

Factors Influencing Students' Satisfaction and Dissatisfaction with the Online Learning Community for Korean High School Science Classes

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ABSTRACT *The purpose of this study was to investigate factors influencing students' satisfaction and dissatisfaction with an Online Learning Community (OLC). The OLC was a Web-based system that was used to supplement school science curriculum. Data were collected from 62 Korean high school students using an open-ended questionnaire. The factors related to the learners' satisfaction with the OLC involved 'usefulness,' 'easiness of use,' and 'fun factor.' The reasons underlying the students' dissatisfaction with the OLC were classified into three categories, including 'environment problem,' 'student problem,' and 'teacher problem.' In general, the learners considered the OLC as helpful for their learning and recognized their difficulty in getting used to the Web-based system. It is strongly suggested to utilize a Web-based system like the OLC, as an educational tool for teaching and learning science.*

KEY WORDS: *Cooperative technology, Online Learning Community (OLC), Web-based system.*

Introduction

Educators are beginning to worry that school learning cannot keep pace with the development of science and technology, and suggested that a Web-based system may help to fill the gap (Molnar, 1997). Today it would be insufficient, even incongruent, to teach students without using the Web, given how completely they are already integrated into both the workplace and home. For example, 10 million Koreans, out of the total 47 million population, used the Internet in 1999, and the use of the Internet is increasing rapidly in Korea since that time. According to the data obtained in December 2002, 71.8% of the people using the Internet did so every day, most (79.5%) accessed it from home, and 39.6% had already joined online communities. In addition, the most frequently used (55%) method of connecting to the Internet was via exclusive connection lines, such as xDSL (x Digital Subscriber Line), which allows the transmission of large volumes of data (Korea Educational Development Institute, 2002). The continuing increase in the use and the recognition of the value of online communities in Korea make the utilization of a Web-based learning system feasible for educational purposes.

What should be the orientation of a Web-based system in education? Many researchers have suggested the concept of collaborative technology (Angeli, Valanides & Bonk, 2003; Dalton, Hannafin, & Hooper, 1989; Hooper, Temiyakarn & Williams, 1993; Johnson, Johnson, & Stanne, 1985, 1986; Lou, 2001; Vockell, 1989). A collaborative technology is a tool that allows individuals to be collectively engaged in the active production of shared knowledge. Such tools are used in the context of a learning community, which supports that social interaction and practical activity are essential to the act of learning (Brown, Collins, & Duguid, 1985; Collins & Collins, 1996; Hung, 2002). Thus, a Web-based system enables people to construct a learning community, wherein the members (e.g., students, instructors, and experts) share significant activities and develop new knowledge and understanding.

This theoretical framework inspired us to set up the Online Learning Community (OLC) project. This project was based on the construction of a Web-based learning community that could be accessed through Internet connection. A learning community is an environment in which the goal is to advance collective knowledge and thereby support the intellectual growth of each member. In such a culture of learning, emphasis is placed on sharing with others, learning with others, and indeed learning how to learn. For this purpose, an educational system needed to be developed in ways that each individual's contribution is accepted and respected, and must build mechanisms for the community to synthesize diverse and even opposing views. To enable students to learn how to construct knowledge appropriately, it is also necessary that the process of constructing knowledge be guided and supported by more knowledgeable and skillful mentors. We believed that the OLC could provide a learning environment where learners' Zone of Proximal Development (ZPD) could be effectively taken into consideration. In other words, the gap between a learners's current or actual of development determined by independent problem-solving, and the learner's emerging or potential level of development could be effectively bridged. The concept of the ZPD (Vygotsky, 1978) implies that a person's capability to learn has no upper boundary and what one learns with the aid of others today can be done independently tomorrow.

A Web-based system creates a social climate that is very different from that in the traditional classroom. Due to the lack of nonverbal cues, an immediate and refined interpretation of the information gleaned from an online environment may sometimes be more difficult to achieve than in face-to-face situations. The lack of physical and psychological cues, such as physical appearance, intonation, eye contact, and group identity, may also have negative effects on the learning process (Kiesler, 1986; Short, Williams & Christie, 1976; Steeples, Unsworth, Bryson, Goodyear, Riding, Fowell, Levy, & Duffy, 1996; Veerman, Andriessen, & Kanselaar, 2000). In order to overcome these weak points resulting from implementing a Web-based system alone, the design principle for the development of the OLC integrated computer technology into regular classes in school was used. The OLC was developed in a manner that the teacher could easily organize students within an online community and facilitate interaction of the members, when needed in the school science curriculum.

Most researches compared the effectiveness of the traditional and Web-based environments (Chou & Liu, 2005; Glen, Jones, & Hoyt, 2003; Klesius, Homan, & Thompson, 1997; Liaw & Huang, 2000; Ocker & Yaverbaum, 2001; Tiene, 2000),

but only few studies examined students' opinions concerning an online learning method, like the OLC, as a supplementary tool to the school science curriculum. Moreover, when a new and innovative strategy is introduced, it is important to investigate learners' perceptions, given that the learners are vital members of the educational framework. Considering such a need, we investigated Korean high school students' reactions and understandings about the Web-based learning experience in terms of their satisfaction and dissatisfaction with the OLC.

Methodology

The Online Learning Community (OLC)

To create the OLC, a pre-made infrastructure, a Web-based platform, with the support of the Korea Education and Research Information Service (KERIS), was used. The KERIS established a website for educational purposes, and invited teachers and students to develop their own communities on it. A teacher can readily create online groups with several clicks by going through the formalities of the Web-based platform. Once being members of the community, students are allowed to be involved in several learning activities at any place and whenever the Internet connection is available. The teacher participating in this study was herself one of the researchers, who developed the OLC and collaborated with her own students for teaching and learning high school science.

The OLC used in this study aimed to integrate a Web-based learning system into regular science curriculum. Table 1 delineates the learning activities offered in the regular classes (i.e., face-to-face environment) and the OLC.

Table 1
Learning and Teaching Activities in the Face-to-face and the OLC Environments

	Face-to-face environment	OLC environment
Students	<ul style="list-style-type: none"> • Students study the basic content related to the textbook. • Students listen to the teacher's explanations. 	<ul style="list-style-type: none"> • Students discuss topics with one another and make plans for the research of their own group. • Students search for resources, collect materials, and compile data. • Students post questions and provide answers on the bulletin board. • Students post the results of their investigations and discuss them with other participants.
Teacher	<ul style="list-style-type: none"> • The teacher provides explanations of the basic content in the school curriculum. 	<ul style="list-style-type: none"> • The teacher gives main subjects of discussion, organizes students into small groups, and posts answers to the questions from students. • The teacher continuously monitors and guides student activities in the Web-based system. • The teacher offers learning materials when necessary, guides students into various resources, provides informative feedback, and suggests new ways for better performance.

In the classroom setting, the teacher mainly provided the class with basic learning materials in the form of textbooks and handouts. On the OLC itself, she provided main topics of study and organized students into small research groups. For this task, each participant was required to access a networked computer through Internet and use it to collaborate with others. This style of collaboration was different from the mode of several students using one computer that was identified by previous studies (Dalton et al., 1989; Hooper et al., 1993; Linn, 2003; Slavin, 1981; Vockell, 1989). Linn (2003) pointed out that the limited number of computers available in schools forces teachers to have many students using the same computer at the same time. The circumstances in Korean schools today are similar to those described by Linn (2003). Due to the lack of computers and time, the new collaborative technology could hardly be used in class. In addition, most users (79.5%) had access to Internet at home. Therefore, the use of the OLC could compensate for the shortage of computers in school, allowing the teacher and students to perform collaborative activities online, by accessing the Internet at home beyond class time.

The new collaboration style in the OLC enabled each student to benefit from interacting with peers and the teacher. To facilitate interaction with peers, the students were organized into small groups, and each member was given different assignments under a project presented by the teacher. The learners were asked to post, compile, and share their materials within the OLC, and cooperate in searching for answers regarding questions from each other. The students were also encouraged to interact by sending messages within the OLC and by e-mail. The teacher played the role of the facilitator, as she responded to student questions, guided the learners with regard to the selection and utilization of resources, monitored the progress of student learning, and posted informative feedback.

Figure 1 shows an example of the ways the teacher and students collaborated in the OLC. Once students click the corresponding button, they could go to the bulletin boards of each group. On the bulletin board, each student could access learning materials posted by others, check the feedback from the teacher, answer questions and post articles concerning research topics. The students were thus able to have opportunities to develop continuously their knowledge and understanding of some science subjects.

Data Collection

Subjects

The subjects of this study were the tenth-grade students in a high school, in a mid-sized city in Korea. This research included three projects, which were called the first learning activity (for three weeks from May 5, 2002 to May 26, 2002), the second learning activity (for three weeks from June 7, 2002 to June 28, 2002), and the third learning activity (for three weeks from November 1, 2002 to November 22, 2002). A total of 62 female students, enrolled in the tenth grade (average age of 15 years), participated in the three projects of the OLC and covered three major science topics throughout the academic year of 2002.

The topics in this study included 'waves,' 'acids, bases, and neutralization,' and 'contraception and abortion.' These subjects were designed to promote student

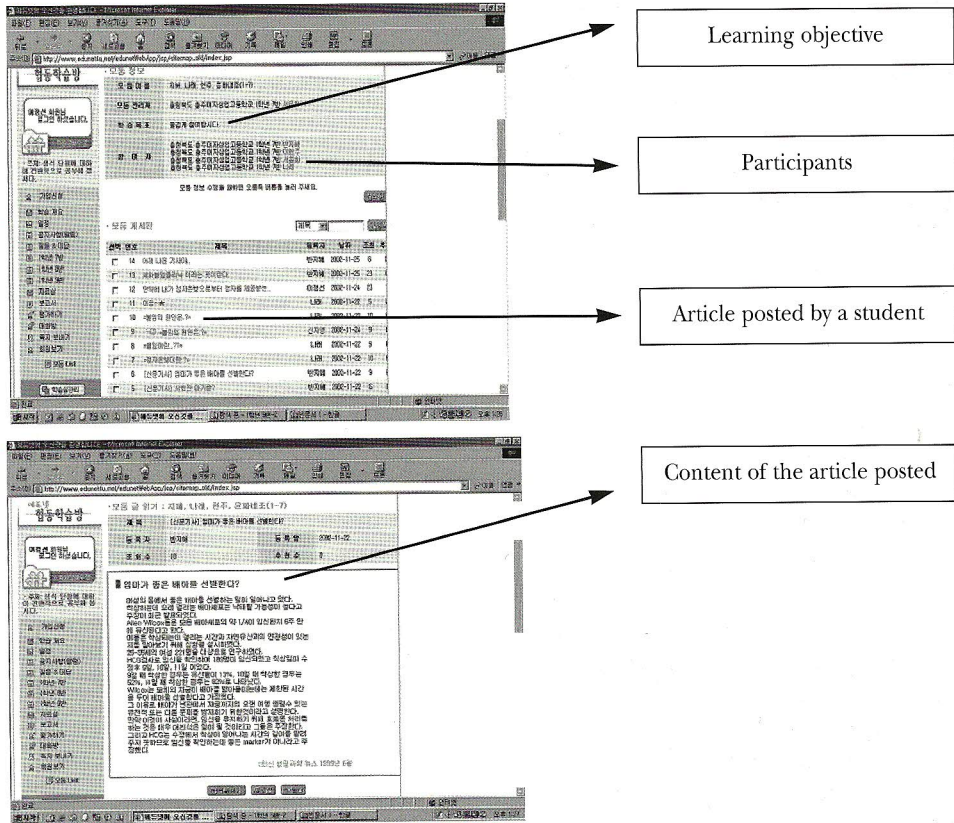


Figure 1. Features of the Bulletin Board Used by the OLC

understanding of the basic content of school science curriculum, and to teach them to connect their findings with real life situations.

At the end of studying each science topic, the students were asked to complete a questionnaire that involved two open-ended questions: "What aspect(s) of the OLC, as supplementary to the school science curriculum, were you satisfied with?" and "What aspect(s) of the OLC, as supplementary to the school science curriculum, were you dissatisfied with?" The learners were encouraged to freely describe one or more reasons with respect to their satisfaction and dissatisfaction with the OLC. One hundred eighty written responses made by sixty students, out of sixty two, after each of three learning activities, were used as data for the present study.

Data Analysis

In order to identify factors influencing students' satisfaction and dissatisfaction with the OLC, a panel of three high school teachers reviewed the relevant literature to find well-known categories of users' perceptions regarding Web-based technology (Davis, 1989; Kim, 2003; Leggett & Persichitte, 1998; Songer, Lee, & Kam, 2002). This process identified three categories of responses related to user satisfaction, that is, 'usefulness,' 'easiness of use,' and 'fun factor,' and three categories of responses related to dissatisfaction, namely, 'environment problem,' 'student

problem,' and 'teacher problem.'

These six categories were then used to group students' written responses. During this stage of the analysis, two of the three high school teachers worked closely together to read student responses and sort them under appropriate categories. But, whenever there was disagreement between them, the third teacher joined the panel to also check the responses and complete the categories. Despite such a negotiation process in the panel, there were the answers from two students for which the members of the panel could not reach consensus, and these were excluded from the analysis.

The data analyzed involved three different sets of students' written responses, corresponding to each of the three science topics, because the questionnaire was administered every time a topic was completed by the class. However, the present study did not attempt to compare the three data sets, because the primary purpose of the study was to get insights into how Korean high school students perceived the OLC, as a Web-based complementary learning system. Therefore, it should be noticed that the findings were drawn from the composite data.

Findings

In what follows, the six categories of responses related to the students' satisfaction and dissatisfaction with the OLC are presented in sequence. Actual examples of student written responses are provided, when necessary to better understand how the learners expressed their experiences with the Web-based learning system.

Categories of Responses Influencing Student Satisfaction with the OLC

Usefulness: Table 2 presents the number and percentage of student written responses describing their satisfaction with OLC. Usefulness, as a reason they were satisfied with the OLC, was the most frequently cited category of responses. Thus, the learners participating in the OLC activities thought that the integration of the Web-based system into the school science curriculum made their learning more effective. Davis (1989) defined 'usefulness' as the degree to which people believe that using a particular system would enhance their job performance. Similarly, we viewed usefulness as the students' belief that the OLC was helpful for them to learn science.

The large proportion of student responses to the questionnaire (91, 50.6%) revealed students' self reported conceptions about the usefulness of the OLC as a complementary to classroom teaching.

I used the Internet more for amusement than for studying. But in this activity, I enjoyed using the Internet for studying (KSW, pseudonym).

I think that I came to have a broader outlook after knowing about the principles of science from the OLC (PHY).

Easiness of use: 'Easiness of use' refers to student perceptions that the OLC was a convenient tool for searching out for information and data, and for discussing them with other members of the learning community. Examples of responses classified under this factor include:

It was difficult for me to express myself in the classroom. But, I found it much easier to express my thoughts in writing a text, step by step in the online environment (LHY).

Table 2
Factors and Typical Responses Concerning Student Satisfaction with the OLC

Factor (N of responses, %)	Typical response by the students
Usefulness (91, 50.6%)	I can learn science at home. I can interact with my friends and the teacher. I can have chances for sharing information. I have learned to understand and respect the opinions of others. I have learned to search for and use data available from the Internet. I have realized that science is related to everyday life.
Easy of use (40, 22.2%)	I found it more convenient to ask questions using the bulletin board in the OLC. I found it much easier to discuss in the online environment. Now, I can search for learning materials in the Internet with little trouble. It became easier for me to read various materials online.
Fun factor (49, 27.2%)	I became much closer to my teacher and friends. I found it that using computers for studying was pleasant. It was interesting for me to post messages online. I feel easy when learning science online with others.

I could easily talk to the teacher through posting a question in the OLC, and I was happy to find out that the teacher answered my question and encouraged me to upload new materials (LJW).

It should be stated that LJW was a shy and introvert student in ordinary classrooms. But, by analyzing her written responses and activities in the OLC, we could tell that she was encouraged to be involved in the online learning environment. By definition, 'ease' means being free from difficulty or great effort. Therefore, it is believed that inert learners may feel freer in an online communication system, like the OLC, and that educators should take advantage of such an environment for tailoring their feedback to the individual needs of the learners.

Fun factor: 'Fun factor' implies that the students are content with the Web-based system, because they find interest in the learning activities on the OLC. The following excerpts from the student written responses indicate that the learners were satisfied with the OLC, not simply because it was a novel method, but because it enabled them to gain learning benefits, while interacting pleasantly with other participants.

I was happy, because I could have much time to talk to friends and the teacher in the OLC. I became close to the teacher with whom I had not been familiar at other times (PJR).

I came to have more interest and participation in science than I had never before (YNK).

Categories of Responses Influencing Student Dissatisfaction with the OLC

While often emphasizing the reasons underlying their satisfaction with the OLC, the students also expressed dissatisfaction with the Web-based learning system in their responses. Table 3 presents the number and percentage of student written responses describing their dissatisfaction with OLC.

Table 3
Factors and Typical Responses Concerning Student Dissatisfaction with the OLC

Factor (N of responses, %)	Typical responses by the students
Environment problem (70, 38.9%)	I have a problem in using the OLC, because of old-fashioned computers. I have difficulty in connecting the Web-site used by the class. It is difficult for me to find computers with the Internet connection available.
Student problem (101, 56.1%)	I have difficulty in using the OLC, because I am not good at dealing with computers. I have difficulty in using the OLC, because I am not familiar with such an online environment. Due to my laziness, it was hard for me to learn science online with others.
Teacher problem (9, 5.0%)	Sometimes I have to wait long for an answer by teacher. I was unhappy, because of the doubt of the teacher's participation in the OLC.

Environment problem: Among three categories of responses related to student dissatisfaction, 'environment problem' refers to the cost aspect, such as the shortage of computer-related equipment and any difficulty with the Internet connection. Typically, students stated troubles with the Internet connection, as in the following example:

It was difficult to get on the Internet, because the exclusive line for the Internet was not available at my home. I usually tried to connect the Internet at my friends' or commercial facilities (ADH).

In fact, the Web-site used to develop the OLC in this study was instable and at times inaccessible. Consequently, although most students were equipped with computers, the response frequency of the environmental problem increased over time. This result implies that to successfully adapt a Web-based learning system, not only administrative but also technical support should be provided and sustained throughout the learning process (Leggett & Persichitte, 1998).

Student problem: The factor 'student problem' means the learning barriers arising from the learners themselves, including psychological aspects, such as, the lack of confidence and technical aspects (i.e., unfamiliarity with an online system). An example of the responses classified into this category follows:

It was difficult for me to know what to do. We have not been taught how to use the Web for learning. Also, I was afraid of what others thought about my opinions which I had posted in the board (LSJ).

Based on the frequencies of the student written responses, the 'student problem' was the most influencing factor for the learners' dissatisfaction with the OLC (101, 56.1%).

Teacher problem: In contrast to the student problem, 'teacher problem' refers to the barriers related to the teacher. Only five percent of the students' written responses indicated examples of teacher problems, including, "I had to wait for a long time for an answer from the teacher" (SIY). This indicates that despite its other characteristics, the OLC was extremely time consuming for the teacher.

Discussion

It has been reported that the learning activity in school does not catch up with the actual development of science and technology. In order to overcome this drawback, new instructional approaches can also use a Web-based environment. Nowadays, with the tremendous development of computer and information technologies, the value of Web-based learning systems cannot be underestimated and it is necessary to make effective use of such a system for teaching and learning. When the present OLC was employed as a supplement to the typical face-to-face classroom teaching in a Korean high school, some difficulties related to the traditional instruction were, to a certain extent, overcome.

Some positive aspects of the students' conceptions were also identified. These positive aspects include student perceptions that the OLC fostered learning from peer interactions, and that it provided students with ownership and motivation for learning. The positive aspects of the OLC found in this study are similar to those which have been identified in previous studies concerning the effects of Internet use in educational settings (Chou & Liu, 2005; Davis, 1989; Lee & Yoo, 2003; Kim, 2003; Songer, 1996; Vazquez-Abad, Brousseau, Waldigg, Vezina, Matinez, & Verjosky, 2004). Especially, usefulness appeared to have the biggest influence on satisfaction with the online education system. That is, the students felt that integrating the OLC into the school science curriculum would be useful for them. Davis (1989) suggested that the perceived usefulness was significantly correlated with self-reported indicators of innovative system use, like the OLC. Therefore, this factor should not be ignored when attempting to design or implement successful systems.

However, it was evident that the OLC included both satisfying and dissatisfying aspects, and obstacles preventing its effective implementation. Based on the frequencies of the student written responses, the 'student problem' was the factor that contributed more to the learners' dissatisfaction with the OLC. Thus, many students were rather accustomed to the passiveness of the traditional classrooms, and some of them considered themselves as being poor at collaborating for learning in an online environment. Such a negative self-conception would be treated properly by increasingly exposing students to Web-based learning activities with the teacher's guidance and appropriate scaffolding.

The factor 'teacher problem' related to the delayed feedback provided by teachers, and indicates that the role of teacher as a learning facilitator cannot be ignored, while taking into consideration that for the teachers the process is time consuming. The role of the teacher as a learning facilitator relates to the need for providing individual guidance about new information, technology, and learning content (Simonson & Thompson, 1994). In addition, the teacher has to function as an advisor both in the classroom and the OLC by organizing and structuring activities, and scaffolding the dialogues among the learners (Postholm, 2006). In fact, teachers should be trained to determine when, why, and how an online environment, such as the present OLC, should be employed (Valandies & Angeli, 2005). The present study did not collect direct evidence regarding the teacher's roles for an online system; the role of the teachers seems to be pivotal for meaningful learning in any educational setting.

Thus, further studies are needed to examine how the teacher fulfills his or her

pedagogical functions in a Web-based learning community. More research evidence is needed to guide the successful integration of an OLC, so that the effects of any positive aspects are intensified and the effects of negative aspects are removed or minimized. School- or district-wide educational programs should provide teachers and students with opportunities to prepare themselves as effective users of a Web-based learning system by understanding the capabilities and limitations of the new technology (Leggett & Persichitte, 1989) and investing on their potential for more effective teaching/learning environments.

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