

# Effects of Computer-Supported Knowledge Building Pedagogy on High School Students' Learning Perception and English Composition Performance

**Abstract:** The purpose of this action research was to investigate the difference in students' learning perception and in their performance of English composition. Participants were 39 high school students who were engaged in computer-supported knowledge building (KB). Data mainly came from questionnaires and students' writing works. Findings suggest that (1) students perceived KB as a better environment for creative learning, especially in terms of generation/improvement of writing ideas and promoting collaborative writing feedback in the class community; and (2) students' performance in English composition was improved in terms of # of words, and writing test scores. Based on the findings, suggestions for further research are provided.

**Keywords:** knowledge building, learning perception, English composition, high school students

## Introduction

Learning environment has great influence on students' performance of learning (Lizzio, Wilson, & Simons, 2002). With the progress of the technology, almost all the classrooms are now well equipped with high-tech equipment. However, the question of how students perceive their learning environments relates to the assessment of their learning performance is rarely investigated. There are in general two types of learning environments. The traditional learning environment favors direct instruction pedagogy which can be commonly seen in Taiwan, and its purpose usually aims to facilitate teachers' control of the teaching procedure by imbuing students with as much knowledge as possible in a short period of time (Engelmann, Becker, Carnine, & Gersten, 1988). The other type of learning environment is more constructivist-oriented, favoring more student-centered learning activities and supporting more creative ways of teaching. How learning environments are designed by teachers and perceived by students can have enormous effects on student learning performance (Collins, 1996). If students perceive their learning environment as more creative, they will be more likely to learn in a constructive and innovative way. Therefore, it is crucial for teachers to consider as many design aspects as possible for fostering a supportive learning environment, and at the same time try to make the best decisions to design more effective instructional activities.

English is an international language and it is widely used in our daily life around the world. English education has been playing an important role in Taiwan as well because it is not only beneficial but also favorable for students to enter a higher or advanced school and/or to earn a better career in the future. However, learning English well is not that easy. Most students consider English composition as the most difficult part in learning English because it requires higher order thinking. English composition test has been put into practice in College Entrance Examination for years in Taiwan, but the results and outcomes of it are not as good as expected (Yang, 2003). The reason why students cannot perform well in their writing might be resulted from teachers' teaching pedagogy. In Taiwan, product-oriented pedagogy (POP) is perhaps the most commonly seen teaching method in a typical class, which mainly concerned about the correctness and the formation of the final (writing) product, simply asking students to imitate the grammatical and syntactical structures with repeated drill and practice. Studies indicated POP confines students' critical thinking and creativity development. It also makes students' works lack of vitality, as well as making them fear of writing (Chang, 2001).

As a result, constructing a good learning environment to assist students in mastering relevant knowledge and technique is important. Knowledge Building (KB) theory represents an idea-centered instruction. It is compatible with student-centered pedagogy. The teaching method aims to help learners with continual idea generation and improvement, as well as to engage them in intensive community collaboration (Scardamalia & Bereiter, 2003). Therefore, this study was designed based on KB pedagogy while using the technological platform of Knowledge Forum (KF), i.e., an innovative multimedia environment to support knowledge building in English writing. Using this pedagogy and environment, English composition pedagogy was implemented. Focusing on high school students, this study hopes to assist them to develop a better perception towards the designed English learning environment, to reach to a higher cognitive stage for writing, and to develop a skillful writing ability. So, the purpose of this research was to investigate the effects of computer-supported knowledge building pedagogy on how students perceived the learning environment intentionally designed based on knowledge building pedagogy by the instructor and on how students performed in their English compositions.

## Methods

This study was conducted in a second-year high-school class (n=39) in New Taipei City, Taiwan. Hong and Sullivan (2009) pointed out idea-centered and principle-based instructional design approach can better help support learning as knowledge creation. They viewed the process of leaning not so much as knowledge acquisition, but as community participation and knowledge creation. Scardamalia (2002) proposed 12 KB principles, highlighting the importance of idea diversity and sustained improvement of ideas generated. Moreover, Scardamalia (2002) also emphasized the importance of transforming individual learning to community knowledge building while promoting collective responsibility during collaboration. Through the guidance of knowledge building principles and the help of Knowledge Forum technology, students in this study learned to freely exchange and elaborate their ideas in an open and ubiquitous online knowledge building environment (KBE). As such, students are expected to be transformed from passive learners into active ones so that their critical thinking and creativity can be better fostered.

This study was conducted for ten weeks, with two lessons in each week totaling 1000 minutes with each lesson lasting for 50 minutes. Through knowledge building activities and its processes, the teacher conducted and guided the students from the basic stage of cognitive domain (knowledge memorization, comprehension, and application) to a higher stage (knowledge evaluation and creation). During the first two-lesson period, the teacher had a tutorial to all of the students first, aimed to enabling them to have a basic understanding of English writing and composition using an idea-centered knowledge building approach. Every time before moving to next steps, a set of self-designed KB scaffolds was provided (see Figure 1). After illustrating some regulations and guiding points of writing, the teacher engaged the students in idea-generating and improving activities in order to help them rise above their ideas on specific topics for writing. Then, the teacher asked students to communicate, discuss, and exchange these ideas with their group members respectively. Scaffolds were provided in-between all activities. After that, students individually did some reflection

upon writing topics/issues/ideas, trying to rearrange their ideas/thoughts and preparing for the next writing step/activity. In the end, each student had to complete their own compositions with more refined ideas. These activities with the same writing topics (but diversified and improved ideas) are conducted for about every three weeks so that students' English compassions and ideas could be revised and polished and improved again and again. This cycling instructional methods and scaffolds, which were collaboratively provided by the teacher, classmates, and environment, fit in with the main conceptual framework of knowledge building as writing ideas were continually worked and re-worked for improvement (see Figure 1). As for data collection, a valid and published Knowledge Building Environment Scale (Lin, Hong, & Chai, 2012) and students' English composition works were employed to enable data collection. Figure 2 showed a screenshot of KF.

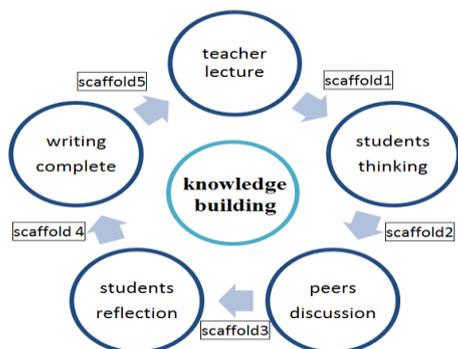


Figure 1. Teaching activities based on KB.



Figure 2. The interface of Knowledge Forum.

## Findings

First, analysis of KBE scale was performed focusing on its three scale factors: “idea”, “agent”, and “community”. Table 1 illustrated how students perceived their learning environment differently in terms of the knowledge building environment (KBE) group and the product-oriented environment (POE) approaches (note: students were asked to compare this KBE class using knowledge building approach with their previous POE class). The differences (see Table 1) were found significant, which showed that students perceived their current class environment as favorable for idea generation/improvement ( $t=-2.97, p<.01$ ), and for community collaboration ( $t=-2.68, p<.05$ ). Overall, students perceived their English writing class as a better environment for learning mainly because their ideas after generated can be freely and collaboratively improved in this class environment. And in terms of English composition, the results (Table 2) showed that the number of the total words was increased by 15 words on average, and the writing scores, which were assessed on a basis of the valid intermediate level standard of General English Proficiency Test (GEPT), were significantly increased by 0.33 points on average as well. That is to say, KBP was favorable for English composition performance. Moreover, students also expressed a positive and affirmative attitude toward KBP based teaching based on complementary interview data.

Table 1: Paired-samples t test in POE and KBE

Factors	POP		KBE		t value
	M	SD	M	SD	
idea	3.69	0.56	3.98	0.59	-2.98**
agent	3.81	0.63	3.92	0.58	-1.29
community	3.69	0.63	3.97	0.67	-2.68*

\* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table 2: Paired-samples t test in POP and KBP

items	POP		KBP		t value	increase
	M	SD	M	SD		
words	119	35.74	134	43.57	1.92	+15
words(120)	1.59	0.50	1.65	0.48	0.63	+0.54
grades	3.39	1.08	3.72	0.97	1.83	+0.33

\* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

## Conclusions

In summary, the study suggests that learning using a knowledge building approach is conducive to making students perceive their course environment as more favorable for idea work and for collaboration. They see ideas as some tangible objects that can be expressed, interacted, comprehended, and integrated in a KBE class. Additionally, they also believed members' participation and collaboration in the class community were very important as all the members who were treated equally in KBE were responsible for knowledge contribution and construction. Moreover, as compared with the previous POP class/learning, students also demonstrated better English composition scores. The results implies that knowledge building pedagogy is useful for enhancing writing that requires idea diversification, thought clarification, structure completion, and community collaboration.

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