

# CHAPTER 1

## Introduction

Creativity becomes a more popular issue raised in many fields, such as business, industry, academic discourse, etc., in recent years. There is no doubt that we need to face the matter of creativity learning because it is considered as an important ability to meet the flat world in time. In fact, the methodologies for creativity, such as De Bono's Lateral Thinking [13], Osborn's Brainstorming [31], and Individual Free Writing, were proposed several years ago. However, whether creativity can be taught or not is still a controversy. Till now, few studies can provide strong evidence on the effectiveness of pedagogies for creativity, and a great number of studies are still trying to verify it [41].

With the wave of computer and the internet rising, some researchers from the field of *Human-Computer Interaction (HCI)* or *Computer Support Collaborative Learning (CSCL)* began to suggest computer- or web-based Creativity Support Tools to encourage people to have more innovative ideas. Although much research has been done on Information- or Communication-type creativity support systems for idea generation [30], few studies have been conducted on the support for perspective-modifying ideas, which is out-of-box thinking. Suggesting few perspective-modifying concepts is a notable shortcoming for such systems because abundant information provided by the support systems could not result in the drastic shift from the problem context [24]. Besides, a long-term research of information system for creativity [9] also reveals that we should consider more external factors such as people personality, learning situation, and final results. However, these issues are less concerned by present research.

The objective of this research is to increase the possibility of generating perspective-modifying ideas. We propose an assisting system, *Idea Storming Cube* (or *ISC* for short) for creativity learning. For learners, it could provide another angle of looking at things and en-

courage them to change thinking patterns in the learning process; for teachers or researchers, it can accumulate the innovative ideas generated by learners and help us discover the key factors in creativity thinking. The result of this study may aid researchers in better understanding the factors affecting the generation of perspective-modifying ideas.

In ISC, we will present a new approach that may stimulate innovative thinking more effectively. Traditional creativity support tools have good processes to support open interchange of ideas [33], but may not stimulate users for better paradigm-shifting thoughts. Therefore, we consider two major design issues of creativity support system, which are used to stimulate different thinking and evaluate creativities.

#### Stimulating different thinking:

In order to strongly push learners to pursue totally different ways of thinking, we should change a learner's angle of looking at things continuously. Thus, we adopt Csikszentmihalyis's theory of creativity [5] to have three stimulating types as inputs: society, domain knowledge, and individual. At the same time, we should also decrease information noise on incubating ideas in order to deal with bounded rationality [36]. We would like to monitor the process of creative idea generation among these perspectives and have an intelligent mechanism to provide appropriate perspective-modifying thinking support for the learners.

Besides, designing an appropriate atmosphere for new idea generation is also necessary. Creating an inspiring environment, probably like a game, is crucial for enhancing the motivation and effects of learning. Therefore, we try to use a collaborative game-based environment for ISC to support production of creativity, especially in perspective-modifying learning support.

#### Evaluating creativity:

Measurement of creativity should be adopted with multiple quantitative indices [17][30], such as novelty, usefulness, originality, and fluency. Moreover, the subjective approach in [1] for measuring creativity also suggested that ideas should be qualitatively assessed by domain experts. Thus, it is necessary not only to propose a quali-

tative evaluation method for the multidimensionality of creativity, but also to be refined by domain experts with the management interface of the system.

However, the essence of creativity is continuously evolving by combining past thoughts to suggest new concepts, so we need a modulating mechanism of creativity recognition for new coming good ideas. Here, we want to adopt a social mutual evaluation mechanism to find potential good ideas.

In addition to the system design issues, it is important to view a learner's thinking behavior based on the long-term in-depth observations because creative mind is usually considered as a persistent thinking behavior. Therefore, for long-term measurement of creative performance on different domains, the ideal creativity support system should not only be experimented in laboratory conditions but also be applied to real educational programs to verify the possible enhancement of the perspective-modifying ability.

In this research, we propose a creativity support system for stimulating perspective-modifying ability and design some experiments and survey for evaluating the effectiveness of the system. We expect that, through this tool, people can exchange perspectives with others in a long-term period (i.e., may use this support system as a training tool by practicing many times for different subject) and allow new innovations to be emerged from the old ones.

This report is organized as follows. In the next section, we will review the research pertaining to our research. In Chapter 3, we will present how we model the problem and present what the ideal creative support system should be. In Chapter 4, we will present a pilot study for exploring the issue of usability and effectiveness. In Chapter 5, we use an experiment to demonstrate the efficacy of the system. The future work and conclusion are given in the last chapter.