An Exploratory Study on Blog Visualization and Learners’ Reactions in an Online Learning Community

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This exploratory study reports on students’ online behavior within an environment that allows monitoring of their and others’ work performance in an online learning community. Previous research showed that group dynamics can both foster and inhibit online participation. It has also been suggested that visualization of the performance (such as a picture) of all members of a group works as an “external feedback,” which can foster higher performance. Students in this research could see others’ blog postings both in textual and visual formats. In this study, a blog viewing tool was implemented in the middle of the semester to observe changes in students’ behavior as reflected in the frequency of their blog posts. Two methods, quantitative blog text analysis and post-course questionnaire administration, were used. The questionnaire was utilized by the students to evaluate the usability of the blog viewing tool. Analysis revealed that students’ blog posting frequency remained fairly high in the latter half of the semester. The study suggests the possibility that visualization of online performance could function as a self-regulatory mechanism to encourage regular online participation in a class community.

Key Words: blog; information visualization; social dilemma; learning community

This study explored students’ reactions in an online learning environment that allows monitoring of their own and others’ work performance as a graphical image. While efforts have been made to develop visualization tools that track people’s online behavior, few studies have been conducted on how these tools relate to and improve teaching practices and learning outcomes. Therefore, this study aims to investigate learners’ reactions at the individual and class group levels to a learning environment accompanied by a visual representation of blog posts in an English as a foreign language (EFL) class, in which blog writing in English was an optional activity.

1. Literature Review

In online learning environments, where people can easily view others’ works, several studies provide the theoretical accounts on participants’ behavior. Social psychology and
group dynamics theories are often used (Kimmerle & Cress, 2009) and it is likely that people use the on-going participation level of the rest of the group to gauge the level of their own participation. In other words, an active and cooperative group is likely to induce an even higher level of participation, whereas an inactive and uncooperative group could induce the opposite. This means that visualizing online activities is a double-edged sword that can induce both positive and negative group mechanisms in the online sphere. Online learning is exploding in popularity around the world (Ala-Mutka, 2009; Allen & Seaman, 2008; McKlin, Harmon, Evans, & Jones, 2004) but much research remains to be done to determine optimal activities, evaluation and motivational interventions.

This leads to the need for a more nuanced dimension of group dynamics called “social dilemmas” (Dawes & Messick, 2000), whose application has been extended to a broader context of online information exchange (Cress & Kimmerle, 2007). Social dilemmas are defined as the “situations in which each member of a group has a clear and unambiguous incentive to make a choice that—when made by all members—provides poorer outcomes for all than they would have received if none had made the choice” (Dawes & Messick, 2000, p.111). In online information exchange, people may not contribute information themselves but only try to retrieve useful information contributed by others because making a contribution demands individual costs (including time and effort) but may not result in direct returns. Hence, the information database will wither and become useless for everyone (Cress & Kimmerle, 2007). This happens frequently in online discussion forums in educational contexts that often ends with very few posts. Much posting is inspired only by the external motivation of graded assessment for participation (Bures, Abrami, & Amundsen, 2000). A possible solution to enhance motivation is to appeal to “anchoring effects” (Furnham & Boob, 2011) where guidelines or descriptive norms for participation are established to serve as positive “anchors” (psychological term to mean the initial standards that guide people how to behave) for people’s productive contribution. Studies have shown that saliency and higher standards (for example, eight contribution requirements instead of three contributions as a group) are in fact necessary to induce a group’s positive contribution as a whole (Cress & Kimmerle, 2007).

From the perspective of computer-supported collaborative learning (CSCL), studies have been made to examine the effects of visualizing students’ participation to a task-based collaborative activity (Janssen, Erkens, & Kanselaar, 2007; Janssen, Erkens, Kanselaar, & Jaspers, 2007). These studies have borrowed social psychological and philosophical concepts, such as “social loafing” (individual member who works less in a group than when he/she works alone) or the “free rider effect” (individual member who takes more than what he/she provides), in collaborative behavior and emphasized that a high level of and equal participation are keys to producing high performance in collaborative learning. To realize these conditions, visualization of all members’ performance could work as an “external feedback” for individuals to monitor their performance in comparison with the others so that the group process would be able to work more effectively.
In other words, when we visualize online performance in a formal collaborative environment, some preventive measures, such as clear high standards to avoid workload inequality and moral stagnation, are necessary in order to attain the common goal of better and higher learning of all members.

In this research, a blog viewing tool was implemented with the aim to “mirror” (Reimann & Kay, 2010) the posting rate at individual and whole class levels to provide the abovementioned monitoring environment. Using the visualization technique, each student intuitively evaluated the distance between the class performance and his/her own performance. As a result, an adjustment would be made on the level of his/her own commitment to the assigned task.

2. Research Questions

At this preliminary stage, the initial research aim was to determine how students react to a learning environment accompanied by a visual representation of blog posts.

Specifically, this research attempted to answer the following three questions: 1) How does students’ online participation pattern change before and after the implementation of visualization intervention? 2) How do students react to the implemented online performance monitoring environment? 3) Is the implemented visualization tool useful enough to provide the target learning environment?

We hypothesize that the macro-level visual information on the blog writing performance of peer members will help increase the self-awareness of the students regarding their own performance in a “nondirective” manner, and, therefore, would help foster steady participation.

3. Methodology

3.1 Blog in the Course Design

The study was conducted in two undergraduate classes (hereafter, Classes A and B) of engineering majors. A total of 56 students participated in the data collection and consented to analysis and publication. Both classes were classified by the English placement test held at the time of entry to the university. The English proficiency of Class A was higher than Class B. The course objective was to acquire the English language skills necessary for work in engineering. The course was required to cover the four skills of reading, listening, speaking, and writing. Therefore, only one fourth of the course content was assigned to online writing in English, which was conducted out-of-class through online independent study.

The course was a blended design with 15 face-to-face weekly meetings and out-of-class blog writing on Moodle. Therefore, students could see the blogs both in text and visual image forms (the text was shown on both the Moodle blog page and the blog visualization page, and the visual image was shown only on the visualization page).

All sessions were held in a school computer room, and each student was assigned a computer with Internet capabilities. Since students’ areas of concentration involved information, media, technology, and communications, all of them had notebook PCs, and nearly all had Internet connections at home. With national and school holidays (including a short fall break), the semester lasted 18 weeks in this research.

With regard to blog topics, the students could freely choose their topics or select among those that the teacher provided as
opinion essay every week. Both free topical writings and essay writings were posted by using the Moodle blog functions and were shown on the blog viewing webpage.

During the second week of meeting, a guidance session was provided so that all the students could make blog posts. The students were encouraged (not required) to write free or topic-based blogs at least once per week. This element was intended to be the ambiguous “anchor” in this research, which was yet exploratory. At this stage, precise evaluation policy for blogs, such as frequency and length, was intentionally not clarified so as to minimize their effects on students’ natural reactions. Therefore, online writing did not belong to the formal part of the final course evaluation.

The students used user names consisting of their students’ identification numbers and their preferred pseudonyms so as to reduce the influence of group and individual dynamics existing in the face-to-face classroom on their online behaviors (Miyazoe & Anderson, 2011). Those who wanted to keep their entries invisible to others could choose the draft mode setting, which is a revision mode invisible to other class members.

3.2 Research Design

This research was patterned as a design-based research study (Anderson & Shattuck, 2012; Brown, 1992; Collins, 1992) that aims to develop and integrate theory and practice in natural educational settings. In comparing the effects of blog visualization, the tool was introduced in the middle of the course to determine students’ behavior with/without the visualization technique within the same class groups. This design was chosen because the focus of this study includes how group dynamics works in blended learning; therefore, group composition was preferably homogenous. During the second half of the semester, the instructor occasionally set up casual blog visualization image viewing sessions (taking a few minutes each time) in class to draw the students’ attention to the utility of the tool.

3.3 Methods

Three data sources were used to triangulate interpretation of the results: 1) a post-course questionnaire, 2) the text analysis of students’ blog writing on the LMS, and 3) the visual representation of blog entries on PISION. The post-course questionnaire included tool usability as measured on the System Usability Scale (SUS) (Brooke, 1996; Tullis & Albert, 2008), and specific questions about blog viewing posed by the developer (see Appendix for the question statements). The questionnaire was anonymous, and the students were allowed to decide whether or not to participate in it. The SUS scores ranged from 0 to 100 with the item score contribution at 2.5. Other questions regarding the usability were provided by affirmative statements with five-point Likert scale answers: 1—strongly disagree, 2—disagree, 3—neutral, 4—agree, and 5—strongly agree. Data were analyzed using SPSS and EXCEL software.

For text analysis of blogs on LMS, the automatic word count function of the word-processing software was used. A small amount of language data written in the students’ first language were removed from the total word count. The count result was further adjusted when two words were collated (for example, “todayis” as “today is”) in order to reflect the more accurate level of participation.

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Furthermore, when blog posts included essay questions, the question statements were excluded from the total word count.

3.4 Blog Visualization Tool

A blog viewing tool named PISION was used in the research. This tool was developed by Dr. Sato (Sato & Kageto, 2010). The tool enables the compilation of blog text content produced on Moodle and creates a visual representation of the blog on a separate webpage. The primary information provided by the tool includes 1) the chronological overview of blog entries and 2) readable, magnified blog texts. This tool allows the course instructor and the students to track when a certain blog entry was made and who made it.

The blog entry was represented as a graphical image as shown in Figure 1. At this exploratory stage, the system was configured so the students had to log in to a separate Web page where a link to Moodle was provided for the image view. The teacher demonstrated the blog view page intentionally but indirectly every two weeks at the beginning of class in the second half of the semester.

The teacher observed that the students in the computer room referred to the visualization page during classes and seemed to check how it looked.

4. Results

4.1 Blog post frequency over the semester

Figure 2 shows the number of posts written by both classes over the semester. The rise in posts in Week 3 was due to the blog guidance session. The temporary declines around Weeks 7 and 8, and 15 and 16, correspond to the national and school holidays. The decline in posts in Week 12 for Class B was the test day. The rise in posts in Week 17 coincided with the final rush for ambiguous course requirements.

Overall, the left figure shows that, in both classes, after the first blog writing guidance session in Week 3, the number of blog posts rapidly decreased over the next two weeks. However, the figure on the right shows that,
from Week 9, when the system was implemented, to Week 15, when the core part of the course session was over, the number of blog posts maintained a moderate level, that is, between 15 to 20 posts for both classes. In online course management, it is possible that the post number drops after the initial enthusiasm and stays at a low level of participation (Shea, 2007). As well, when some event, such as a short break, occurs, the post number rises momentarily (usually at lower levels than that generated by initial enthusiasm) and then drops again. However, in this study, the students’ posts seem to be revived after the implementation of visualization technique, maintaining a more or less moderate level of participation throughout the second half of the semester.

4.2 Post frequency, Timing, and Content

Appendix 2 summarizes the time at which each blog post was made for Classes A and B over the course of the semester. On the uppermost vertical cells, the individual student is identified as S-1, S-2, and so on in each class. Each of the vertical cells corresponds to one day in the semester. The cells in blue correspond to the day/time when a student made a blog post. This figure is similar to the visual information that a student can see when accessing PISON.

To give a precise interpretation, color variation is added. There are two shades of blue in terms of blog content: dark blue (b) indicates that the blog post is for personal reflection, while light blue (e) indicates that the blog post is for writing an opinion essay. Gray and green marks concern events on the school calendar that could affect students’ posting behavior; gray (h) corresponds to national and school holidays when classes were suspended, and one day in green (t) refers to the test day in the curriculum when normal classes were not held. Yellow (d) marks shows the posts set in draft mode, that is, only the author and the administrator of the system could see his or her own blogs. These blogs in draft mode, although they exist, do not appear on the tool.

Because the blog post guidance session was conducted in the second week of class, most students, except those who were absent on that day, made a blog post at least once during the semester. This is reflected by the horizontal dark blue line in both classes in the figure. During national and school holidays (marked in grey), the majority of the students stopped posting, although the teacher encouraged them to keep writing blogs. Several students made many posts toward the end of the semester, as if to catch up on the total number of required posts, which was vaguely projected to be at least one per week.

The psychological and social theories overviewed in the literature review section are identified in some of the students’ online behaviors in this study. There were two students in Class A (marked in light blue) whose blogs were on draft mode and who wrote blogs at the same pace as the others. For these students, looking at other students’ regular performance may have helped them write blogs more regularly. In other words, they could be “free riders,” although probably unintentionally, who took more than what they contributed within the online class. Moreover, their absence online, or invisibility, may have given wrong perceptions to the other students that fewer students were writing than they actually were. In this sense, the liberty of
choosing the draft mode may have amplified the "community dilemma" of to-do-or-not-to-do in the current setting.

When focusing on students who chose more challenging opinion essays, the two classes showed somewhat opposing behavior. In Class A, three students were able to keep up with the suggested pace of at least one blog per week. More precisely, two of them (S-3 and S-30) did the essays from the beginning, and the third (S-27) joined right after the implementation of the blog viewing tool. This particular case can be an example of positive class dynamics, that is, more challenging "anchors" fostered higher performance. In contrast, in Class B, one student (S-5) started the essay option but desisted around the time of the viewing tool implementation when he/she may have seen nobody else in the class did the same, that is, when "social loafing" was evident. In this case, witnessing lower performance from other classmates unfortunately may have dissuaded this student to do better.

The phenomenon of many postings in one week towards the end of semester is understandable, as students may have rushed final submissions to offset their laxness during the semester. This awareness of not keeping up compared with others could have been a result of the visual tool but only toward the end of the course. However, the case of one student (S-20) in Class B, who submitted nine blog posts besides his regular work, calls attention. In addition to short regular blogs all submitted more or less regularly during the semester, this student submitted nine posts with a longer average length of 77 words (of good content) in the final week, as if he had written all these long blogs throughout the semester but did not want to show them to others, showing a case of the "to-do-or-not-to-do dilemma" within one person. Combined with the opinion essay case who desisted, these cases can be interpreted as representative of the negative effects of visualization, which dissuades higher performance within a learning community.

4.3 PISION Usability

The SUS score distribution appears close to normal, with the mean score at 51.35 (N = 48, SD = 11.2). The perceived ease of use varied from 17.5 to 82.5. These results reveal that the tool is fairly easy to use but students’ perceptions varied considerably as to its usability.

Table 1 shows the results for specific abilities: wholeness (Q.1), comparison (Q.2), and efficiency (Q.3) of viewing blog posts. Students’ response levels were between 3.04 and 3.19 and the tool was perceived as being fairly helpful for the students’ viewing and searching of blog posts.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Results of utility questions</th>
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<td>N</td>
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<tr>
<td>Wholeness</td>
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<td>Comparison</td>
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<td>Efficiency</td>
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Each potential capacity of visualization, such as wholeness, comparison, and efficiency, is considered relevant to foster online participation in the form of blog posting. The regularity of the online participation pattern of all members of the class could become a positive trigger that fosters the comparison between the work performance of the majority
and the individual. The visualization seems to have successfully supported the intended utility in this research. However, from the obtained results, the direct relation among factors is not yet evident. Further research is needed to identify which utility item is more relevant to the observed stability in online participation.

5. Discussion

This study supports the possibility that visibility as enforced by the visualization technique may help ensure high participation within a given learning context. The students acknowledged the merits of viewing other posts at a glance. In each class, the student’s blog posting frequency rose and remained fairly high in the latter half of the semester. Consistent with previous research, this research also observed a certain level of “social dilemma,” which explains people’s behaviors in the online community formation process. Visualizing online performance could function as a self-regulatory mechanism to approximate the online participation of a class community.

One of the limitations of this research is its adoption of the experimental research design within the same course period with the same participants. This format has advantages of reducing the influence of group dynamics during class meetings, which may affect the learning performance of online writing. In this research, the fact of re-gain in the number of blog posts after implementation of the visualization tool can be interpreted as the positive relation between visualization and high participation. However, in an educational setting, where many unseen variables intervene, allotting only one semester for the experiment is insufficient to allow any generalization to be drawn.

Suggesting that students write blogs at least once per week may have triggered students to write more blogs, thus impacting the frequency of each student’s writing. Performance of some form of anchoring was necessary, and the findings in this research reveal that all the students did not write one per week, some stopped, some continued, some worked more, and some worked less. This finding suggests a further avenue of research to examine the effects of different level of anchors on students’ behavior.

From the perspective of course management, the merits of visually acquiring a complete picture of students’ online participation are numerous. Monitoring online classes in a blended course design is different from physical participation in that the teacher could visually verify attendance by roll call. It is more difficult and laborious to follow online classes. The visualization technique in this research was conceived more for efficient viewing or reading of blogs rather than analytics; however, it could be further developed to maintain more features, such as automated word count and frequency analysis, with which both the teacher and the students can obtain a more detailed grasp of what each member is doing within a specific online educational sphere. Careful observation of visual information could work as an “early warning system” to detect students at risk of withdrawing (Macfadyen & Dawson, 2010), and help the teacher become more analytical and engaging in his/her own teaching and learning performance online. This kind of integration, in a sense, allows the online learning sphere to more-closely resemble
face-to-face learning.

6. Conclusion

Although further research is necessary, this work found that the visualization of students’ online behaviors has both positive and negative impacts on students’ overall learning performance in a class learning community. Visualization also runs the risk of losing merits such as independence and self-regulation in a higher stakes and normative learning environment. Our next step, therefore, is to find a way to utilize the highest merits of visualization without influence from its demerits. There is no doubt that the visualization of online activities has opened a new dimension to online learning, as well as challenged our perceptions of how we learn.

References


7. Appendices

7.1 Questions included in the post-course survey

- System Usability Scale (SUS) questions (Tullis & Albert, 2008, pp.138-139)
  1. I think that I would like to use this system frequently.
  2. I found the system unnecessarily complex.
  3. I thought the system was easy to use.
  4. I think I would need the support of a technical person to be able to use this system.
  5. I found the various functions in this system were well integrated.
  6. I found this system was too inconsistent.
  7. I would imagine that most people would learn to use this system very quickly.
  8. I found the system very cumbersome to use.
  9. I felt very confident using the system.
  10. I needed to learn a lot of things before I could get going with this system.

- Questions from the PISON developer
  1. PISON, it was easy to grasp the whole picture of posts (yours and your friends’).
  2. With PISON, it was easy to compare and examine the contents of many posts.
  3. With PISON, it was efficient to view many posts.
7.2 Post content and timing over the semester
オンライン学習コミュニティにおけるブログの情報
可視化と学習者反応に関する予備研究

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本稿は、参加者全員のブログ投稿状況が画像として可視化されモニター可能なオンライン学習環境下に対する学習者の反応に関する予備研究を報告するものである。従来の研究によれば、オンライン学習コミュニティに働く集団力学が学習参加を促進する場合と阻害する場合の両者があることが知られている。また、全メンバーの参加状況を（画像として）可視化することが「外部フィードバック」として機能し、より高い学習パフォーマンスを育むことが知られている。本研究では、学生はブログ投稿の様子をテキストおよび画像の両形式で見ることができた。学期半ばにブログの視覚化ツールを投入し、ブログ投稿の頻度に反映される学生の行動変化を観察した。分析法として、ブログの定量的テキスト分析および学期末アンケートの二種を採用した。アンケートではブログ閲覧ツールのユーザビリティ評価を行った。結果、学生のブログの投稿頻度は学期前半に比べ学期後半に高いレベルを維持していることが判明した。本研究では、オンライン学習環境下における学習パフォーマンスの可視化が、学習コミュニティ全体の学習参加を促す自己調節機構として機能する可能性が示唆された。また、「外部フィードバック」がプラス・マイナスの両方に働き、対面授業に類似するコミュニティ参加を「不すべきかなさざるべきか」のジレンマ（"to-do-or-not-to-do dilemma"）が学習者反応として認められた。

キーワード：ブログ、情報可視化、社会的ジレンマ、学習コミュニティ