

# Revealing student blogging activities using RSS feeds and LMS logs

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**ABSTRACT:** *Blogs are an easy-to-use, free alternative to classic means of computer-mediated communication. Moreover, they are authentically aligned with web activity patterns of today's students. The body of studies on integrating and implementing blogs in various educational settings has grown rapidly recently. However, it is often difficult to distill practical advice from these studies, since the application contexts, pedagogical objectives, and research methodology differ greatly. This paper aims to make a further step towards an improved understanding of employing blogs in education by presenting a follow-up case study on using blogs as reflective journals in an undergraduate computer-science lab course. The paper includes lessons learned and adaptations following from the first-time application, the underlying pedagogical strategy, and a detailed analysis and discussion of blogging activity data obtained from RSS feeds and LMS logs.*

**Keywords:** Blogs, Web 2.0, Computer science education, Log file analysis, Reflective journaling

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## INTRODUCTION

Blogs are a convenient and increasingly popular means of introducing Web 2.0 for educational purposes into the classroom. Teachers with a passion for learner-centered education have recognized the educational potential of Web 2.0 tools such as wikis, social bookmarking, or blogs, which offer accessible, easy-to-use and cheap (Rosenbloom, 2004) means of collaboration, expression, communication, reflection and many more creative, spontaneous facets of participation and knowledge building (Yuang, 2008) in the off-campus space. Essentially, a blog is a personal web page that is updated periodically by the blogger through posting (typically short) hypertext entries. These entries are presented in reverse-chronological order to visitors, who are typically allowed to post comments to blog entries. Most blogs are hosted on publicly available, free blog hosting services that provide state-of-the-art features such as offering permalinks, maintaining blogrolls, downloading web feeds for content syndication, and enabling personalization of the blog page using all sorts of visual layouts and gadgets. The success of blogs can largely be attributed to the social power and the simplicity of blog technology (Blood, 2004) and process: a new personal blog is only few mouse clicks away, and posting a new blog entry is as convenient as sending an email.

As a form of communication supporting highly diverse personal motivations (Nardi, Schiano, Gumbrecht, & Swartz, 2004), blogs have been successful on the Web for over a decade now; it is accepted that in the educational context blogs as a tool have inherent value beyond mere provision of information (Hall & Davison, 2007), e.g. for collaborative production and exchange of learning resources (Tomberg & Laanpere, 2008). It is also evident that participation in the blogosphere—either as a reader or as a contributor—is an integral part of the daily lives of the current generation of students (Wong, Vrijmoed, & Wong, 2008). Nonetheless, it appears that in educational settings we are still in a phase of collecting experiences. There are numerous studies and theoretical investigations available in the literature on successes and failures of integrating blogs into web-based or hybrid course environments (Kim, 2008). Previously reported uses of blogs in education include, for instance, the facilitation of collaborative learning by having students publish their work in a blog and receiving comments, feedback as well as support by peers and teachers (e.g. Berman & Katoma, 2007; Chang & Chen, 2007; Chang, Chang, & Chen, 2008; Hall & Davison, 2007); or offering the students a means of reflection on their work on assignments, the obtained results, and their learning process and progress (e.g. Carroll, Calvo, & Markauskaite, 2006; Lin & Yuan, 2006; Xie, Ke, & Sharma, 2008). For instance, this can be used in overarching e-portfolio scenarios (Chuang, in press) or simply as a “spontaneous and authentic” (Ray & Coulter, 2008) alternative to classic means of web-based communication.

Some reports also deal with failed first-time introduction of blogs (e.g. Divitini, Haugalokken, & Morken, 2005) – as with any other new technology, building up expertise requires time, resources, and thorough reflection of lessons learned. We need to go beyond the novelty of using blogs in education and towards building a solid foundation of successful practice based on research (West, Wright, Gabbitas, & Graham, 2006). It is not easy to identify those foundations and handy pieces of practical advice in the current body of academic papers on student blogging. This

paper aims to take a further step in improving the current situation by reporting results of quantitative analysis of blogging and LMS (Learning Management System) log data during the application of student blogs in a computer science lab course. We present empirical observations of relationships between blogging behavior and student academic performance, as well as a model of blogging activity within the course community. The model aligns different variables of blog participation (e.g., visiting peers, commenting, and posting blog entries) and empirically investigates relationships in the variables using obtained log and feed data.

The paper is structured as follows. In the next section we describe the context of the course in which blogs were employed. This is followed up in Section 3 by a presentation of design details of the blog portal, which we implemented as an extension to our LMS to provide a seamless integration of blogging activities into the LMS. In Section 4 we present findings obtained from quantitative analysis of collected data and align the observed blogging activity variables in a correlation model. In the last section, we discuss the findings and present a conclusion and outlook on further work.

## **STUDY CONTEXT**

### **Course Description**

The context of this study is a module on software architectures and web technologies in the third semester of the computer science bachelor study at the Faculty of Computer Science, University of Vienna. The module was held in winter term 2008 (i.e., from begin of October, 2008 to end of January, 2009); it consisted of a lecture course (2hrs per week) and a lab course (2hrs per week) running over the whole semester. While the lecture was used to present subject matter, the lab course was used for hands-on practice through team projects and individual assignments. The lab course was organized into several parallel groups, of which two were held by the author and are thus under investigation here. The lab groups were designed in a blended learning style, with weekly on-campus group meetings in the computer laboratory serving as “synchronization points”, i.e. they were used for distributing and explaining new assignments, for presenting and discussing team project deliverables, for presenting solutions to individual assignments, and for solving any emerging subject-related and assignment-related problems and difficulties. However, most of the student workload on the assignments was due outside of the lab meetings. For handling these web-based activities we employed our home grown learning management system CEWebS (Mangler & Derntl, 2004).

### **Integration of Blogs**

Since this course was held every year for the last five years, we basically had a good estimation of which tasks and assignments would cause “trouble” for students. However, since the CS curriculum at our institution underwent some significant changes in 2007, the teacher had to make several adaptations to the course structure and content. To get a clearer picture of issues students are dealing with during their striving for solutions at home and on campus, the teacher decided in 2007 to use student blogs in the context of the lab groups. Generally, the pedagogical design options for introducing blogs are seemingly unlimited; yet they can be classified into three—mutually not exclusive—categories: group blogs,

teacher blogs, and student blogs (Weller, Pegler, & Mason, 2005, p. 63). In the case at hand the intent was to have students document their tasks, problems, solutions, failures, opinions, and feedback on exercises. The teacher participated as an observer and did not keep an own teacher blog. This case study (Derntl, 2008) was only partially successful: while student feedback on the pedagogical aspects of the blogging experience was generally positive, there were some severe drawbacks regarding the blogging tool that was built into the LMS:

- There was an option of flagging blog entries as private, which would prevent them from being read by students' peers. In fact, the design flaw was that "private" was the default setting, and students had to assign a public flag during submission of a new entry to make it visible to peers.
- The tool did not offer any of the fancy community-building features that almost every up-to-date blogging service offers, such as commenting, trackback, embedding media, polling, customization, etc. This additionally impeded the community building power of blogs.

In the light of these issues the aim for the 2008 instance of the course was to put more explicit emphasis on reflective issues, i.e. problems encountered, solution approaches, peer support, reflection on learning process and progress. This time the teacher also joined the community as an active blogger instead of being a read-only participant like in 2007. The blogging guidelines as communicated to students and published on the LMS blog portal were as follows:

"Use your blog to reflect on your problems, insights, and contributions during and after your task-related activities (project work, individual tasks) for the lab course. For example, you could ask yourself the following questions: What causes/caused me problems (and why)? Which solutions have I found/tried that could also be useful for my colleagues? Where was I unable to find a solution (and why)? What am I contributing to the team project? How do/did I approach the current problem? etc. – The minimum requirement is one blog entry per person per assigned task."

Students were explicitly told that blogging behavior may be used as input by the teacher to improve their final grade; it was also made clear that there would not be any adverse effect on their final grade based on their blogging behavior. So the requirement of posting at least one entry per person per assigned task as set forth in the above blogging guidelines was not strictly enforced by the teacher. Additionally, there was no explicit requirement to post comments to peer blogs, even though the teacher verbally expressed during the semester that this would facilitate the building of a virtual community and offer possibilities of supporting peer students and giving them feedback. Note that the teacher did not put any emphasis on the fact that their blogging behavior would be subjected to data analysis.

To facilitate students in building up confidence in this communication channel, the teacher explicitly committed himself to provide a high level of quality of service for bloggers by promising to handle blog entries with equal attention as emails and forum posts. However, there were no a-priori promises made regarding the blogging frequency of the teacher.

As an additional measure, the LMS internal blogging tool was discarded and it was decided to host the student blogs on *Blogspot.com* (also known as *Blogger*, see <http://blogger.com> or <http://blogspot.com>), a free blog hosting service offered by Google. *Blogspot.com* comes with all the state-of-the-art features like maintaining a blogroll, personalization of the blog page, using trackbacks, posting comments, etc. To achieve a smooth integration of blogging activities into the course LMS, an LMS extension was implemented, which acted as a portal to blogging activities in the course (described in more detail in the next section).

## Students

The students were third-semester undergraduates of the computer science bachelor study at the University of Vienna. The two groups (Group A and Group B) under study in this paper had  $N_A = 24$  and  $N_B = 19$  participating students, respectively, for a total of  $N = 43$  with 19% females and a mean age of 24.11 years ( $SD = 2.91$ ). The distribution of participants into two groups was *not* part of the study design; it was due to regulations at the University of Vienna, where each lab group may have a maximum of 25 participants. At the beginning of the course only 7% of the students did not know what a blog was; 40% of the students have already been reading other blogs at least once a month; and about 27% already had experiences with keeping an own blog.

## THE BLOG PORTAL

In general, there are two ways of hosting blogs in educational contexts: (a) within an LMS that offers a blogging tool, e.g. Moodle, or (b) outside of the LMS on an externally hosted blogging site such as Blogspot.com. In our case, the decision was to host the blogs externally to exploit all state-of-the-art blogging features as mentioned above. However, since the LMS was *the* platform for all other web-based course activities, hosting the student blogs externally created one critical problem: exploiting blog community features would require each student to create his/her own complete blogroll on Blogspot.com or in some other external web feed reader application. This would create entry barriers for each individual student and might be perceived as being too cumbersome to manage and too detached from the course LMS. In light of studies which revealed that easy-to-use technology does play a major role for the success of employing blogs (e.g. Du & Wagner, 2006; Hsu & Lin, 2008), an LMS extension that served as the *blog portal* was implemented. The main page of this portal as displayed in Figure 1 included several sections (the alphabetic item numbering below matches the section numbering in Figure 1).

- A. *Blogging instructions*: A brief paragraph outlining the blogging guidelines, which were also orally communicated in the early lab meetings.
- B. *Own blog*: Displays a hyperlink to the own blog on Blogspot.com. In the student view of the portal—which was otherwise identical to the teacher view—this section also included a link to the teacher’s blog. Essentially, obtaining the URL to student blogs on Blogspot.com was the only obstacle to getting the blogging activities started in the course. Students who visited the portal for the first time were presented a form that advised them to create a new blog on Blogspot.com and to supply the URL to their newly created blog. To ensure a

synchronized start of blogging activities in the course, the teacher dedicated parts of one early lab meeting to demonstrate how to create a blog on Blogspot.com, how to use the blog portal, and to explain the blogging guidelines.

- C. *Blog feed*: At three-hour intervals, the RSS (Really Simple Syndication; see Winer, 2003) feeds of all student blogs on Blogspot.com were automatically downloaded. These feeds were backed up for analysis and the 20 most recent blog entries extracted from the RSS feeds were listed in this section of the portal. For each blog entry in this list the display included: title of the blog entry, author's name, author's lab group number, date and time, and the number of comments posted to the blog entry. The purpose of this list was to stimulate blogging activity by showing peers' blog entries and comments. A click on a blog entry title would redirect the user to the blog entry on Blogspot.com.
- D. *Blogging charts*: This section was divided into two subsections. The subsection on the left-hand side displayed a list of top-10 bloggers in terms of number of blog entries. The idea was to stimulate some competition for appearing in this prominent spot. Since it would have been easy to claim a top position on this spot by posting huge numbers of non-sense entries (actually, such a case did not occur), this list was complemented by a blogger ranking determined through peer rating: the subsection on the right-hand side displayed the list of the own top-rated peer blogs (aka. "favorites"), or alternatively a list of the overall top-rated blogs as voted by peers. These lists were updated using AJAX requests each time a user rated a peer blog by clicking the respective rating (between one and five stars) in the blogroll (section E).
- E. *Course blogroll*: Displayed a list of students in each lab group; the names were hyperlinks to the blogs on Blogspot.com. This section was intended to enable easy access to all peer blogs.

## Blog

Use your blog to reflect on your problems, insights, and contributions during and after your task-related activities (project work, individual tasks) for the lab course. For example, you could ask yourself the following questions: What causes/caused me problems (and why)? Which solutions have I found/tried that could also be useful for my colleagues? Where was I unable to find a solution (and why)? What am I contributing to the team project? How do/did I approach the current problem? etc.

The minimum requirement is one blog entry per person per assigned task.

- **My blog** (opens in new window)  
Address: <http://swa08.blogspot.com>

### Recent Blog Entries

(Max. 20 entries, updated every 3 hrs / last update: 06.02., 10:02)

- P6 - Implementation: Die Abgabe / Ein kurzes Danke, für das lehrreiche SWA-Semester ;) — XXXXX Andreas, Group 4 (30.01.2009 00:11)
- Schöne Ferien — XXXXX Michael (29.01.2009 22:28)
- Teamaufgabe P6 - Implementierung — XXXXX Patrik, Group 1 (28.01.2009 13:35)
- Einzelaufgabe A6/A7: Webservice-server/client (Nachtrag:P) — XXXXX Patrik, Group 1 (28.01.2009 13:28)
- Implementierung — XXXXX Thomas, Group 1 (28.01.2009 13:17)
- Webservice — XXXXX Thomas, Group 1 (28.01.2009 13:14)
- P6 - Implementierung — XXXXX Peter, Group 4 (28.01.2009 11:03)
- Unser Projekt in Zahlen und Schlagworten — XXXXX Martin, Group 4 (27.01.2009 01:04) [1 comment]
- P6-Implementation: AJAX macht NOCH IMMER Probleme — XXXXX Andreas, Group 4 (27.01.2009 00:02) [1 comment]
- Kleines Helferlein — XXXXX Philipp, Group 4 (25.01.2009 02:39) [1 comment]
- Prüfung — XXXXX Benedikt, Group 2 (23.01.2009 20:24)
- Nach der Prüfung ist vor der Prüfung — XXXXX Philipp, Group 4 (23.01.2009 00:09)
- A6-neu — XXXXX Janina-Elena, Group 1 (22.01.2009 18:59) [1 comment]
- VO-Prüfung — XXXXX Nicolas, Group 4 (22.01.2009 12:39) [2 comments]
- P6 und anderes (auch Kekse) — XXXXX Werner, Group 4 (21.01.2009 20:31) [3 comments]
- Projektarbeiten beginnen — XXXXX Michael (20.01.2009 21:32)
- P6: Implementation "fertig" — XXXXX Julia Theresa, Group 4 (19.01.2009 15:59)
- P6: Implementation — XXXXX Julia Theresa, Group 4 (19.01.2009 14:45)
- Projekt/Registrieren — XXXXX Petranka Grozdanova, Group 4 (18.01.2009 21:39)
- assembla nicht mehr kostenlos :( — XXXXX Dritan, Group 4 (18.01.2009 17:13)

### Top 10 Bloggers

1. XXXXX Andreas (Group 4), 27 entries
2. XXXXX Iris Emanuela (Group 5), 22 entries  
XXXXX Werner (Group 4), 22 entries
4. XXXXX Martin (Group 4), 21 entries
5. XXXXX Manfred (Group 4), 19 entries
6. XXXXX Philipp (Group 4), 18 entries
7. XXXXX Nicolas (Group 4), 16 entries  
XXXXX Benedikt (Group 2), 16 entries
9. XXXXX Alexander (Group 4), 15 entries  
XXXXX David Georg (Group 4), 15 entries

### Overall Top 10

[Show My Top 10]

- ☆☆☆☆☆ XXXXX Christoph (3 ratings,  $\emptyset = 3.66$ )
- ☆☆☆☆☆ XXXXX David Georg (8 ratings,  $\emptyset = 3.62$ )
- ☆☆☆☆☆ XXXXX Ronny (7 ratings,  $\emptyset = 3.57$ )
- ☆☆☆☆☆ XXXXX Philipp (7 ratings,  $\emptyset = 3.57$ )
- ☆☆☆☆☆ XXXXX Florian (7 ratings,  $\emptyset = 3.57$ )
- ☆☆☆☆☆ XXXXX Werner (7 ratings,  $\emptyset = 3.57$ )
- ☆☆☆☆☆ XXXXX Andreas (6 ratings,  $\emptyset = 3.5$ )
- ☆☆☆☆☆ XXXXX Nicolas (4 ratings,  $\emptyset = 3.5$ )
- ☆☆☆☆☆ XXXXX Rebecca Maria Theresia (5 ratings,  $\emptyset = 3.4$ )
- ☆☆☆☆☆ XXXXX Manfred (6 ratings,  $\emptyset = 3.33$ )

### Blogs in Group 4

- ☆☆☆☆☆ XXXXX Ronny (11)
- ☆☆☆☆☆ XXXXX Peter (10)
- ☆☆☆☆☆ XXXXX Julia Theresa (13)
- ☆☆☆☆☆ XXXXX Nicolas (16)
- ☆☆☆☆☆ XXXXX Martin (21)
- ☆☆☆☆☆ XXXXX Majda (1)
- ☆☆☆☆☆ XXXXX Vlad Bogdan (3)
- ☆☆☆☆☆ XXXXX Manfred (19)
- ☆☆☆☆☆ XXXXX Marek (1)
- ☆☆☆☆☆ XXXXX Dritan (11)
- ☆☆☆☆☆ XXXXX Dzemal (11)
- ☆☆☆☆☆ XXXXX Petranka Grozdanova (10)
- ☆☆☆☆☆ XXXXX Christopher (9)
- ☆☆☆☆☆ XXXXX Werner (22)
- ☆☆☆☆☆ XXXXX Philipp Heinz (12)
- ☆☆☆☆☆ XXXXX Alexander (15)
- ☆☆☆☆☆ XXXXX Seyyed Ahmad (2)
- ☆☆☆☆☆ XXXXX Robert-Flavius (2)
- ☆☆☆☆☆ XXXXX Andreas (27)
- ☆☆☆☆☆ XXXXX Florian (15)
- ☆☆☆☆☆ XXXXX David Georg (15)
- ☆☆☆☆☆ XXXXX Milena (2)
- ☆☆☆☆☆ XXXXX Philipp (18)
- ☆☆☆☆☆ XXXXX Rebecca Maria Theresia (12)

### Blogs in Group 5

- ☆☆☆☆☆ XXXXX Shaweta (8)
- ☆☆☆☆☆ XXXXX Adis (5)
- ☆☆☆☆☆ XXXXX Dragan (8)
- ☆☆☆☆☆ XXXXX Ekaterina (8)
- ☆☆☆☆☆ XXXXX Emir (0)
- ☆☆☆☆☆ XXXXX Richard (13)
- ☆☆☆☆☆ XXXXX Damir (5)
- ☆☆☆☆☆ XXXXX Adnan (0)
- ☆☆☆☆☆ XXXXX Damir (13)
- ☆☆☆☆☆ XXXXX Minh Viet (13)
- ☆☆☆☆☆ XXXXX Minh Phuong (11)
- ☆☆☆☆☆ XXXXX Bernd Michael (11)
- ☆☆☆☆☆ XXXXX Velimir (2)
- ☆☆☆☆☆ XXXXX Julian (1)
- ☆☆☆☆☆ XXXXX Mikhail (8)
- ☆☆☆☆☆ XXXXX Robert (10)
- ☆☆☆☆☆ XXXXX Dragojle (7)
- ☆☆☆☆☆ XXXXX Iris Emanuela (22)
- ☆☆☆☆☆ XXXXX Sasa (10)

Figure 1: Screenshot of the LMS blog portal (anonymized).

All hyperlinks pointed to a proxy page, which first recorded the click in a log file and then immediately redirected the user to the target location. This way, the blog portal was able to log each portal visit and also each click on a hyperlink within the portal (including the timestamp, user, and relevant link-related information such as target blog, target entry, etc.). Thus the log files provide a comprehensive record of all actions taken on the blog portal.

Unfortunately the actions on the actual blog hosting site Blogspot.com were technically impossible to record. The portal logs should still be able to serve as a representative record of blogging activities in the course.

## BLOGGING ACTIVITY ANALYSIS

This section presents results of the analysis of LMS portal log data as well as blogging activities on Blogspot.com as obtained from the RSS feeds. To operationalize the concept of “blogging activity” we used several observable variables including number of blog entries, number of comments received, number of comments posted, and relevant log data from the blog portal page, including frequency of portal visits and visits to peer blogs and blog entries. Based on those data it was possible to distill each student’s blogging activity profile. In this study the focus was on quantitative data related to student blogging activities in the course and the actual blog contents were not considered for analysis.

### Descriptive data

Table 1 shows descriptive blogging statistics for all students of Groups A and B.

Table 1. Blogging and blog portal descriptive statistics.

	<b>Total</b>		<b>Group A</b>		<b>Group B</b>	
	<i>whole group</i>	<i>per student mean (s.d.)</i>	<i>whole group</i>	<i>per student mean (s.d.)</i>	<i>whole group</i>	<i>per student mean (s.d.)</i>
<b>Blogspot.com</b>						
Blog entries posted	425	9.88 (6.5)	276	11.50 (7.0)*	140	7.84 (5.4)
Avg. entry length	–	825 (659)	–	939 (709)*	–	613 (533)
Comments received <sup>a</sup>	254	5.91 (8.4)	199	8.29 (9.1)**	55	2.89 (6.5)
Comments posted <sup>b</sup>	139	3.23 (6.1)	123	5.13 (7.46)**	16	0.84 (2.3)
<b>Portal</b>						
Page visits	2,320	53.95 (84.2)	1,819	75.79 (104.4)**	501	26.37 (34.3)
Peer entry visits	1,914	44.51 (81.4)	1,590	66.25 (102.0)**	423	17.05 (27.7)
Peer blog visits	638	14.84 (16.2)	396	16.5 (17.6)	242	12.74 (14.5)
* $p < .1$ , ** $p < .05$ ... significance of difference of means between Group A and B						
<sup>a</sup> including teacher comments; <sup>b</sup> excluding teacher comments						

The table shows that each student on average posted close to 10 blog entries. The average blog entry was 825 characters long, i.e. about the length of a typical paper abstract. A total of 254 comments were posted to the student blogs, that is .6 comments per entry. The blogs and blog entries were accessed through the portal 638 and 1,914 times, respectively. The portal had a total of 2,320 page visits by students of both lab groups. During the blogging period (102 days) the student community posted an average of 4.17 entries per day. However, as evident from the plot in Figure 2, blog posting activities were not distributed evenly over time; instead, they followed a rather ragged pattern of ups and downs. Students had Christmas holidays of 16 days, where only one entry was posted per day on average. Also, the



last two weeks at the end of the semester were reserved for final project meetings between the teacher and individual project teams; during this period the blogosphere was rather “quiet.” Posting activities peaked on days close to assignment deadlines and lab meetings. In the days on or before lab meetings (26 days) more than 50% of all entries were posted (averaging 8.2 entries per day). This means that the teacher’s workload with reading blogs and facilitating bloggers also peaked on those days. This knowledge is valuable to teachers intending to adopt blogs as a technology for learning journals, as they will need to reserve some time to be spent in the course blogosphere shortly before and after days with meetings and/or deadlines.

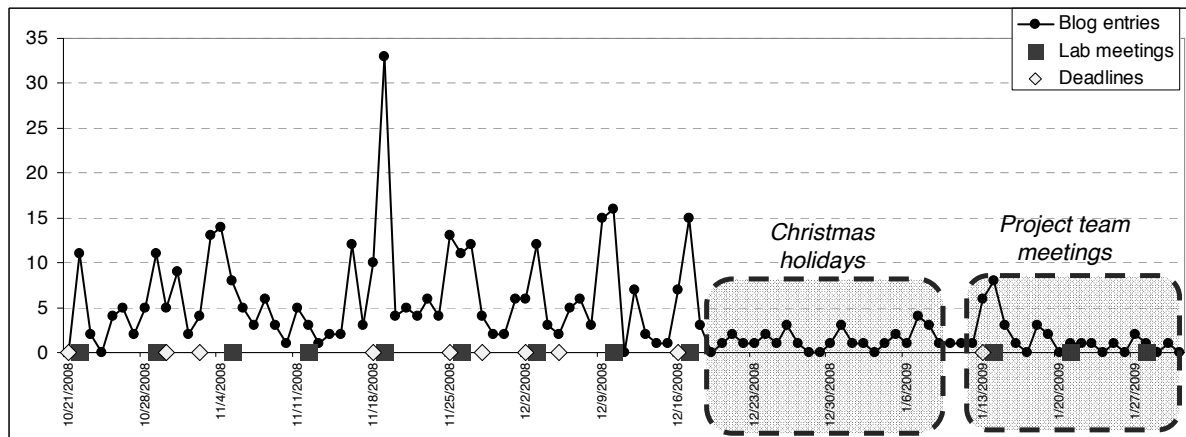


Figure 2. Blog posting activities over time. Each dot represents the number of blog entries (vertical axis) posted on that particular day (horizontal axis).

The other variables displayed in Table 1 also show substantial variance, which may be illustrated by a few simple facts:

- 12% of the students contributed almost two thirds of all comments to peer blogs;
- 28% of the students contributed two thirds of all blog entries;
- 20% of the students accounted for half of all visits made from the blog portal.

This kind of skewed distribution of few heavy contributors, some active contributors, and a vast majority of lurkers is typical of online communities, and has been described by Nielsen (2006) as the “90-9-1” rule of participation inequality.

### Bloggging and lab score

Correlation analysis using Pearson’s coefficient  $r$  shows that there is a significant positive correlation between the overall score students received for assignments and the number ( $r = .65, p < .01$ ) and average length ( $r = .30, p < .05$ ) of their blog entries. Figure 3 visualizes the relationship between lab score and number of entries posted per student. The plot is divided into four sectors, divided on the horizontal axis by the threshold for achieving a positive grade (i.e. at least 50% lab score) and on the vertical axis by the average number of blog postings per student (i.e. 9.88). While the data points do expose considerable scatter, it is evident that the top-left sector of the plot is empty. This essentially means that all students who posted more than the average number of blog entries did finally receive positive grade. The same finding was obtained from blogging data in the previous year (Derntl, 2008). There may be

several reasonable explanations for this repeated observation. One would be that students who achieve higher scores for their assignments presumably invest more time and effort into solving their assignments. This additional effort spent should produce more ideas, issues, solutions and other information to blog about. The blogging guidelines (see the section on study context) advised students to post one blog entry per assignment. Even though the guidelines were not enforced (there was no scoring of blogging activities), better students tended to demonstrate more compliance. Rank correlation analysis using Spearman's  $\rho$  showed that better students also more frequently visited their peers' blogs ( $\rho = .47, p < .01$ ) and posted more comments to peer blogs ( $\rho = .50, p < .01$ ). Thus, high-performing students tended to be more active in the blogosphere both actively (posting blog entries and comments) and passively (visiting peer blogs).

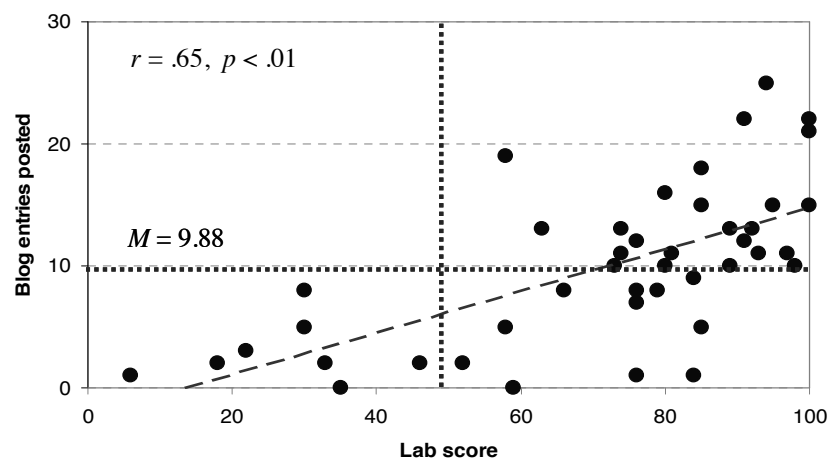


Figure 3. Plotting students' lab scores vs. their average number of blog entries.

### Previous use of blogs

Based on a survey distributed at the end of the course ( $n = 31$ ), We also tested whether previous experience with and knowledge about blogs had an effect on blogging activities. Previous experience with reading other blogs and keeping an own blog, respectively, did not have any significant effect on the number of blog entries posted by students. Only two students did not know what a blog was at the beginning of the course—too few to calculate meaningful statistics.

### Blogging as a duty vs. voluntary activity?

In the survey we also asked students whether blogging was perceived as a voluntary activity or as a duty, both at the beginning of the course and towards the end of the course. While students who perceived blogging as a duty did contribute fewer blog entries than those who voluntarily blogged, the difference was not statistically significant. However, as a confirmation of the generally positive perception the teacher sensed in the student community about the blogging experience, Figure 4 shows the shift of perception of blogging as a duty vs. voluntary activity based on a pre-post comparison. It shows that 10 students (i.e. one third of the survey sample) began to blog on a voluntary basis after starting off with experiencing this activity as a duty imposed by the teacher. Only one student, who perceived blogging as a duty at

the beginning of the course, quit blogging during the semester. Only one student, who started blogging voluntarily, considered the activity as a duty at the end of the semester.

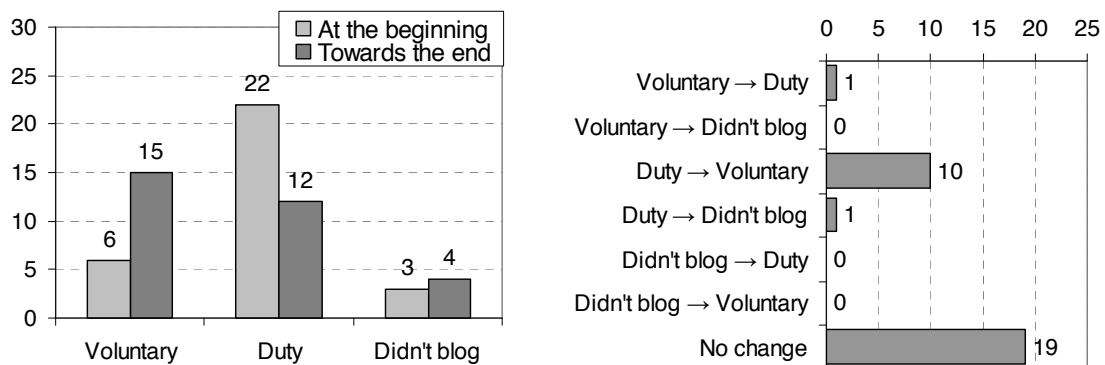


Figure 4. Pre-post comparison of blogging as a duty vs. voluntary activity.

### Peer-visit networks

Individual blogging activities in a course take place within a community of peers. Students may be curious about what their peers are blogging, post comments to their peers' entries, and maintain blogrolls of their favorite peer blogs. To shed some light into such a community, Figure 5 displays the network of peer blog/entry visits in Groups A (left) and B (right). Each node in these graphs represents a student, whereby the size of the node grows in proportion to the number of blog entries posted by the student that is represented by the node. The thickness of the connecting edge between two nodes indicates the number of visits to the target peer's blog and/or entries via the blog portal. The figure reveals a substantial difference in the number of peer connections in Groups A and B, which was already indicated in Table 1. Even though Group A had five students more than Group B, this could not fully explain the disproportions in the two group networks. To test this, the top five bloggers were removed from Group A data; even after this change there were still more than double as many peer visits in the network of Group A as compared to Group B. Note that in this figure, all inter-group peer visits were removed to keep the figure clear and focused on intra-group interaction; of course, it was possible to visit the blog of a student of the other group, but the majority of interactions—face-to-face and online—happened within the groups.

The figure is mainly intended to demonstrate that the size of a student group is not the only determining factor in the peer-visit network of a student blogger group. It is suggested that there are other factors of importance, such as the presence of a critical mass of active bloggers.

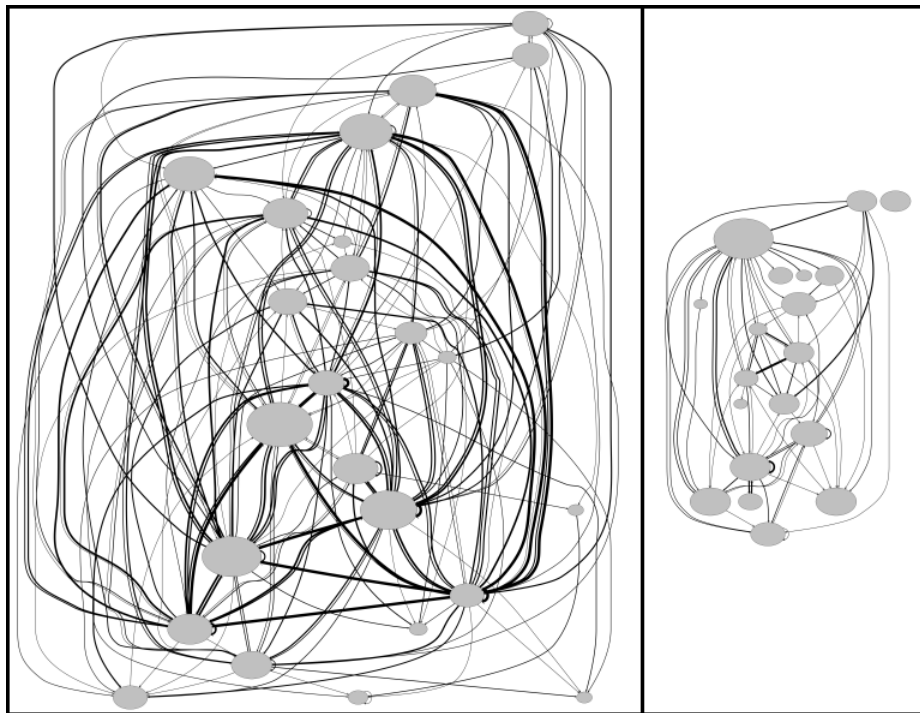


Figure 5. Networks of peer blog visits in groups A (left) and B (right).

### Model of correlations among observed blogging activity variables

To achieve a better understanding of student blogging communities and their differences, we created a model that aims to explain the relationships between various variables of activity within a blogging community based on correlations between variables. The model, which is shown in Figure 6, is also intended to reveal spots in the community that offer teachers opportunities for facilitating and supporting blogging activities.

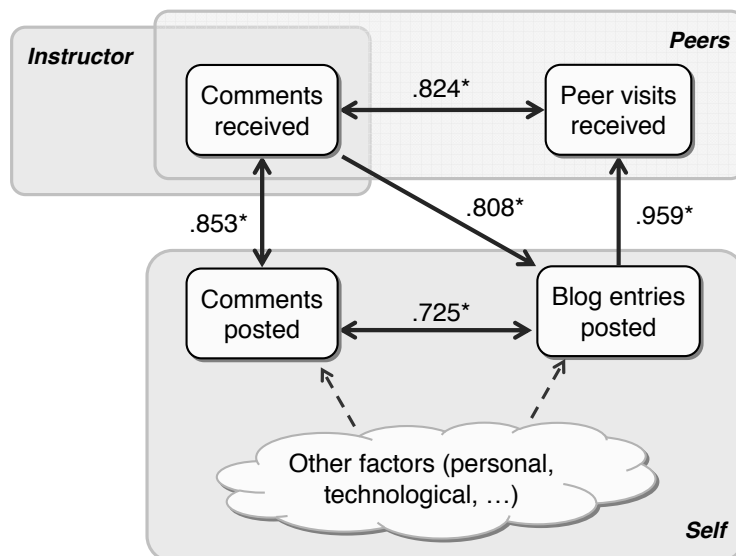


Figure 6. Correlations between log data variables. (\* $p < .01$ )

The main variables contributing to an active community of bloggers in the model are: number of comments and entries to blogs as well as number of comments received; all these can be observed directly on the blog hosting platform. The number of visits by peers to the own blog cannot be obtained from Blogspot.com, since this site does not offer access to any visitor traffic statistics. However, these figures can be estimated based on blog visits made through the blog portal. The correlation effects as indicated by arrows in Figure 6 are explained as follows:

- Students who frequently posted to their blog tended to post more comments than students who posted less frequently, since both actions are similar forms of active participation. The data reveal a significant correlation between these two variables (Spearman's  $\rho = .72$ ,  $p < .01$ ).
- The more comments students received by peers, the more peer visits they attracted. This is obvious since—as described in the section on the blog portal—the portal displayed the number of comments of each blog entry in the list of recently posted entries. It should be safe to assume that (a) entries with comments attract more visits than those without any comments, and (b) this relationship is bidirectional, since each additional visitor will increase the chance of a comment being posted. This bidirectional relationship is confirmed by available data ( $\rho = .82$ ,  $p < .01$ ).
- Received comments also significantly stimulate the own blog posting activities ( $\rho = .81$ ,  $p < .01$ ). This relationship is unidirectional, since the reverse direction (influence of blog entries on comments received) is transitively covered in the model via the “peer visits received” variable (i.e. only a visitor can post a comment).
- There should be a strong relationship between blog posting and peer visits, since each blog entry appeared (at least for some time) on the RSS feed of the 20 most recent entries on the blog portal. Actual data reveal an extraordinary high correlation coefficient of  $\rho = .96$  ( $p < .01$ ).

This correlation model reveals a spot that may be used by teachers / facilitators to spark and sustain blogging activity: “comments posted” is the only variable within the student community that is actually under co-control by teachers. From the student point of view, this effect is less obvious, since the blog portal did not reveal *who* commented on an entry; it merely showed *how many* comments were posted, which is anonymous until the blog entry is actually visited. So keeping external factors constant, the obvious way to facilitate bloggers would be to make inspiring comments to their blog entries. The model can also be used to try to explain the strong differences in activity within the communities of Group A and B evident from Figure 5. According to the model, the primary seeds for activity within a student blogger community are comments and peer visits. Table 1 shows that commenting and posting in Group B was significantly less frequent than in Group A. However, there were additional factors which were subjectively obvious to the teacher. For instance, in Group A there were a handful of active, motivated bloggers who kept the activity at a high level and demonstrated how useful blogging can be in supporting reflection and personal exchange. Without such bloggers, it might as well be impossible to spark and sustain blogging activity in the student community.

Of course, in reality there will be many more factors—motivational, technological, social, and personal—which contribute to individual blogging and community activity. Several researchers have tried to explain student blogging behavior based on such

factors. Du and Wagner (2006) propose a weblog success model based on content value (e.g., type of information, presentation, posting volume), technology value (e.g., tool characteristics), and social value (e.g., visitors, commentators, blogroll). In relation to this model, the model in this paper clearly focuses on observable, quantitative measures of social value in combination with number of postings (content value). Another research model was recently presented by Hsu and Lin (2008): it shows that the intention to blog is dependent on factors of technology acceptance, knowledge sharing, and social influence. However, this model is primarily concerned with user intentions as surveyed through questionnaires, and it does in contrast to our model not deal with statistics of actual blogging activities. In an effort to explain blogging activities based on personality traits, Guadagno et al. (2008) found that people who are open to new experience and who score high on the neuroticism scale are likely to blog. As one would expect, active learners (in terms of the Felder-Silverman Learning Style Model; Felder & Silverman, 1988) tend to contribute more postings to the blogosphere than reflective learners (Derntl & Graf, 2009).

Since the models discussed above show a range of different factors explaining blogging intentions and behavior, the obvious limitation of our model is that it does not consider personal and technological factors. Our model focuses on observable participation—that is, viewing, posting and commenting. Follow-up studies will have to investigate the impact of additional factors in our model.

## **CONCLUSIONS AND FURTHER WORK**

In this paper a case study of using blogs in a blended computer-science lab course on software architectures and web technologies was presented. Blogs were intended as a medium for reflecting on ideas, issues, assignments, and other things of relevance, as well as a tool for virtual community building. The blogs were hosted on Blogspot.com, a free blog hosting service, and integrated into our LMS by extending it with a *blog portal*, which downloaded RSS feeds of student blogs and displayed the recently posted blog entries and the course blogroll.

One limitation of the present study is the very specific nature of the study context, i.e. an undergraduate lab course in computer science. This context may exhibit peculiar characteristics and student behavior that may not be shared by other subjects or disciplines or course styles. Therefore, the conclusions drawn here need to be considered in the light of this specific context. To draw more universally applicable generalizations, the study needs to be reproduced in different contexts.

Analysis of blog usage using RSS feed data from Blogspot.com and log data obtained by the blog portal showed quite diverse patterns of blogging activity. There were considerable differences in individual blogging activities, i.e. posting entries to the own blog as well as visiting and commenting peer blogs. It was discovered that students with higher academic performance tended to post more blog entries and comments, and they also tended to visit their peers' blogs more frequently. Similar results were found in a previous study in a similar context (Derntl, 2008). Thus, observed blogging activities seemed to be a good indicator of student performance, which could help teachers and facilitators in identifying “blog lazy” students as potential drop-outs and/or low performers. Another finding was that blogging activities

followed a ragged pattern, with peaks occurring close to approaching lab meetings and assignment deadlines.

In analyzing the network of peer blog visits in the two different lab groups under study, there was a significant difference in frequency of peer visits, which could not be solely attributed to different group sizes. A model of correlations between important variables of blogging activity was devised to help reveal the relationships between those variables within a network of student bloggers. Correlation analyses showed that there was a circle of interdependence between receiving comments, visiting peer blogs, and posting to the own blog. This circle includes a spot that may give teaching staff opportunities to spark blogging activities, i.e. comments to student blog entries. These findings may have strong ties to the peer blog information that were chosen to be displayed within the blog portal page. Further research is required to substantiate this proposition.

Reflecting on the experience from the teacher's perspective, the blogs provided an unexpectedly rich source of insight into students' learning processes, including hints about difficult stages in problem-solving processes, sharing of personal successes and significant events encountered during the course, information about issues with teamwork, deadlines, and assignment descriptions, as well as valuable feedback on the course in general. Potential adopters should however be aware of the fact that reading the blogs and considering their contents may consume some significant share of those days where blogging activities typically peak (i.e. on or before meeting days and assignment deadlines). Therefore teachers aspiring to adopt blogs in a similar way as presented in this study need to make sure to allocate some time on each of those days exclusively to reading blogs and dealing with issues raised in the blogs. It may help to seek the help of a tutor for facilitating the bloggers. Most importantly, engaging as a facilitator of student bloggers appears to only make sense when the teacher is genuinely interested in what students are doing and thinking in their role as students and as human beings. Therefore, educators need to exhibit some degree of openness toward these virtual interpersonal experiences; those who see the teacher primarily in the role of a permanently busy and thus mostly unavailable expert who is only accessible through proxies like tutors and assistants may have difficulties experiencing and enjoying the moments of immediateness and connectedness in the blogosphere.

To obtain more qualitatively grounded conclusions from student blogging activities and to overcome the narrow observation-based activity focus of the model proposed in this paper, future research will address analysis and categorization of blog content, i.e. entry, comments, and personalized appearance of the blog page. The goal is to achieve a better understanding about who blogs, and why particular bloggers (or course sub-groups) have the capability of spawning high-activity communities of student bloggers.

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