

Impact of Learning Styles on Student Blogging Behavior*

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Abstract

The use of blogs in educational contexts has been gaining popularity in recent years. While there are many case studies already available, few have been investigating the relationship between students' learning styles and their blogging behavior. In this paper, we use the Felder-Silverman learning style model to empirically analyze effects on blogging behavior in an undergraduate computer science course on software architectures and web technologies. While results show that blogging behavior is generally not much affected by learning style, we found some significant differences in the type of participation in blogging activities between active and reflective learners and between sequential and global learners.

1. Introduction

A blog is a collection of “frequently updated, reverse-chronological entries on a single Web page” [1], p53. The entries are typically posted by a single author, i.e. the blogger. While blogs have been an established and generally well understood communication medium on the Web for quite some time, their use in educational contexts has only recently been gaining attention [2]. Using blogs in educational settings can serve many different purposes, depending on how they are embedded into the “core” course activities. One prominent use is that of blog as a learning diary, e.g. for allowing students to reflect on their course activities and document their work [3]. This can be applied in settings such as project-based learning or inquiry learning where students tackle ill-defined, complex problems and may offer insights into their problem-solving and research processes by posting on their blogs (for an example in medical

education see [4]). Blogs can also be used as a tool to let students submit their contributions [5], e.g. paper reviews, peer feedback, comments, reactions, etc. Generally, blogs can be used as an effective instrument to increase student immersion with the course subject [6]. Due to features such as blogrolls, trackbacks, permalinks, commenting tools and content syndication, blogs are a powerful tool for building and facilitating learner communities. Within such settings, blogging may facilitate development of generic competencies, e.g. communication and writing [7].

These are just some of the options of employing blogs in e-learning or blended learning courses. Blogs are a highly favorable tool in these settings since they are typically easy to use, offer manifold customization features, are freely available on popular blog hosting services (e.g., Blogger or Wordpress), and are open to integration into existing applications via Web feeds (most prominently, RSS and Atom).

Over recent years, case studies and theoretical articles have investigated the foundations and success factors of using blogs in educational settings. However, there are only few studies dealing with the effect of students' personal preferences on their actual blogging behavior; for a notable exception see [8]. In this paper we aim at bridging this gap by analyzing the effect of learning styles on blogging behavior.

The rest of the paper is structured as follows. In the next section we present the learning style model underlying our research. Section 3 presents and discusses an empirical study of learning styles and blogging in a computer-science course. The last section concludes the paper and gives an outlook on further research.

2. Learning Styles

Learning styles can be seen as “a description of the attitudes and behaviours which determine an individual's preferred way of learning” [9], p1. Many learning style models exist in literature, such as the learning style model by Kolb [10], Honey and Mumford [9], Pask [11], and Felder and Silverman

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[12]. For this study, we selected the Felder-Silverman learning style model (FSLSM) [12]. While most learning style models classify learners into very few types, FSLSM is based on the idea that each learner has a preference on each of four dimensions, measured as values between +11 and -11. FSLSM considers learning styles as tendencies, meaning that students have a core tendency for a specific learning style but can also act differently in particular situations. By incorporating the concept of tendencies, the description of learning styles also considers exceptions and extraordinary situations. Besides, FSLSM is one of the most often used learning style models in technology enhanced learning and often considered to be the most appropriate model for use in learning systems [13].

According to FSLSM, each learner has a preference on four distinct dimensions: active/reflective, sensing/intuitive, visual/verbal, and sequential/global. *Active* learners learn by trying things out and working together with others, whereas *reflective* learners learn by thinking things through and reflecting about them, and they prefer to learn alone. *Sensing* learners like to learn from concrete material like examples, tend to be more practical, and are careful with details, whereas *intuitive* learners prefer to learn abstract material, like challenges, and are more innovative. *Visual* learners remember best what they have seen, whereas *verbal* learners get more out of words, regardless whether they are spoken or written. *Sequential* learners learn in linear steps, prefer to follow linear, stepwise paths and be guided through the learning process, whereas *global* learners learn in large leaps and prefer a higher degree of freedom in their learning process. In the following main part of the paper, we analyze the effects of these four dimensions on students' use of blogs.

3. Empirical Study

3.1. Course Context

The context of the study presented in this paper is a third-semester undergraduate module on "software architectures and web technologies" that was held during winter term 2008 (October, 2008 – January, 2009). The module is part of the bachelor curriculum of computer science at the University of Vienna; it consists of a lecture course and a concurrent lab course. The lab course was held in a blended learning mode, with face-to-face lab meetings serving as a plenum for assigning tasks, doing hands-on exercises, discussing contributions, solving task and project related problems, checking assignments, and presenting team project results. The lab course was held in five separate groups, of which four were employing a similar mode (regarding tasks,

instructions and materials) and are thus under investigation here.

Students had to complete six personal assignments and six team-project tasks during the online phases of the lab course. Also, they were expected to be active during in-class exercises, presentations and discussions. They were asked to document and reflect on their efforts as contributed online and face-to-face in their personal blog. Consequently, blogging was intended as a kind of personal journal: it offered the students space for posting insights, reflections and remarks on the tasks (e.g., why they were unable to solve a problem), reflection on their project and teamwork, and anything else they consider worthwhile to mention. So the primary intent was to use blogs in the spirit of reflective logbooks [3]. The guidelines for blogging were posted on the course homepage as follows (trans. from German): "*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 posting per person per assigned task.*" – Note that this was a 'weak' requirement, meaning that students were not assessed on the actual use of their blog.

The blogs were hosted on *Blogger*, a free blog hosting service offered by Google (<http://blogger.com>). Thus, they were accessible publicly by everyone on the Web. The problem of integrating the blogging activities into the course's learning management system (LMS) was approached as follows: we implemented a custom module as an extension to the LMS, which served students and instructors as an entry point to blogging activities. The module shows an LMS page comprising the following pieces of information:

- (1) The blogging guidelines as given above.
- (2) A link to the own blog on Blogger (at the beginning of the lab course students were asked to create a personal blog on Blogger and to submit their username to their instructor) as well as to the instructor's blog.
- (3) A bullet list of the 20 most recent blog postings, including title, author, date, and number of comments. This list was automatically updated in 3-hour intervals by parsing and transforming the RSS feeds available on Blogger for each blog.
- (4) A list of links to all students' blogs; it was possible to assign a rating to each blog (1 to 5 stars)

right next to the blog link. This rating, and a list of top bloggers, was also listed on the page in the form of top-10 charts. The idea underlying the rating option was to stimulate blogging activity, and to reward frequent and popular bloggers with presence on the blog entry page.

3.2. Participants

The four lab groups subject to the study were held by two instructors with an overall enrollment of 77 students (61 male, 16 female; age: $M=24.5$, $SD=3.4$). Students could choose their preferred group, but a roughly equal distribution of students among groups was achieved with consensual, minor reassignments after enrollment was completed.

3.3. Method and Research Questions

At the beginning of the lab course, all students were asked to fill out an online version of the Index of Learning Styles (ILS) questionnaire [14] to acquire information on students' learning styles according to the FLSM. Based on a comparison of studies about the reliability and validity of this instrument, Felder and Spurlin concluded that the ILS questionnaire may be considered as reliable, valid and suitable [15]. Overall, 74 of the 77 students submitted the questionnaire and data from these students were included in our study.

Blogging data was collected by automatic periodical downloads and backups of RSS feeds of student blogs, recording date, author, content and comments of each blog posting. All actions on the LMS blog page were recorded in a log file. These actions include page visit, accessing the own blog, the instructor's blog, or another blog from the blog list, from the charts, or from the list of 20 most recent blog postings. Using collected data we were interested in analyzing how learning styles are related to blogging behavior and thus investigated the following research questions: *Is there a relationship between students' learning styles and ...*

- ... how often they visit and use the blogging environment? (RQ_1)
- ... how often they post to their blogs? (RQ_2)
- ... how often they read others' blogs? (RQ_3)
- ... their preference for reading blogs from others over writing to their own blogs? (RQ_4)
- ... their average length of messages? (RQ_5)
- ... their preference for using links from the 20 recent blog postings? (RQ_6)
- ... their preference for using links from charts? (RQ_7)

To answer these research questions, we used rank correlation analysis, calculating Kendall's *tau* and Spearman's *rho*. Outliers were considered in our analysis. If few outliers (5 or less) were found in the data, we excluded them from analysis.

3.4. Results

Learning styles distribution. Table 1 describes the distribution of learning style preferences of the 74 participants. Most of the students prefer a visual learning style. This is in line with reports from other studies (summarized in [15]), showing that students with Engineering background more often prefer a visual learning style. The distribution of the other learning style dimensions is also similar to the ones found in literature.

Table 1. Distribution of learning styles.

active	reflective	sensing	intuitive	visual	verbal	sequential	global
51	23	54	20	63	11	36	38
69%	31%	73%	27%	85%	15%	49%	51%

Blogging behavior. At the beginning of the course 70% of the students had no prior experience with keeping a blog and 6% of the students did not know what a blog actually was. Over the whole semester, the average number of blog postings per student was 7.50 ($SD=6.35$; $min=0$; $max=25$). The average total length of a student blog was 6,892 characters ($SD=10,815$); the average length of a single blog posting was 725 characters ($SD=579$). All "actions" (i.e., views and clicks) on the blog module page that was embedded into the LMS were logged; the logs reveal that on average each student performed 99 actions on this page during the semester; viewing this page ($M=38.5$, $SD=68.7$) and clicks on one of the 20 most recent postings ($M=37.8$, $SD=83.3$) account for most of these actions. Unfortunately, the exact behavior of students on the blog hosting service (blogger.com) cannot be tracked. The analysis in this paper is based exclusively on the RSS feeds available from blogger.com and on log files collected on the blog module in our LMS.

Relationships between learning styles and blogging behavior. Table 2 shows the results of the correlation analysis for each research question and each learning style dimension. Significant results are highlighted by an asterisk and written in bold font, using a significance level of 0.05.

No significant results were found regarding research question RQ_1 , indicating that learning styles do not influence how frequently students visit and use the blogging environment. This result gives us an indication that using blogs in education does not favor learners with particular learning styles and therefore

has potential to support all learners independent of their learning styles. Especially interesting is that there is no difference with respect to the active/reflective dimension. While active learners tend to be more socially oriented and like to communicate, discuss, and explain learning material to each other, reflective learners like to reflect about their work. So both preferences can be met in the blogging environment.

Table 2. Correlations between learning styles and blogging behavior.

			act/ref	sen/int	vis/ver	seq/glo
blog_usage	Kendall	tau	0.114	-0.015	-0.090	-0.036
		p	0.176	0.854	0.285	0.664
	Spearman	rho	0.159	-0.019	-0.123	-0.069
		p	0.176	0.870	0.296	0.558
blog_postings	Kendall	tau	0.188 *	-0.013	-0.111	-0.013
		p	0.030	0.881	0.199	0.883
	Spearman	rho	0.257 *	-0.016	-0.146	-0.019
		p	0.027	0.890	0.215	0.871
blog_reading	Kendall	tau	0.081	-0.015	-0.058	-0.019
		p	0.339	0.861	0.496	0.817
	Spearman	rho	0.114	-0.011	-0.084	-0.026
		p	0.335	0.926	0.478	0.826
blog_postread	Kendall	tau	0.258 *	0.018	-0.079	0.117
		p	0.003	0.836	0.366	0.181
	Spearman	rho	0.348 *	0.021	-0.106	0.160
		p	0.003	0.859	0.388	0.189
blog_length	Kendall	tau	0.010	0.110	-0.115	0.177
		p	0.909	0.234	0.205	0.058
	Spearman	rho	0.007	0.154	-0.144	0.264 *
		p	0.955	0.235	0.258	0.041
blog_recent	Kendall	tau	-0.012	-0.021	0.072	-0.010
		p	0.885	0.802	0.398	0.904
	Spearman	rho	-0.022	-0.042	0.107	-0.015
		p	0.850	0.722	0.367	0.902
blog_charts	Kendall	tau	0.191 *	0.004	0.022	0.009
		p	0.034	0.968	0.809	0.920
	Spearman	rho	0.238 *	0.014	0.028	0.007
		p	0.043	0.908	0.811	0.951

Looking at the total number of messages students have posted to their blogs and whether this behavior is related to their learning styles (RQ_2), we found a significant correlation for the active/reflective dimension: learners with an active learning style post more frequently than learners with a reflective learning style. This is in line with our expectations since, according to FLSM, active learners have a preference for communicating with others and are therefore expected to post more frequently.

For answering RQ_3 , the relationship between learning styles and the students' preferences for reading others' blogs was analyzed based on the total number of times students clicked on the blogs and blog postings of other students and the instructor. As a result, no significant differences were found for any learning style dimension. Having in mind that active learners tend to post more often in their blogs, it seems that reflective and active learners read blog postings of others similarly frequently.

As a next step, we investigated the relation between posting to the own blog and reading others' blogs with

respect to learning styles (RQ_4). A significant correlation for the active/reflective dimension was found, indicating that reflective learners prefer reading others' messages over posting to their own blogs, whereas active learners have a significant higher rate of posting relative to their reading activities.

When looking at the average length of the students' postings (RQ_5), we could only find a significant difference according to Spearman's ρ for the sequential/global dimension, indicating that postings from sequential learners are on average longer than postings from global learners. This could be explained by the sequential learners' preference for details, which might lead them to include more details about their work in the postings. However, since the average number of postings is only 7.50, further investigations are necessary to confirm this result and find relationships with other dimensions.

The next research question (RQ_6) deals with the effects of the list of 20 most recent postings, investigating whether it attracted learners with particular learning styles more than others. Comparing the number of clicks on this list relative to all other clicks in the blogging environment (e.g., on the own blog, on peers' blogs, on the charts), no significant difference was found, indicating that the feature supports all learners alike.

Analyzing the effects of the charts feature (RQ_7) showing top-10 charts related to number of postings and peer rating, respectively, we found a significant difference between active and reflective learners, the former using charts more often. This can be explained by the characteristics of active learners, who tend to be more social oriented, relying more on the opinion of others and therefore are also more interested in blogs which are recommended by their colleagues.

3.5. Discussion

The results show that most learning style effects on blogging behavior were found for the active/reflective dimension. Active learners tend to post more frequently to their blogs than reflective learners and they also tend to use the top-10 charts more frequently as an "entry point" to reading other blogs. On the other hand, reflective learners' ratio of reading other blog postings vs. posting to their own blogs is significantly higher than that of active learners. This is an important finding, since it relates to an "invisible" activity, i.e. reading, which also constitutes some form of participation in the blogging activity. The only significant effect of other learning style dimensions was found for the sequential/global dimension: sequential learners tend to write longer posts than global learners.

In general, these findings indicate that the blogging activity does not prefer any particular learning style; however, the active/reflective dimension shows effects regarding the form of participation in the blogging activity: active learners prefer to write blog postings, while reflective learners prefer to read other blogs.

Note that this study needs to be considered in the context of two restrictions. First, the findings need to be interpreted in the light of the blogging guidelines and facilitation provided by the instructor – i.e., different guidelines and interventions might lead to different results. Second, this study focused on analysis of quantitative data only. To obtain more conclusive information on the quality of students' participation, the content of the blogs need to be considered in the analysis. These considerations are part of the future research agenda.

4. Conclusions and Future Work

In this paper we investigated the impact of students' learning styles on their blogging behavior in a course on software architectures and web technologies. The learning styles were obtained by distributing the Index of Learning Styles questionnaire [14], and blogging behavior was observed using RSS feed data offered by the blog hosting service (blogger.com) and log files comprising all "actions" performed on the blog page on our LMS, which was kind of the course's "home base" for the blogging activities.

The results show that learning styles do not have a broad impact on observable blogging behavior, which is basically good news since it suggests that learning style preferences generally do not impede nor facilitate participation in blogging activities. However, we found some differences regarding the "quality" of student participation. In particular, active learners do post more frequently to their blogs while reflective learners are more into reading their peers' blogs than posting to their own blog. Additionally we found that sequential learners write longer postings than global learners.

Further research will address multiple threads: investigation of the relationship between blogging behavior and learning outcome; qualitative analysis and classification of blog postings to enable investigation of the impact of learning styles on blog content; and putting observation data into context using data from a survey on the blogging experience (e.g. effects of prior experience or attitudes towards the use of blogs) that was distributed to students at the end of the course.

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