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Exploring college students' perceptions of classroom learning in a knowledge building environment

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Abstract. This study examined students' perceptions of classroom learning in a knowledge building environment. The participants were 48 college students in Taiwan, who participated in a course titled "Introduction to Natural Sciences." The course was implemented based on knowledge building pedagogy. The online learning environment, Knowledge Forum, was employed to help engage students in collaborative knowledge building. A questionnaire (SPOCK) on the perceptions of classroom learning and knowledge building was employed to assess how students' viewed their learning activities in class. The findings indicated that the students involved in a knowledge-building environment perceived stronger student-centeredness for their classroom learning than those who were not involved in a knowledge-building class. Further analyses on students' online discourse will be conducted to better understand students' perceptual change.

Keywords: knowledge building, Knowledge Forum, perception of learning.

Introduction

Traditional instruction tends to be more teacher-centered in which learning usually emphasizes knowledge assimilation, rather than knowledge construction. However, with recent advances in computer-supported collaborative learning (CSCL) environments, more creative learning and knowledge construction have become possible [1][2]. Nevertheless, despite the widespread use of CSCL environments, less attention has been given to learners' perception of CSCL environments. Tsai [3] argues that students' conceptions and attitudes of web-based learning are important prerequisites to effective web-based instruction. If students thought that learning is an individualistic activity, they will be less likely to involve in collaborative learning. On the contrary, if students are often engaged in environments that emphasize knowledge sharing and co-construction, their conception of learning will be more group-oriented. Given the increasing importance of CSCL in today's education, it is timely to investigate students' perceptions of online learning environments.

Knowledge building theory

In the present study, we are interested in investigating students' perceptions of a knowledge building class. Whitehead [4] argues that learning should not be regarded as a process of accumulation of knowledge; instead, we have to take an innovative viewpoint that highlights the reproduction and transformation of knowledge in education and emphasizes learning as active, critical and creative activities. From a knowledge building perspective, knowledge can be changed or improved through continual idea generation and improvement [1][5. The concept of knowledge building theory was originally proposed by Scardamalia and Bereiter [5]. According to them, knowledge and ideas should not be seen as personal properties, but should be treated as public, social epistemic entities, which can be continuously improved via community members' collaboration, interaction, elaboration, and innovation of ideas. When engaged in knowledge building, members of a community are guided to address authentic problems, and to facilitate the exchange and transformation of ideas, in order to achieve the goal of collective knowledge advancement.

To facilitate knowledge building, Scardamalia [6] proposed a set of 12 principles to help conceptualize the complex social dynamics involved in knowledge building environments. They include authentic problem; improvable ideas; idea diversity; rise above; epistemic agency; community knowledge; democratizing knowledge; symmetrical knowledge advances; pervasive knowledge building; constructive uses of information; knowledge-building discourse, and concurrent assessment (see [6] for detailed explanations). These principles are intended to help teachers better understand the process of knowledge building so as to support the process of classroom knowledge work among student learners. Empirical research has demonstrated positive effects of knowledge building pedagogy on depth of inquiry, collaboration, and co-construction of knowledge, both from Western and Eastern cultures [5], [7], [8].

Researchers studying classroom climate have demonstrated the classroom climate which teachers construct has effects on students' learning [9][10]. To date, at least two broad types of learning environments have been identified. One is a teacher-centered learning environment, which usually focuses on lecturing and instilling textbook knowledge, and hopes that students' academic achievement can be improved by means of direct knowledge delivery [11]. In Taiwan, teaching is often presented this way, emphasizing on the importance of knowledge acquisition and neglecting students' creative capacity for knowledge creation. Another is a student-centered environment, which in contrast pays more attention to students' innovative learning processes and needs, with the role of teachers as someone who provides support to help students learn in a more self-initiated and self-directed manner. Pratt [12] argues that the student-focused learning environments provide students with more encouragement to build mutual confidence between teachers and students. Therefore, it is important to create more student-centered learning environments and we envisage that engaging students in a collaborative knowledge building environment should have positive effects on their views of classroom learning. Yet, such assumption remains to be tested (especially in an Eastern cultural context). As such, this study investigates the effect of implementing knowledge building pedagogy in shaping students' perception of classroom learning.

Method

The Participants in this study included 48 college students (26 females) in a top Taiwanese university (these students were ranked above the 95th percentile nationwide). Learning from textbook for the purpose of achieving high scores in standardized tests are considered as a cultural norm in the nation. As such, the adoption of knowledge building pedagogical approach represents a novel instructional approach. The study took place in a class titled "Introduction to Natural Sciences" over a period of an 18-week semester. Knowledge-building pedagogy and Knowledge Forum technology were implemented in the class to provide students a learning environment that emphasized collaborative learning and knowledge creation. To facilitate the adoption of knowledge building pedagogy and technology, a tutorial workshop was given in the beginning of the semester (e.g., students learned how to create, and build-on to others' notes). The instructor was familiar with knowledge building pedagogy, and had 6 years of experience of using Knowledge Forum at the time this study was implemented. Some instructional activities included reading papers, class discussion, watching videos, and online threaded discussion. Knowledge Forum was used to support knowledge building activities (e.g., helping students generate deeper ideas for solving practical problems through sustained generation, interaction and elaboration of ideas). Figure 1 shows a screenshot of a Knowledge Forum 'view' (a discussion board).

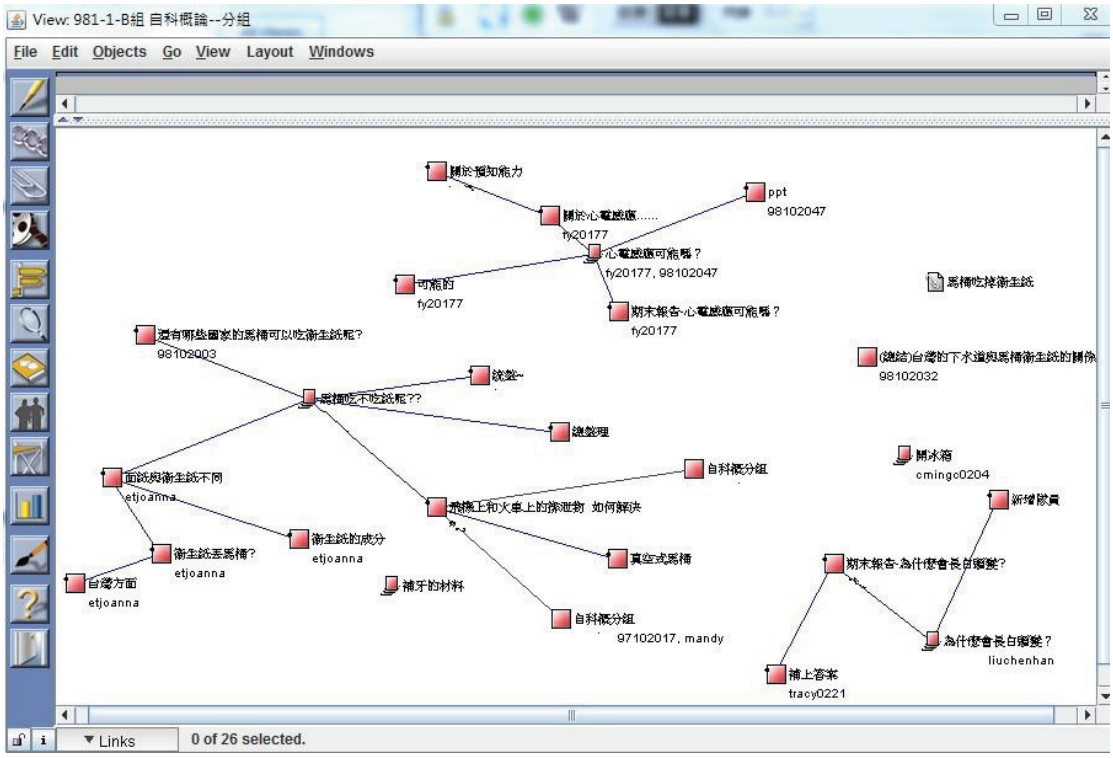

Figure 1. A screenshot of a Knowledge Forum 'view'

The data of this study came mainly from student's online performance; in addition, this study employed a 5-point Likert survey called Student Perception of Classroom Knowledge Building (SPOCK) [13]. The survey measures six aspects of student' perceptions in class: (a) Self-Regulation (nine questions; e.g., in this class, I take notes and jot down questions when I am reading the class materials); (b) Knowledge Building (10 questions; e.g., in this class, I think about different approaches or strategies I could use for studying the assignments); (c) Question Asking (three high-level questions, e.g., in this class, I ask questions about things I am

curious about, and four low-level questions, e.g., in this class, I ask questions so that I can be sure I know the right answers for tests); (d) Lack of Initiative (10 questions; e.g., in this class, I rely on someone else to tell me what to do); (e) Cooperative Learning (five questions; e.g., in this class, my classmates and I actively share ideas); and (f) Teacher-Directed Classroom (seven questions; e.g., in this class, I get most of the information from the textbook and the instructor).

Coefficient alpha reliability estimates for SPOCK were consistent with those obtained for similar instruments, such as the Motivated Strategies for Learning Questionnaire (MSLQ) and LASSI [14][15]. The Cronbach's alpha for SPOCK for this study was .93. At the end of the semester, the students were asked to use the SPOCK survey to report their perceptions of learning in this particular knowledge building class. As it is only sensible to assess class climate after a class is finished, no pre-test was conducted; to compensate, an additional survey was made to the same students by asking their learning perceptions in other non-knowledge-building classes in the school, using the same survey. The results derived from the knowledge-building and the non-knowledge-building environments were then compared, by means of a paired-sample *t*-test.

Results

Table 1 shows data regarding basic knowledge building activities (derived from the Analytic ToolKit) which was used to show the intensity of collaborative learning activities over the semester (two phases,. each last for nine weeks, were divided using midterm exam as a separating point). Overall, paired-sample t-tests indicate that there were no significant differences between the two phases in all the knowledge building activities. The number of notes generated and worked-on, the number of notes being read, and the number of notes being built-on/linked indicate that the classroom community can be regarded as fairly active and collaborative (see for example, [16]). The findings suggest that the time and effort spent on learning and using the KF for discussion is equally distributed between the two phases. Table 2 further shows that there were significant correlations among most of basic KB activities, indicating that the more active the participants were in a KB activity, the more likely they would be actively engaged in another activity.

Table 1. Basic knowledge building activities

Activity	Phase 1	Phase 2	t-value
	M(SD)	M(SD)	
# of notes created and worked	14.27(12.45)	11.44(7.17)	1.58
# of notes read	162.17(111.64)	171.73(127.96)	-0.47
# of notes built-on	11.08(11.77)	8.21(6.66)	0.10
# of Reference	3.27(3.58)	1.96(3.85)	1.78
# of scaffolds used	10.81(13.05)	7.50(7.83)	1.88
# of annotation	0.13(0.44)	0.67(2.29)	-1.61

Table 2. Correlations among knowledge building activities in Knowledge Forum

KB activity	1	2	3	4	5

1. # of notes created/worked	-				
2. # of notes read	.488**	-			
3. # of notes built-on	.734**	.460**	-		
4. # of Reference	.27	.320*	.25	-	
5. # of scaffolds used	.676**	.578**	.85**	.28	-
6. # of annotation	-.00	.04	.09	-.06	.06

* $p < .05$. ** $p < .01$.

SPOCK analysis. Table 3 further shows a comparison between students' perceptions of learning in the knowledge building class and their overall perceptions of learning in non-knowledge classes in the school. Of the six aspects of SPOCK, it was found that students in a KB class were more likely to engage in knowledge building activities (M=3.94>3.50), in asking higher-level questions (M=3.68>3.21), and in working collaboratively (M=3.98>3.44). They are also less likely to be lack of self-initiative (M=3.12<2.93) and they perceived lesser teacher directedness in their classroom learning (M=3.69<3.07). On the other hand, students in a KB class were less likely to engage in a self-regulatory mode (M=3.40<3.65). Overall, the results suggested that students in a KB class tended to perceive their class as a more constructivist-oriented, student-centered classroom.

One thing to note is that the rating of students' perceived "Self-Regulation" is low in a KB class. This may be because the questions asked in the survey were mainly about the routine class assignments (e.g., a question item asked, "In this class, I think about the best ways to study each assignment."), rather than working for the purpose of knowledge building that was pedagogically designed for this class (e.g., asking whether students would become more self-directed learners in producing ideas for solving real-life, rather than textbook, problems). Thus, it is not surprising to see lower ratings in this aspect. Further, the reason why the lower-level questioning behaviors did not differ significantly as expected was perhaps because most students tended to use lower-level questions as a basis fundamentals to gradually build up to higher-level questions. To sum, the findings indicate that engaging students in knowledge building activities did help them perceive their class as more collaborative and interactive for the advancement of knowledge.

Another thing to note is that a significant correlation (r=.0297, p<.05) was found between the total number of notes created/contributed/worked in the KF and the combined SPOCK score (which was computed by adding all the average ratings of the positive dimensions and subtracting that of all the negative dimensions). This suggests that in general, the more activities students engaged in KF, the more likely they would perceive the class as student-centered. Whether this also represents a causal relationship, however, remains to be examined.

Table 3. Differences in terms of aspects of students' perception of classroom

Aspect	Non-Knowledge building environment *M (SD)*	Knowledge building environment *M (SD)*	*t*-value
Self-Regulation	3.65 (.52)	3.40 (.49)	3.35**

Knowledge Building	3.50 (.48)	3.94 (.46)	-6.70***
Question asking			
Lower level	3.31 (.72)	3.27 (.59)	0.44
Higher level	3.21 (.70)	3.68 (.82)	-4.67***
Lack of Initiative	3.12 (.38)	2.93 (.51)	2.91**
Cooperative Learning	3.44 (.61)	3.98 (.51)	-5.70***
Teacher Directed Classroom	3.69 (.48)	3.07 (.65)	5.22***

** $p < .01$. *** $p < .001$.

Discussion

In summary, the findings in the present study showed that engaging students in knowledge building activities was helpful to change how they perceived learning in many important aspects. For one, as compared with non-knowledge-building classes, students engaging in a knowledge building class tended to ask more high-level questions. Second, through the process of idea interaction and knowledge creation, students were more likely to see collaboration as part of their learning processes. Third, they also tended to perceive learning as student-centered rather than teacher-directed. Overall, engaging students in knowledge building activities seemed to help them develop more positive perceptions towards knowledge building practices.

Learning and teaching are not independent of each other. To make a learning environment more effective, it is important to bridge the gap between them. One way to mitigate this gap is to help teachers better understand students' perceptions of class learning. Doing so is helpful for teachers to figure out how to improve their instructional processes in order to help students develop more positive and enthusiastic perceptions of learning.

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