

# The Development and Evaluation of a Twitter-based Course Support System

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## ABSTRACT

In this paper, we develop and evaluate of a course support system based on the principles of self-determination theory. Specifically, this system was developed to maintain and enhance student motivation by targeting variables that increase intrinsic motivation. We anticipated that the system would provide learners with support by enabling them to exchange opinions and ask questions freely using Twitter. Moreover, we expected that students would easily connect with their classmates using the same system. Since it is known that motivation increases when individuals sense that they are connected and related to others, we by extension predicted that student motivation would develop as students interacted and exchanged opinions. The support system was utilized in two programming courses, and evaluated by analyzing students' tweets. Results of the analysis revealed that the system fostered relatedness among participants and motivation.

## KEYWORDS

Course Support System, Learning management system (LMS), e-learning system, Self-Determination Theory (SDT), Twitter

## 1 INTRODUCTION

With the Internet's rapid growth and the advancement of information communication technologies in recent years, a variety of web-based course support systems have been developed (e.g., Moodle [1], WebCT [2], and Prometheus [3]). Course support systems enable students to remain up to date with course content and study from any location, provided that Internet access is available. The aforementioned systems include features that promote

self-study and simplify the delivery of course materials, as well as the submission of assignments; furthermore, course support systems assist teachers by making the grading of assignments easier. Nevertheless, existing support systems tend to focus exclusively on time or spatial convenience rather than student motivation.

This paper discusses the development and implementation of course support system based on intrinsic motivation and self-determination theory, which aims to enhance and maintain student motivation. The system provides students with support by enabling them to ask questions freely and exchange opinions using Twitter [4], thereby allowing learners to easily connect with peers enrolled in the same course. Since prior research [5] has established that motivation increases when the need for students to feel related and connected is satisfied, we anticipate that student motivation will increase as they connect with classmates and exchange opinions using our support system. Furthermore, we believe that the system will contribute to the formation of real-world rather than virtual relationships between learners.

The system in this study utilizes Twitter, a microblogging website that has attracted a considerable amount of attention in recent years. Unlike other forms of online communication (e.g., traditional blogs, forums, mailing lists, and chat rooms), microblogs are limited to an extremely small number of characters (140 in the case of Twitter). When compared with other online services that facilitate the exchange of opinions, Twitter is more user friendly, and allows individuals to follow others in order to receive their posts in a personalized feed. Twitter's initial rise in popularity is likely attributable to the availability of vari-

ous Twitter clients for mobile devices such as smart phones, which enabled users to immediately respond to posts without being in front of a computer. Moreover, Twitter can be likened to a social networking service, since it facilitates the creation of lists of friends who share similar interests and the ability to follow them. Unlike other social networking services, however, mutual consent is not required to follow a user on Twitter, and therefore friend lists can be created unilaterally; hence, Twitter users are less hesitant to establish relationships and communicate with others.

Due to the aforementioned characteristics of Twitter, it was adopted as an underlying platform for our proposed system, which provides features for course management and communication support. The former feature comprises three subfeatures (i.e., problem exercises, course material distribution, and a report submission mechanism), while the latter consists of two subfeatures (i.e., a Twitter client and bot). Using the support system's Twitter client, learners can easily see the posts of other classmates, regardless of whether or not they are followers. By reading such posts, learners can establish relationships between peers, and hence satisfy a need for relatedness. The bot, whose function will be discussed in greater detail later, is a program designed to encourage student participation by routinely tweeting predefined content.

The structure of this paper is as follows. In Section 2, we describe the current studies on the course support system. Furthermore, in Section 3, we present the features of the our system. We then show performance evaluation of our system in Section 4. Finally, in Section 5, we conclude the paper and discuss the possible direction of future studies.

## 2 RELATED WORKS

A significant amount of research has been conducted concerning the use of course support systems [6–8]. For example, the authors utilized a web-based e-learning system in a course to examine its affect on motivation by conducting interviews and administering ques-

tionnaires to both students and teachers; the results of their research revealed considerable improvement in student motivation [6]. Nevertheless, the system attached a great deal of importance to providing students with diverse content during class sessions in order to increase student autonomy; since the system's materials utilized videos, animations, and music extensively, it was necessary for instructors to invest an exhaustive amount of time and effort into the creation of unique content for each session.

In [7], the authors implemented the web-based Prometheus management system in a course, and in doing so examined levels of comprehension and satisfaction, in addition to the occurrence of teacher-student and student-student interactions. The results of a questionnaire administered to students concerning the experience revealed high levels of comprehension and course satisfaction. Furthermore, the system facilitated both teacher-student and student-student interactions. Nevertheless, their research did not examine the system's motivational effects, which is the focus of the present research.

Moreover, in [8], the authors examined the practical use of Twitter in a higher education context, wherein students in different countries collaborated in order to solve various problems. The study revealed that it facilitated an abundance of mutual exchanges, while also leading to the formation of an online student community. However, the web application in [8] was primarily used to promote information sharing between students in distant locations, and therefore did not examine its usefulness as an e-learning or motivational tool.

In [9, 10], the authors proposed and evaluated the course support system that is based on the relatedness needs in the self-determination theory. The proposed system uses Twitter and provides an environment in which students can easily exchange information with another by creating and reading posts. However, they performed simple evaluation of the system and evaluation was not enough. In this paper, we develop the system and evaluate it through

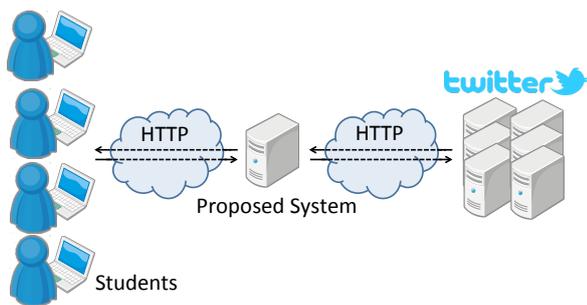


Figure 1: Relationship between students, the support system, and Twitter

analysis.

### 3 COURSE SUPPORT SYSTEM

The support system operates as a web application that allows students to both create tweets and read tweets from classmates. Figure 1 shows the relationship between students, the support system, and Twitter. The system was developed using Ruby and Ruby on Rails; MySQL and Phusion Passenger were used as database and web servers respectively. The system could be accessed using a standard web browser.

#### 3.1 System Accounts and Bot Tweets

The system includes student, teacher, teaching assistant, administrative, and bot accounts. Student accounts are permitted to access communication features, practice problems, submit reports, and review course content. Teaching assistant accounts are afforded the same privileges as student accounts, however they can also create exercise problems, confirm student reports, and provide students with feedback. In addition to the privileges afforded to teaching assistants, teacher accounts are permitted to create and manage courses and practice problems. Administrators can access all of the aforementioned features, however they are able to manage the system itself as well. The bot account is used to automatically send predefined messages intended to lessen students' resistance to tweeting, such as "the course has started" or "I am currently solving problem

three." Theoretically, the bot should contribute to enhancing relatedness by facilitating a sense of community; this, in turn, ought to result in increased intrinsic motivation, particularly since students are unaware that these are bot accounts, and therefore consider them to be actual classmates.

#### 3.2 Features

The system includes course management and communication support features. The communication support feature comprises a Twitter client and the aforementioned bot. In addition to enabling students to create and read tweets, the Twitter client records student tweets upon transmitting them. Since the system allows students to read tweets from classmates specifically, it consequently facilitates student relatedness. Twitter users can make use of hashtags to link keywords or topics. Accordingly, appropriate tags are configured before each class session, which are appended to posts made through the system, thereby ensuring that users of other Twitter clients can identify course-related tweets. Furthermore, the system summarizes posts related to the course on a separate page, where explanations of concepts that proved to be problematic for students are featured. These summaries also allow students who were absent from class to review the lesson and catch up on coursework.

The system's course management feature consists of three subfeatures: practice problems, the distribution of course materials, and a report submission mechanism. As its name suggests, the practice problems subfeature provides a means for students to solve problems created in advance for a given class session. Likewise, the course material distribution subfeature enables instructors to quickly and easily distribute assignments and other class materials. The report submission subfeature provides a mechanism for students to submit reports, and also tweets reminders about submission deadlines.

### 3.3 Privacy

To use the system, students must create or already possess a Twitter account. However, students who chose to use a preexisting account were made aware that doing so would reveal their past tweets, followers, and the individuals that they follow. Hence, students who value privacy were encouraged to create new accounts specifically for the course. However, some degree of privacy can be exercised with regard to posts based on one's settings. Twitter's "protect my tweets" option ensures that only authorized followers can read one's posts, although users can selectively override this setting through the use of appropriate hashtags. For example, by including a hashtag addressing the course specifically, a student with the "protect my tweets" option enabled could make certain posts visible to course members in addition to his or her followers. A summary of Twitter's privacy mechanism is provided in Tab. 1.

## 4 PERFORMANCE EVALUATION

Following the system's implementation, it was evaluated through an analysis of students tweets. The system was implemented in two programming courses at Osaka Electro-Communication University. It was used in the first course 12 times among 44 students, and in the second course 13 times among 32 students. The average rate of attendance for the first and second course was 38.5 and 10.1 persons respectively.

The frequency of tweets before, during, and after the course was examined. Figure 2 shows the distribution of tweets according to number of days that classes were held and between them. It should be noted that the number of tweets is normalized according to each day's attendance; "during" refers to the number of tweets that occurred during a class session, while "after" indicates the number of tweets made in between sessions. The average number of tweets in Course A and Course B was 1.025 and 0.5644 respectively. As shown in Figure 2, roughly half of the stu-

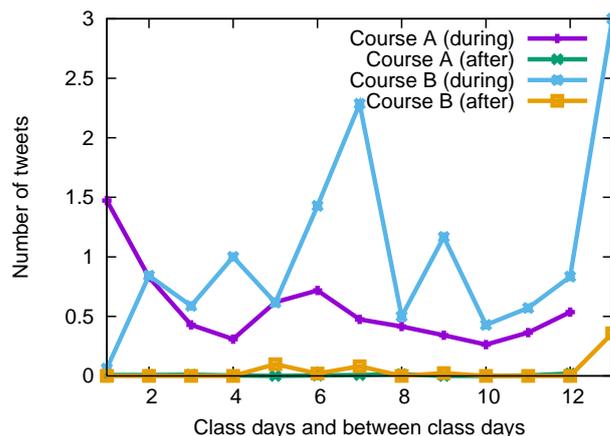


Figure 2: Distribution of tweets in general

dents tweeted during class sessions, although virtually no tweets occurred between sessions. Nevertheless, approximately half of the participants reviewed the timeline at some point between sessions, even if they did not actually tweet. Figure 3 shows the distribution of tweets that posed questions concerning the course between and during class sessions. As in Figure 2, the number of tweets is normalized according to each day's attendance. The frequency with which questions were asked during many, although not all classes was low. This is because questions and their answers were displayed directly on the timeline, and therefore students could often find solutions to their problems without asking questions directly.

Table 2 shows the number of tweets made daily by students before the course began, a week after it ended, and throughout its 114-day duration categorized according to whether they possessed a Twitter account prior to enrollment. Nine students used Twitter before enrolling in the course, while 20 created accounts specifically for it. The number of tweets by students who had previously used Twitter increased progressively; this could be attributable to the enhanced sense of relatedness that was acquired by students while using the support system. In contrast, the number of tweets from students with newly created accounts decreased following the course's com-

Table 1: Overview of Twitter privacy controls in relation to the support system

	Public	Followers	Classmates
Protect my tweets disabled	✓	✓	✓
Protect my tweets enabled and without hash-tag		✓	
Protect my tweets enabled and with hash-tag		✓	✓

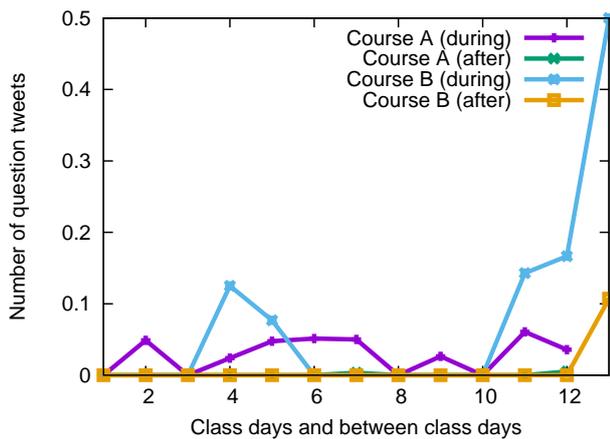


Figure 3: Distribution of tweets posting questions

Table 2: Number of posts before, during, and after the course

	Had a Twitter account	Created a new account
Before	0.1746	N/A
During	1.8841	0.7271
After	2.3810	0.6108

pletion. This is likely because students with newly created accounts considered them to be merely an extension of the support system, and therefore the class itself; consequently, they no longer deemed their accounts to be useful after completing the course.

In summation, almost half of the students tweeted using the support system—a percentage that is substantially larger than in a normal class. The system provided students with an environment wherein tweeting could be per-

formed easily. Moreover, the number of tweets made by prior members of Twitter increased due to the formation of new relationships, which was made possible through the course’s support system.

## 5 CONCLUSION AND FUTURE WORKS

This study developed and evaluated the implementation of a course support system based on the concept of relatedness as defined by self-determination theory. The system used Twitter to facilitate an environment wherein students could exchange information easily, which enabled learners to establish connections among classmates, and therefore achieve relatedness. The system was developed as a web application and implemented in two separate programming courses. This implementation was evaluated through an analysis of students’ tweets; the results revealed that the system increased student relatedness, thereby demonstrating its effectiveness.

Future research should attempt to examine and implement this system in other courses among a more diverse range of students. Moreover, the course model in this study presupposes that the support system will be used in courses that include practice problems. Accordingly, in a future study we intend to adapt this model to meet the demands of a traditional, lecture-style course.

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## REFERENCES

- [1] “Moodle.” available at <http://moodle.org/>.
- [2] “Webct.” available at <http://www.blackboard.com/>.
- [3] “Prometheus.” available at <http://citl.gwu.edu/pages/projectprometheus.html>.
- [4] “Twitter.” available at <http://twitter.com>.
- [5] E. L. Deci and R. M. Ryan, *Handbook of Self-Determination Research*. University of Rochester Press, 2002.
- [6] S.-K. Wang and T. C. Reeves, “The effects of a web-based learning environment on student motivation in a high school earth science course,” *Educational Technology Research and Development*, vol. 54, no. 6, pp. 597–621, 2006.
- [7] A. Sher, “Assessing and comparing interaction dynamics, student learning, and satisfaction within web-based online learning programs,” *Journal of Online Learning and Teaching*, vol. 4, pp. 446–458, Dec. 2008.
- [8] T. Cochrane, “Twitter tales: Facilitating international collaboration with mobile web 2.0,” in *Proceedings of 27th Australian Society for Computers in Learning in Tertiary Education (ASCILITE) Conference*, 2010.
- [9] H. Hisamatsu and T. Hatanaka, “Twitter-based course support system considering relatedness needs,” in *Proceedings of International Conference on Education, Psychology and Society (ICEPAS)*, pp. 425–42, June 2013.
- [10] H. Hisamatsu and T. Hatanaka, “Design, implementation and evaluation of twitter-based course support system considering relatedness needs,” in *Proceedings of 6th International Conference on Education and New Learning Technologies (EDULEARN14)*, pp. 996–1001, July 2014.