques was similar with acting as delicacies gluttons to taste a main course, Surf & Turf. The participants acting as intelligent makers need to initiate their feelings and motivations to know why they do and how to appreciate the imagination works.

Participants

Participants were from the enrolled students in the University of Science and Technology. The 218 college students as samples were randomly assigned into the experimental groups with two classes and the control groups with the other two classes, Including 117 participants in the experimental groups, and 101 participants in the control groups.

Instruments

Research instruments included: 1. The research conducted Questionnaire of creative thinking (QCT), it showed the appropriation of internal consistency within Cronbach α.892. 2. It was used work analysis form (WAF) for imaginative work. As Doppelt argued that creative thinking in designing works frequently were influenced by awareness, observation, strategy and reflection (Doppelt, 2009).

RESULT AND DISCUSSION

Planning Instructional Design for Imaginative Works

To plan a practical instructional design for imaginative works is important for students how to inspire creative and imaginative thinking, also for instructors how to operate teaching methods, procedures, points and outputs. To apply Lotus Blossom Technique in instructional design of experiment was considered associations and expectations for students how to create imaginative works. It was as **Table 2**.

Table 2. Plan instructional design for creating imaginative works

Teaching methods & procedures	Teaching output
1. Inspiring motivation ✓ Every student has about 2 minutes to show his/her creative collections. ✓ Encourage students to observe concrete products/things from network, patents, database, product and stores by browsing, reading, analysing, reporting and sharing	✓ Deepen learning ✓ Increasing motivation ✓ Increasing the ability to observing, exploring and realizing ✓ Realizing creative changes and challenges and learn to observe the context
2. Cluing learning goals ✓ Instructor explains what relationships between creative shows and techniques. ✓ To point & clarify what learning goals of creative techniques are requirement.	✓ Initiating teaching objects. ✓ Understanding students' learning mind-set
3. Providing Lotus Blossom Technique (LBT) materials ✓ Editing systematic materials of LBT, multi-medias of instructional design and discussion lists of Jiugongges for students on teaching website before teaching ✓ Rethinking how to implement methods of teaching, learning & practice, how to use divergent and convergent thinking, and Lotus Blossom Technique for students	✓ Enhancing the application to use strategies and reflection on the context of observations ✓ Promoting insights of abstract frameworks by rigorous analysis
4. Conducting panel discussion on creative cases ✓ Learning ways to create imaginative products through analysing steps of LBT and the actual cases by Jiugongges ✓ Brainstorming for drawing creative ideas of text or figure of Jiugongges in the groups	✓ Depth understanding the theories and concepts applying in real situations ✓ Self-learning application of new knowledge to correct misperceptions and skills
5. Classroom sharing on creative projects with feedback and revise ✓ Using results of discussion lists, post-it, blackboard for groups' sharing. ✓ Sharing reports of panel creations in class by the feedback of creative thinking and works among the correction of instructors and students	✓ Constructing knowledge of acquisition and application in creative thinking and problem solving performance ✓ Producing positive reflection energy of creativity
6. Class reflection and discussions with creative amendments ✓ Peer learning with feedback on reflecting corrections to integrate the creative techniques and creative problem solving	✓ Increasing problem-solving knowledge and skills, and being able to adapt changes ✓ Reinforcing learning interest in creative problem solving
7. Top-attack performance and assessment ✓ Creating imaginative works by groups ✓ Presenting works ✓ Appreciating imagination creativity on innovation, uniqueness, practice and imagination through competition scores ✓ Assessing groups' works by instructor and experts, reflection on works' performance	✓ Self-learning in awareness, observation, strategies, reflection in terms of adjusting creative thinking and problem-solving performance ✓ Being more courage to accept the challenges, creative thinking and actions

Assessing Creative Thinking of Imaginative Works

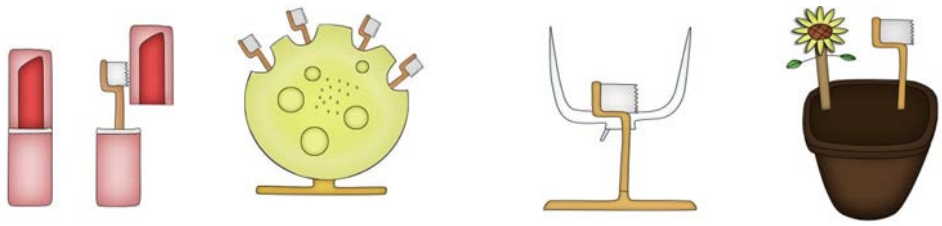
The differences of creative thinking between pre-test and post-test in the teaching experimental group, it was summarized as **Table 3**. The mean of the total score regarding creative thinking in the post-test was higher than that in the pre-test in the experimental group reached a very significant difference ($t = 8.903$, $p < .001$). 2. Except collection ($t = 1.491$, $p > .05$) did not reach the significant difference in the experimental group, fluency ($t = 7.333$, $p < .001$), flexibility ($t = 6.846$, $p < .001$), originality ($t = 7.836$, $p < .001$), elaboration ($t = 6.652$, $p < .001$), sensibility ($t = 6.276$, $p < .001$), discovery ($t = 6.450$, p creative $< .001$), performance ($t = 8.263$, $p < .001$), practice ($t = 7.706$, $p < .001$), creative problem solving ($t = 7.133$, $p < .001$), 9 aspects of the creative thinking ability, reached a significant difference.

In other words, in addition to collection not being affected by the teaching experiment, the other aspects in the teaching experiment had generated considerable influence effects and reached the very significant difference. Conducting creative teaching techniques in teaching instructional design experiment showed the impact of that in the experimental group. The result is the same as Lau, Wong, & Lee pointed out that providing creativity training can be arranged appropriately in the lesson plans, it would motivate and assist students to dig out their potentiality of creativity (Lau, Ng, & Lee, 2009).

Table 3. Summary of t-test regarding the pre-test and post-test on creative thinking in the experimental group

Varity	Test	N	M	SD	SE	t-test	Sig.
Total	pre	88	36.545	5.258	.560	8.903	.000
	post	113	28.185	7.485	.704		
Fluency	pre	91	3.52	.689	.072	7.333	.000
	post	113	2.70	.865	.081		
Flexibility	pre	90	3.60	.684	.072	6.846	.000
	post	113	2.81	.902	.085		
Originality	pre	91	3.37	.877	.092	7.836	.000
	post	113	2.36	.945	.089		
Elaboration	pre	91	3.41	.816	.086	6.652	.000
	post	113	2.60	.892	.084		
Sensitivity	pre	90	3.66	.810	.085	6.276	.000
	post	113	2.88	.914	.086		
Collection	pre	90	3.81	.717	.076	1.491	.137
	post	113	3.35	2.893	.272		
Discovery	pre	90	3.81	.701	.074	6.450	.000
	post	113	3.04	.954	.090		
Performance	pre	90	3.84	.702	.074	8.263	.000
	post	113	2.87	.931	.088		
Practice	pre	91	3.69	.799	.084	7.706	.000
	post	113	2.70	.999	.094		
Creative Problem Solving	pre	89	3.76	.866	.092	7.133	.000
	post	113	2.88	.888	.084		

*p<.05 **p<.01 ***p<.001



(a) (b) (c) (d)

Figure 2. Toothbrush Sets a) Lipstick Set b) Moon Set c) Wine-cup Set d) Green-energy Set

In inquiry the reason that collection did not reach significance level and that might be because of the motivation. The students can observe their own life context in quite extensive way, and that made it difficult to focus on linking the creativity works. Further considering how to collect creative information would assist them in performing creative imagination works.

Influential Factors for Teaching Imaginative Works

Case analysis of imaginative work~ Toothbrush Sets

Selected from teams of teaching experiment as a case study, the "TB team" presented the 4 toothbrush sets as **Figure 2**, showing the students' creative imagination creations after the teaching experiments.

Creating imaginative work process of moon toothbrush

For example, the students' creations, moon toothbrush, demonstrating their creative thinking shared the following creative characteristics: 1. Lunar surface with holes for plugging in many toothbrushes. 2. The shine of moon for quickly finding the position of holds 3. Being cautious on teeth decay, as surface of the moon potholes. According to steps of Lotus Blossom Technique (LBT), firstly, establishment of core theme; secondly, development of outward vision; thirdly, diffusion extending vision; fourthly, dynamically complete creative ideas. The TB Team developed their creative characteristics and followed LBT steps to create works. The application of LBT was presented the creative thinking and outcomes shown in **Figure 3**.

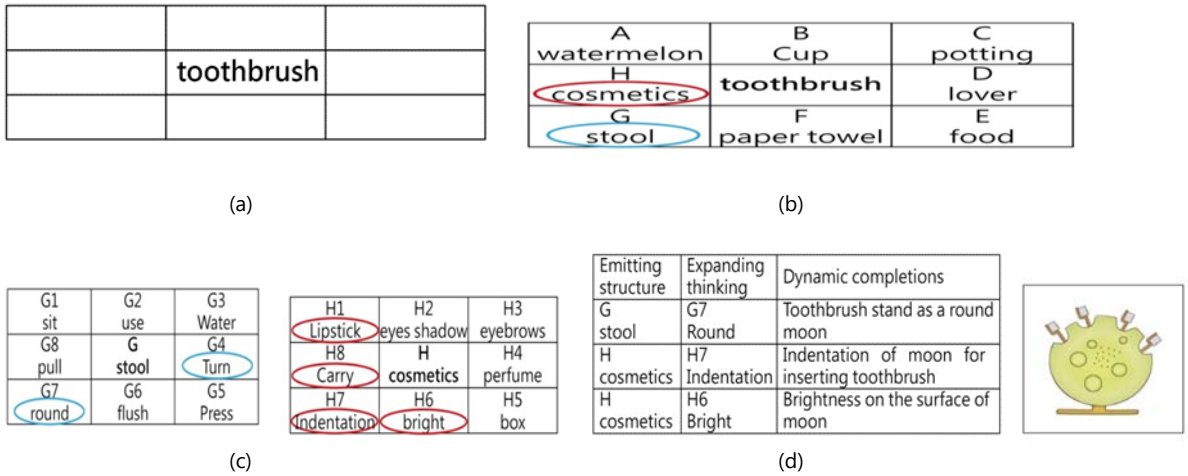


Figure 3. Creating imaginative work process of moon toothbrush a) Establishment of core theme b) Development of outward vision c) Diffusion extending vision d) Dynamically complete creative ideas

Table 4. The influential factors for teaching imaginative works

Creative Thinking	The influential factors
Awareness level	✓ To provide with discovery the creative techniques with easy and fun atmosphere. ✓ To prepare and apply discussion topics and lists for students to write or to draw ideas. ✓ To create opportunities of designing and discussing the assignments in class. ✓ To facilitate applying creative techniques on the imaginative works.
Observation level	✓ To encourage to observe the relevance of the keywords on the convergent and divergent thinking. ✓ To compare learning ways through analysing steps of LBT by Jiugongges with different groups.
Strategy level	✓ To guide to be familiar with creative techniques. ✓ To make good use of discussion list of LBT steps for completing the imaginative works. ✓ To organize creative thinking and to define the thematic objects for the works. ✓ To apply convergent and divergent thinking on the creative imaginative works.
Reflection levels	✓ To manipulate the thinking tools systematically. ✓ To accomplish the creative thinking design dynamically based on reflecting, perceiving, relocating and extending.

Influential factors for teaching imaginative works

The creative thinking for the design works often consider the following four influential factors on the design of the work output: 1. Awareness level: Students perceive that thinking skill can be trained; students can prepare themselves to explore and listen to the views of others based on the theory. 2. Observation level: Students should be able to do observations based on the behaviour and selection results and to consider the views of others with comparing the differences. 3. Strategy levels: Students should be able to use reflection tools to organize people's thoughts and to define the targets by steps. 4. Reflection level: Students can systematically use reflection tools to examine the awareness of thinking to people's reflection and to design thinking process and executing methods (Doppelt, 2009). These influential factors for teaching imaginative works (results of learning) can be verified by empirical test. In induction the participation of "TB Team" creative imagination works" Toothbrush Sets" was revealed on **Table 4**. The results indicated as Awang and Ramly (2013) found that if Malaysian students can learn creative thinking skills and related technologies, it would help them enhance the perspectives of creative thinking and problem solving.

CONCLUSION AND RECOMMENDATION

The effectiveness of creativity can be produced through teaching. Take the teaching experiment in this research for example; the integration of creative techniques and instructional design confirmed that creative teaching techniques can inspire students to develop creative ideas in the imagination works. The researchers found that the performances in the experimental group were better than those in the control group regarding fluency, flexibility, originality, elaboration, sensibility, discovery, performance, practice and creative problem solving, but there was no difference in the level of collection.

This result indicated that the students can elaborate the energy of resources of learning creativities by means of employing the information of software, practices, cases, patents and sharing creativity in the instructional design phase. The students can also elaborate creative potentiality and action performances to produce the diverse imagination works. Hence, instructional design of creative techniques can be feasible and effective to inspire students to produce creative imagination works.

From the level of the learners' awareness, observation, strategy and reflection, the researchers found the students' creative and imaginative works were produced by the following means: the instructor provide the specific discussion forms of creating steps for the creative and imaginative works at the observation and strategy level; offer the students opportunities of practices of convergent and divergent thinking on the creative imaginative works; induce students to elaborate their imagination to escape the existing framework for thinking; conduct panel discussion through the brainstorming among teachers and students in the instructional design steps.

Finally, the researchers suggest that if the universities offer creativity courses, carry out creative thinking training, conduct instructional design products, the college students with participating the learning process of creative techniques course and with receiving the creative and innovative skills and knowledge will contribute to the needs of industries. Meanwhile, the researchers will conduct the variety of creative techniques in the future on the bases of using the instructional design to observe more feasibility of creating imagination works by the students.

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