UNDERGRADUATE STUDENTS’ SELF-REGULATED LEARNING EXPERIENCE IN WEB-BASED LEARNING ENVIRONMENTS

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This phenomenological study explored 5 undergraduate students’ experiences in a Web-based general science course through the lens of social cognitive theory. Thematic analysis was used to examine their self-regulated learning (SRL). Our findings revealed that the participants exerted a variety of SRL strategies in the Web-based learning environment (WBLE) with the facilitation from instructional elements and strategies: planning with the online calendar, monitoring progress with the online gradebook, and sustaining motivation with instructor’s virtual presence via multimedia capability of the WBLE. They were also able to adapt to the WBLE by adjusting their study routines, note-taking strategies, and seeking help to succeed in this Web-based course. Design implications were provided based on our findings in this research.

INTRODUCTION

Online education, as a subcategory of distance education, has established its status in recent years, thanks to the advance of Internet technology and development of the broadband network. According to Online Nation (Allen & Seaman, 2007), the annual report by the Sloan Consortium on online education in higher education in the United States, almost 20% of all U.S. higher education students were taking at least one online course in the fall of 2006, and 86% of those were undergraduate students. Specifically, for research universities, the compound annual growth rate (from 2002 to 2006) of students taking at least one online course was 22%. Furthermore, this report revealed that 67% of academic leaders of research universities believed that students’ demand for online learning is growing.

The rapid growth of online learners and future demand of online learning imply that online education is a “win-win” situation for both the learners and education providers. For learners, the online delivery format, like other delivery formats of distant education (e.g., correspondence courses and TV broadcast), provides the following advantages: breaking
geographic barriers, saving time and transportation expense, and flexible scheduling. Additionally, students can have access to the online instructional materials as long as they have adequate Internet access. For education providers, online courses can help increase student access (Allen & Seaman, 2007), while enabling better use of limited resources such as instructors and classrooms. In large universities where thousands of undergraduate students are required to take general education courses, online courses might be a method to accommodate relatively large enrollments (50 enrolled students or more) without the physical constraints of traditional classrooms.

Despite the aforementioned advantages of online learning, the Web-based learning environments (WBLEs) featured in online courses pose different challenges for learners, as indicated by higher attrition rates in online learning environments (Martinez, 2003). On the affective aspect, the motivation factors available in the traditional classroom, such as interpersonal communication with the instructor and peers, may be lacking in the online setting, resulting in a sense of isolation (Yang, 2003; Hodges, 2005). Also, the lack of technical support and delayed feedback from instructors may also cause students frustration (Yang, 2003). In addition, as Opwis (2004) pointed out, the characteristics of WBLEs require more autonomy from students and are likely to make them assume more responsibility in their own education and learning. Similarly, other researchers indicated that in WBLEs students need to exercise a high level of self-regulation to achieve their learning goals and course requirements, while in traditional face-to-face classroom settings, instructors have better control over the learning process, and may be better able to monitor students' attention and progress (Dabbagh & Kitsantas, 2004; Hodges, 2005).

Past Research on SRL in WBLEs

Past research suggests that self-regulation is an important factor that impacts one's success in traditional classroom settings (Zimmerman, 2002). Artino (2007) further argued that self-regulated learning (SRL) skills may be especially important for students participating in online education, since online learning requires high autonomy. SRL involves “metacognitive, motivational, and behavioral processes that are personally initiated to acquire knowledge and skill, such as goal setting, planning, learning strategies, self-reinforcement, self-recording, and self-instruction” (Zimmerman, 2001, p. 13855). Although SRL has been extensively researched since the 1970s (Zimmerman, 2001), there are relatively few studies on SRL in WBLEs, as the Internet has been one of the top choices for distance learning recently (Moore & Kearsley, 2005).

Several correlational studies examined the relationship between self-efficacy (i.e., students’ confidence in their ability to complete specific learning tasks, Bandura, 1997) and other learning-related variables. For example, in a study by Joo, Bong, and Choi (2000), Korean junior high school students’ self-efficacy for SRL positively correlated with academic self-efficacy, cognitive strategy use, and Internet self-efficacy in three Web-based instruction sessions of a regular biology course. Also, Wang and Newlin (2002) found that college students’ self-efficacy for online learning positively correlated with academic performance in the context of a Web-based course.

A few experimental studies examined the effects of SRL strategies on learning outcomes. For instance, Kauffman (2004) found cognitive strategy prompts for note-taking had a significant influence on college students’ learning achievement. In addition, Kramarski & Gutman (2006) found that in an online environment, Israeli 9th graders supported with self-metacognitive questioning performed significantly better than their peers without such support, in problem-solving procedural and transfer tasks regarding mathematical explanations, and using self-monitoring strategies during problem solving.

Applying qualitative inquiry through interviews and archived documents (e.g., online
journal and discussions), Whipp and Chiarelli (2004) provided a rich picture of six graduate students’ SRL in a WBLE and how they adapted SRL in the unique environment. Their findings of SRL included daily access, printing materials for offline reading, and frequent checking of the online gradebook.

Among the aforementioned studies, several important aspects of SRL were investigated, such as self-efficacy, cognitive strategy, and metacognitive strategy. Those studies also provided valuable design implications for Web-based course instructors and designers. However, the following aspects still need to be addressed to further understanding of students’ SRL in WBLEs.

First, studies applying correlational and experimental design provided information concerning the correlational relationships among SRL-related constructs as well as the impact of SRL strategies on learning. Nevertheless, they did not depict students’ actual SRL experience in the authentic settings.

Second, although Whipp and Chiarelli (2004) provided a rich picture of graduate students’ SRL, those students are arguably subject to more selective institutional screening than undergraduates. Thus, the picture of SRL in WBLEs for general college students should differ. In addition, Whipp and Chiarelli (2004) did not conduct observation of students’ SRL in the WBLE; therefore, they might miss any online adaptations of SRL that their participants failed to reveal in the interview process.

Finally, students’ SRL could have evolved with the affordance of the advanced Web technology (e.g., help-seeking via online chatroom). Whipp and Chiarelli (2004) argued the design of the Web-based course in their study seemed to encourage students’ use of SRL strategies. For example, the master-level graduate students in their study mentioned that it was easy to self-monitor their progress through an online gradebook. While the findings of their study (conducted in 2000) are informative, changing technologies might open other possibilities in terms of enhancing students’ self-regulation. In the conclusion of a review of self-regulation in the Web courses, Hodges (2005) indicated the need to understand the technology affordance as well as instructional strategies in Web-based courses that can promote the effective use of self-regulated learning strategies. Likewise, Artino (2007) urged future research of self-regulation in online education to focus on instructional elements and individual characteristics that may contribute to learning and achievement in this setting. These voids in the existing knowledge and understanding of college students’ SRL in WBLEs drove our exploration of the phenomenon.

THEORETICAL FRAMEWORK

The purpose of this study was to describe the authentic experience of undergraduate students in a particular online course to discover their SRL in the WBLE, with the social-cognitive perspectives guiding our exploration. According to Bandura (2001), social-cognitive theory explains human functioning in terms of triadic reciprocal causation, which refers to the reciprocal interactions among behaviors, (physical and social) environmental variables, and personal factors (e.g., self-efficacy). Under the framework of social-cognitive theory, self-regulation is deemed to be influenced by the cyclical process of the interactions among these three factors. That is, self-regulated individuals would change their strategies, cognitions, affects, and behaviors during learning as a result of their monitoring and reaction upon these factors (Schunk, 1989). In the context of Web-based learning, individuals’ SRL behaviors may include different learning strategies, such as note-taking, summarizing, checking online announcements from the instructor, etc. Personal factors may include self-efficacy on taking Web-based courses and goal orientations. The physical environment in this context has two levels, namely, the surroundings where learners work on the lessons and the WBLE where the lessons reside. The social environment includes peers and instruc-
tors, who may provide modeling, guidance, and feedback (Zimmerman, 2001).

By examining these three factors, we intended to create a more comprehensive picture of SRL in this specific context. Thus, we defined self-regulated learning in the Web-based learning environment as “the active, constructive process whereby learners set goals for their learning and attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features of the environment, where the entire course is delivered on the Web” (Pintrich, 2000; Baker & O’Neil, 2006). We generated the following research question to help crystallize the investigation: What are undergraduate students’ self-regulated learning experiences in a Web-based course? Specifically, we are interested in examining SRL in the WBLE through the lens of triadic reciprocity under the social cognitive framework.

**METHOD**

We employed the phenomenological method to develop a deeper understanding of the undergraduate students’ SRL in the WBLE through their lived experience. This lived experience refers to “the immediate and pre-reflective consciousness of life” (Van Manen, 1997, p.35). With a phenomenological approach, we intended to describe the essence of students’ lived experience to show a vivid picture of their self-regulated learning in WBLE (Van Manen, 1997).

**Participants**

The participants in this study were five undergraduate students in a large, northeastern public research university in the U.S. Specifically, they were students enrolled in a Web-based general science course, Energy and Environment, in the summer of 2007. Students were recruited to participate in this study, and the primary recruitment criterion was near-campus or campus residency for the purpose of on-site interview and observation. Among the five participating students, two were males and three were females. They were provided with a 2% credit of their final grade as compensation. The following is a table of general demographics of the participants.

**Context: A Description of the Course**

Since 2002, the course, Energy and Environment, has been offered as a Web-based course in the fall, spring, and summer, with an enrollment of approximately 1000 students annually. Like most of the courses at the uni-

![](https://example.com/Table1.png)

**TABLE 1**

Participant Demographics

<table>
<thead>
<tr>
<th>Name</th>
<th>Semester</th>
<th>Major</th>
<th>Prior Online Course</th>
<th>Self-Reported GPA</th>
<th>Self-Reported Technology Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tom</td>
<td>Junior</td>
<td>Division of undergraduate studies</td>
<td>No</td>
<td>2.5-2.99</td>
<td>Comfortable with Web</td>
</tr>
<tr>
<td>Gary</td>
<td>Junior</td>
<td>Information sciences and technology</td>
<td>No</td>
<td>3.6 or above</td>
<td>Tech-savvy</td>
</tr>
<tr>
<td>Christy</td>
<td>Senior</td>
<td>Hotel, restaurant, and institutional Management</td>
<td>No</td>
<td>Not available</td>
<td>Hate technology</td>
</tr>
<tr>
<td>Maggie</td>
<td>Junior</td>
<td>Actuarial science</td>
<td>One</td>
<td>Not available</td>
<td>Not a problem</td>
</tr>
<tr>
<td>Rosie</td>
<td>Sophomore</td>
<td>Journalism</td>
<td>One</td>
<td>3-3.59</td>
<td>Tech-savvy</td>
</tr>
</tbody>
</table>
versity, this course is supported with ANGEL, the adopted course management system (CMS). In this Web-based course, students mainly interact asynchronously with the instructor in the CMS, but the instructor can also provide a face-to-face meeting during his office hour if students need it. This general science course introduces a wide range of issues related to energy use and environmental challenges in 10 lessons. In addition to three exams and one research paper, other course components include weekly quizzes, reflections, and ice-breaking short answers. This study explored students’ SRL in the WBLE in a 6-week module during the summer session. In this compact and intensive offering, students complete two of the 10 lessons almost every week, and take an exam every other week. Within the CMS (ANGEL version 7.1) there are six default tabs representing different functionality where instructors may include course information and material. These six tabs are Syllabus, Calendar (exam dates and assignment due dates), Lessons (major content, video, quizzes, exams), Resources (announcement), Communicate (course e-mail), and Report (gradebook).

**Data Collection and Analysis**

To learn about undergraduate students’ lived experiences of SRL in the WBLE, we collected primary data through in-depth interviews and observations, and secondary data through artifacts. In interviews, we probed for participants’ general Web-based learning experiences (e.g., number of past Web courses) and potential SRL themes, such as goal-setting, routines of completing assignment, exam preparation strategies, and help-seeking. In observations, we recorded field notes of students’ navigation routines, note-taking, time management, and structuring learning environment. The general themes used to prepare for interview and observation protocols were identified from prior empirical and review literature (e.g., Whipp & Chiarelli, 2004; Hodges, 2005).

The first author conducted two stand-alone and one short, face-to-face semistructured and conversational interviews with each individual, except for one male participant who was unavailable for the second stand-alone interview. The first stand-alone interviews (approximately one hour each) were conducted around one third of the way into the course (two weeks), during which students had experienced the course to a certain degree. The observations of their learning in the WBLE, were conducted approximately two thirds of the way into the course (four weeks), when students were expected to have established their learning routines. In the same session of the observation, a short interview was conducted to help confirm the researchers’ observation. The second stand-alone interviews, following the observation, were conducted at a different meeting for questions emerging from the earlier interviews and observations. The interviews and observations were all conducted at the reserved study room (with desktop PCs connected to the Internet) at the university’s main library. We selected this location because we felt the observations were more robust in terms of minimal distraction and stable Internet connection.

We also collected artifacts that provided information about this course (e.g., syllabus, calendar, and the CMS through which the course is delivered) and students’ learning processes (e.g., the handwritten and electronic student notes, assignments, e-mail communication, and instructor feedback). The collected artifacts were used to confirm as well as expand other aspects of the stories and thus assist in triangulation (Guba & Lincoln, 1994). Together, these three different data sources offered a more comprehensive view of students’ SRL experience, and information revealed in one source served as inquiry input of the other.

In this study, thematic analysis was used to determine the important themes that constitute the lived experiences (Van Manen, 1997). Simply put, thematic analysis is a qualitative method for “identifying, analyzing and report-
The thematic analysis suggested by Braun and Clarke (2006) guided our analysis process. The first author first transcribed all the interviews word-by-word. The first and second authors then read and reread the interview transcripts, observation field notes, and artifacts to immerse ourselves in the data. We then separately coded these data systematically based on a coding scheme extracted from prior SRL literature and also on what had emerged from the data. After coding, we compared our coding to reach agreement on code assignment, and collated codes into potential themes and created a matrix to organize these themes. Through this matrix, we searched for patterns across different participants and data sources. We determined the final themes based on how essential the themes were in presenting the picture of SRL in the WBLE (Van Manen, 1997). Finally, we categorized the themes under the three factors of triadic reciprocality and examine the interaction among the categorized themes through the lens of social cognitive framework.

**Research Quality**

We concurred with Baptiste (2006) that research quality is the measure of the extent to which readers find research findings meaningful, useful, ethical, and honest. We also agreed with him that the meaning of quality needs to be discussed with the research purpose and context in mind, so that appropriate combination of quality-enhancing strategies/procedures could be determined. Extending from Baptiste’s (2006) argument, we defined research quality in our study as the extent to which the readers, including SRL researchers, instructors teaching via WBLEs, and WBLE instructional designers, find our research findings meaningful and useful. Although the meaningfulness and usefulness of our research findings might be interpreted differently by the audiences, since they would look for different information that applied to their settings, we used three strategies to enhance the research quality. These strategies included employing a theoretical framework that guides the research, data triangulation, and rich description. How these strategies were employed was described and evidenced throughout this article.
FINDINGS AND DISCUSSION

In the following sections, we present the findings and discuss the emerging themes of students’ self-regulated learning under the social cognitive framework where the three factors (i.e., personal, behavioral, and environmental) of human functioning interacted in a cyclical fashion in the context of WBLE.

Staying on Track

Planning With Online Calendar. Effective time management (i.e., knowing when and for how long to study) is the product of planning (Zimmerman, Greenberg, & Weinstein, 1994) and deemed essential in individual’s learning, especially in the WBLE (Dembo, Junge, & Lynch, 2006). Similar to the graduate students in Whipp & Chiarelli (2004), the undergraduate students in this Web course liked to keep themselves on track by using the online calendar that informed them about the due dates of lessons, exams, and assignments. Christy’s concern about this course was alleviated by the online calendar:

I like the calendar ... my only concern taking this course being a web-based course ... was him [instructor] maybe not being as explicit in the due dates.... But you know, the calendar ... I can just look at it and then okay the lesson’s due.

Maggie also found the online calendar very helpful, and she checked it every time when logging into the course. She mentioned, “You can look at [the calendar] and see, you know, which week would have been really bad, which one has a lot of lessons, which one doesn’t.” While Rosie appreciated the information of the online calendar, she actually went further printing it out and putting the due dates on her own planner instead of checking the online calendar.

Creating a Routine. To regulate their learning, the participants created their own routines in completing the course requirement. For example, Maggie liked to pace herself and split each lesson into two parts. She commented:

I’ll usually start at 10 [pm] ... I’ll check the course e-mail to make sure there’s nothing new going on.... I usually spent about 2 days on a lesson. I like to read through about half the material, take a break from it, and come back ... read it, ... do the reflections and the quiz at that time.

Tom checked the calendar only once in a while, because he mostly followed the consistent schedule of the course. He commented, “You know when you have to do your things, without looking at your calendar every day. Monday, Wednesday, Friday.”

Under the social cognitive framework, we found that the physical environmental factors influenced students’ SRL behavior. On the one hand, the course schedule revealed through the online calendar informed and provided a scaffold for students’ planning and study routines. On the other hand, the consistency in the course structure also made it easier for students to stay on track with study routines.

Monitoring Progress With Online Gradebook

Another feature in the Web-based course that students accessed very often is the online gradebook. The students monitored their learning performance with the online gradebook. According to Zimmerman (1998), self-regulated learners pay attention to their learning outcomes and would act accordingly to calibrate their behaviors (e.g., changing note-taking strategies, see the Taking Notes subsection) to achieve their goals. Maggie found herself checking the gradebook every time she logged in the course:

I’m just the one that kind of paranoid about the grades.... I usually check it every time when I’m on ANGEL, just to see if anything else is graded, or checking off pretty much everyday now to see when the paper is graded.
Rosie described herself as very particular about the grade as well, “I’ll print out and save my [quiz] score just to make sure they are, well, graded correctly online. So then whenever I check it, I like to make sure ... like the final score ... it’s, um, the right one.” For Gary, he only checked his grades after exams, since he knew that it would take the instructor a while to post the exam grade.

Despite the overall helpfulness of the gradebook, Christy and Gary indicated that they would prefer an actual letter grade to their standing/percentile in the class. Christy commented:

I don’t find it [standing] extremely helpful ... amongst the whole class, I was 30 out of 70, 72 people ... but ... I’m more interested in the letter grade.... I don’t care how I’m doing COMPARED to other people...I’ve never seen these people, talked to them...

Just like students taking a course in a traditional face-to-face setting, the participants cared about their grades and monitored their progress. In the WBLE, students seemed to rely heavily on the online gradebook for monitoring their progress, which corresponded to the findings of Whipp and Chiarelli (2004). In addition, the fact that the course roster was hidden (see the rationale under Seeking Help section) from the students might make the participants care less about how they performed as compared with other students. It might not be true that they did not really care about their relative standing in this course, but it is very likely that they were indifferent or not motivated to do so due to the lack of a sense of community.

Similar to the online calendar, the online gradebook as one of the (physical) environmental factors, influenced students’ SRL behavior in the WBLE, as it provided a convenient tool (available 24/7) for students to monitor their learning progress and made adjustment to their learning strategies when necessary. Nevertheless, the students relied on the gradebook to a different degree (e.g., printing grades for future reference or frequency of checking grades), depending on how particular they are about grades.

Learning Strategies Adapted to the WBLE

Reading off the Screen. All the participants felt fairly comfortable reading the course materials online. Unlike the findings in the past research (e.g., Whipp & Chiarelli, 2004 [research conducted in 2000]) where the students preferred to print online content for reading offline, most of our participants read the course materials off the screen, although Rosie did indicate that she printed out about 25% of the material. We could not claim that there was some definite change or trend from this difference, but it seemed plausible that students nowadays (i.e., year 2007) were more accustomed to and comfortable reading online/off-screen. In addition, instructional materials in the multimedia format also minimized the benefit of printing materials. For example, some of the material was interactive and with mouseovers to present additional information or image transitions. The extensive use of video/audio clips, and abundant images and color use could also discourage the learners from printing out materials. However, reading off the screen also presented challenges for traditional learning strategies, such as note-taking, since note-taking capability was not incorporated into this current environment.

Taking Notes. Most of the students took notes while studying the content, and they had slightly different strategies for note-taking to overcome the lack of affordance of the current web-based environment on highlighting and note-taking. Christy liked to take hand-written notes, while others took notes with computer applications such Microsoft Word. Maggie indicated:

I did read it online, and then a lot of times I might have a Word document open, so if it's like a really important point ... I’ll just copy and paste it into there.... I like to make like a
little outline format, so I bring up the main points, I’ll read through it.

When we observed Rosie’s learning in the WBLE, we found she had both a web browser showing the lesson material on the left side of the screen and a Word document open on the right side simultaneously. Like Maggie, Rosie took notes along the way she studied the content (including watching the video and listening to the audio). While being asked about what she did with her notes, Maggie responded:

Sometimes I’ll print it out, in case like I might study during my lunch break, there’s something, but most of the time I just saved it on my computer, so when I’m studying I can just pull up and just read it over to like refresh my memory about this stuff.

As for Gary, he copied and pasted what he learned into his notes and also made use of the study aid (i.e., coverage map, a map about the important related concepts covered in a lesson) provided in each lesson by the instructor, which he found helpful.

When asked about studying the course materials, Tom pointed out that he took notes at earlier stage in this online course; however, he changed his mind during the later stage because “In this class, I don’t see a reason to take notes. The information is all there.” He further elaborated on his studying strategy, which provided rationale for his not taking notes, “I read through it, try to remember as much as possible. Also, read through this more than once. And the quiz at the end helps you remember.”

It appeared that the web-based environment influenced students’ SRL behavior in several ways. Students took advantage of the material existing in a digital format online, and executed the copy-and-paste action while taking notes. One of the students, Tom, changed from initially taking notes while studying the content to not taking notes at all because the content was always online for his access. It is worth noting that Tom did not perform as well as other participants in this study although his final grade was above the course average. It might be premature to assume from our data that Tom’s not taking notes posed negative impact on his overall performance in this course; however, we could not rule out the possibility. Prior research (e.g., Zimmerman & Risemberg, 1997) indicated that there were high correlations between learners’ self-regulatory processes (e.g., note-taking) and their academic achievement.

Seeking Help

As Dabbagh & Kitsantas (2005) pointed out, self-regulated learners would identify and request outside resources (either social or non-social) for assistance to overcome frustration they encounter while trying to achieve their goals or facing with difficult tasks. Learners who seek help tend to be more successful than learners who do not (Aleven, Stahl, Schworm, Fischer, & Wallace, 2003). In this web-based course, the instructor was the only social source for help seeking if the students had course-related questions. Due to logistics issues (i.e., the instructor did not want to have the students in this course to send their e-mail to the whole class due to large enrollment) and integrity concern (i.e., the web-based exams in this summer course were honor-based non-proctored exam), the online course roster was hidden by the instructor intentionally, which made it unlikely, if not impossible, for the students to seek help from their classmates via e-mail. The students mainly sought for help in the following ways: phone calls, e-mail, and online help forum.

Christy called the instructor regarding a technical difficulty (i.e., disconnection from the Internet) she encountered while taking the first exam:

The first part the essay part, didn’t submit, so I had to call him and it’s surprising he picked up the phone, you know. It’s like SO easy, and he’s just, yeah, just re-do [set up] it for you ... I panicked, just because, I was out of time ... So I mean, he made it so easy.
Tom also had called the instructor for an issue related to taking Exam 1—he took the exam in a reverse order and had concern about losing points due to certain penalty specified in the exam instruction. Both Christy and Tom found the instructor very helpful and resolving their issues in a timely manner.

Tom and Gary had contacted the instructor via e-mail regarding their individual paper assignment. Tom asked for an extension for submission, while Gary had concern about his grade not meeting his own expectation.

Christy and Gary had made use of the Class Help Desk forum where the students could post their content-related questions for response from the instructor. Christy actually had posted a question regarding not seeing her grades for certain tasks. As for Gary, although he did not post any questions on the forum, he indicated that he benefited from reading his peers’ questions on the paper assignment that was purposely ill-defined. He commented:

I know, um, a few people have a few problems with that, coz I checked the, where students can post, and I know there’s a couple of examples of that students didn’t understand exactly what to write about, kind of watch the teacher’s responses to those, give myself a little more guidance.

However, Maggie, Rosie, and Tom were not aware of the existence of the forum. Among the three, Tom had used both phone calls and e-mail to seek help from the instructor, but Maggie and Rosie did not seem to have questions and therefore did not seek help via any of the available channels.

From the participating students’ experience in this online course, it appeared that they preferred to call the instructor directly when there were high-stake questions, such as encountering technical difficulty while taking the exam. When necessary, they also sent course e-mail (embedded in the CMS) to the instructor. As for the forum set up for a “Question & Answer” purpose, it did not quite catch the attention of the students we interviewed (3 out of 5 students missed it). In fact, our examination of the postings and students’ activity record confirmed our interview finding—only 8 out of 67 students in this class had posted course-related questions, and 37 out of 67 accessed the forum during the 6-week session. This suggested that the forum might not be well-publicized in this course or students did not use this help function very effectively.

From our interview and examining students’ activity record in the WBLE, we found they presented SRL behavior in the form of help-seeking. Their SRL behavior caused the social environment (i.e., the instructor) to change (i.e., providing response to individuals or clarifying instruction for the whole class), while the social environment (i.e., the instructor and the peers) also influenced students’ learning since the students received guidance and feedback from the instructor and modeling from peers (i.e., asking questions) in the context of online Class Help Desk.

Sustaining Motivation Through Multimedia Capability

It appears that the students enjoyed very much the streaming video clips explaining the relationship among concepts as part of the learning material. Tom and Rosie specifically mentioned that the videos helped them visualize the material. What Rosie mentioned probably captured best what the students thought of the video clips as part of the course:

I really enjoy watching the video clips. They’re entertaining and informative. I’m a visual learner, so actually being able to see the concepts is helpful. The video and audio clips are the most effective and satisfying in the course.... I prefer to hear and see the material as a way to break up the reading.

We could tell from Rosie’s comments that the multimedia capability of the WBLE was helpful in addressing the content in a different way to accommodate students’ learning styles. It also prevented students from being worn out due to accessing the same mode of delivery (e.g., text) in this intensive course. In addition,
the video clips further enabled the instructor’s virtual presence. Tom commented, “Videos are good...And, I like how the professor...he put a little humor into everything, it’s all refreshing.” Christy also found the instructor’s humor delivered through the videos kept her “going and wanting to read more.”

In fact, in WBLEs where class members (both instructors and students) could not meet each other, students need to exercise self-regulation to sustain motivation in persisting through the course, since a sense of isolation might occur (e.g., Yang, 2003). In this course, the multimedia capability of the WBLE afforded various instruction delivery modes that addressed learners’ different learning needs as well as provided a venue for the instructor to offer affective support through his virtual presence. In our research, we could find the physical environment (i.e., the streaming video and audio) and the social environment (i.e., the instructor’s virtual presence and humor) influenced the personal factor (i.e., students’ motivation). Both environmental factors also further influenced the behavioral factor (i.e., students’ sustainability in learning).

DESIGN IMPLICATIONS

We revealed the picture of students’ SRL in this specific WBLE—a 6-week general science education course with an enrollment of 67 students, hosted on a Web-based CMS adopted university-wide. By emphasizing the context of this course and the characteristics of the WBLE, we encouraged readers to consider the following design implications for facilitating SRL in WBLEs, with the contextual characteristics in mind.

In our research, the participants kept themselves on track with the help of the online calendar and/or the consistent schedule. A clear and informative online calendar coupled with consistent design, including lesson structure and assignment/exam due dates, could help alleviate students’ anxiety and frustration about staying on track.

Our participants overall recognized the usefulness of the online gradebook. But how web-course instructors present grades to their students might need to depend on the course design. In this specific course where a sense of community was lacking, it might not make sense for students to see their grades in relevance to those of others. Hence, instructors might want to consider providing students with letter grade as the major (if not the only) display format in this case, while offering percentile format for students in the course that encourages interaction among classmates.

While most of the participants took notes during their learning, the existence of and easy access to the online material made one participant believe that it was unnecessary to take notes. This misconception thus led to student’s loss of the opportunity of engaging in deeper processing of information through taking notes to evaluate, organize and transform the material (Igo, Bruning, & Mccrudden, 2005). To prevent this situation, instructors could provide scaffolding that enhances SRL, such as encouraging the practice of note-taking, recommending online note-taking techniques (e.g., restricted copy-and-paste, Igo et al., 2005), or prompting students to take notes (Kuffman, 2004).

A Class Help Desk (online Q & A forum) was designed as one of the channels providing help in this course; however, it was not fully taken advantage of by most of the class, even though the student using it did comment on its usefulness. We would recommend that web-based instructors introduce the existence and benefits of such tool more formally or explicitly. When there are important questions asked on the forum, instructors might also want to direct students’ attention to check out the forum. This strategy might help reach to students who need help most but are least likely to use help appropriately, such as students with low prior knowledge (Aleven et al., 2003). Another approach would be to provide a unit-specific online help desk within each instructional unit so students can direct contextualized questions more conveniently.
With the broadband and multimedia capability (i.e., high-quality yet small-size streaming video and audio), we recommend instructors make good use of the advancing technology to scaffold students’ learning and sustain motivation in WBLEs. The variety of delivery modes can be used to accommodate students with different learning styles (e.g., graphics and videos for visual learners). Also an instructor could infuse his/her personality, such as humor (James, 2004), to establish presence via current web technologies to sustain learner’s motivation.

CONCLUSION AND LIMITATION

In this research, we explored undergraduate students’ self-regulated learning experiences as a phenomenon in the web-based learning environment. Through the lens of social cognitive theory, we examined how behavioral, personal, and environmental factors interacted and influenced students’ SRL (Schunk, 1989). Among the presented themes, we found that the physical environmental factors (e.g., course content in various digital formats, online calendar, and gradebook) had great impact on students’ SRL behaviors (e.g., note-taking and planning). In addition, the social environmental factors (e.g., instructor response/guidance and peer modeling) and behavioral factors (e.g., student asking questions) also influenced each other in the context of online Class Help Desk.

In all, our research added to the existing body of literature on how undergraduate students self-regulate their learning in a large-enrollment general science course in the WBLE. Although the picture we tried to put together came from only a limited number of students in a single course, we believed the compelling findings helped inform instructors and instructional designers, in terms of what students are more likely to rely on when engaging in learning in WBLEs, and how we could better serve the students’ interest.

Finally, we found our findings relatively confined due to the fact that the instructor was the major social environmental influence while the peers’ influence was at a minimum. We would encourage future research to explore the WBLE context where peer interaction is encouraged to a greater degree to provide a more comprehensive picture of such phenomenon.

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