Empirically Examining the Effectiveness of Teaching Blogs on University Course Instruction

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Abstract
Blogs have the potential to be integrated as learning tools to help students learn and reflect. Many educators have incorporated the use of teaching blogs to enhance teaching and learning outcomes in higher education settings. However, research conducted to empirically examine the effectiveness of blog use in education is rare. This study intends to help fill the remaining gaps in the research; there are two main purposes: (1) to examine, using a field quasi-experiment, whether the use of teaching blogs in university course instruction enhances student learning outcomes; and (2) to empirically understand the determinants and impacts of the extent of student blog use on university’s course learning via a questionnaire analysis. Two separate studies were conducted. The experimental results of Study 1 show that using teaching blogs not only enhances learner satisfaction, but also increases university students’ learning achievement. The Study 2 results show that higher quality teaching blogs positively influence the extent of student blog use, which in turn positively influences student learning satisfaction and achievement. This study extends our knowledge and insights regarding the use of teaching blogs within the higher education domain.

Keywords
achievement, blog, education, education, learning satisfaction, social sciences, social sciences, teaching, teaching blog, university course instruction

Introduction
Blogs (also known as weblogs) are one of the latest and most rapidly expanding social networking applications on the Internet. They can be regarded as a media for Internet communication and publication (Alzahrani et al., 2020; Chen et al., 2014). Blogs allow users (i.e., blog owners) to create online journals and resource sites to share with their community and give others the opportunity to comment and provide feedback (Makri & Kynigos, 2007; Matheson, 2004; Top et al., 2010). The content of blogs is usually arranged in reverse chronological order and usually includes texts, hyperlinks, images, video, and audio (Elega et al., 2020; Mansor, 2011). Since blogs can be used as a platform for information sharing, knowledge dissemination, interactive communication, reflection, peer feedback, and collaboration, they have the potential to be integrated as learning tools for helping students learn and reflect (Ajjan & Hartshorne, 2008; Blush et al., 2020; Halic et al., 2010; Kalk et al., 2019; Onete et al., 2020). Therefore, many educators have attempted to implement blogs to enhance their teaching and learning outcomes, and to encourage student interest and course participation in higher education settings (Blush et al., 2020; Halic et al., 2010; Y. S. Wang et al., 2010; Zúñiga, 2009). This type of blog is called a teaching blog (or course blog) (Chen et al., 2015; W. J. Lin et al., 2006; Milutinović et al., 2017). Educators can upload teaching materials, review students’ homework, interact with students, post matters related to courses, share information, and follow students’ learning processes via teaching blogs (Chen et al., 2015). Teaching blogs can also be used as collaborative tools and showcases for student work (Amasha & Al Saif, 2009; Barari et al., 2020; Milutinović et al., 2017; Ray, 2006).

However, studies conducted to empirically examine the effectiveness of blog use in education are rare (Deng & Yuen, 2011; Garcia et al., 2019; Halic et al., 2010; Sim & Hew, 2010; Top et al., 2010). Although some previous studies (e.g., Churchill, 2009; Y. S. Wang et al., 2014) analyzed the impact of blog usage on students’ learning effects, most of

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these utilized subjective measures—that is, asking students about their use level, perceived learning achievement and effects. Few studies have incorporated objective measures for these constructs—that is, obtaining the actual use level value from the blog’s log file, and calculating the learning achievement value from the student test scores. There is a need to comprehensively and empirically demonstrate the effectiveness of using teaching blogs. The main objective of this research is to comprehensively and empirically examine the effects of teaching blogs on student learning outcomes in university course instruction.

Figure 1 shows the research framework, including both studies. Study 1 adopts the field experiment method to examine whether the teaching blog can enhance students’ learning outcomes in university course instruction. The experimental method is the most rigorous research method that can assess causality. Differences in learning outcomes between the control group (students without a teaching blog to support learning) and the experimental group (students with a teaching blog to support learning) are compared.

Once the effects of teaching blog are supported, Study 2 attempts to extend and generalize the findings of Study 1. Questionnaire results are used to further analyze the determinants and impacts of the extent of students’ blog use in university course instruction. To do so, we create a teaching blog, and develop a research model focusing on teaching blog use. The empirical data associated with students’ perceptions and experiences of using the teaching blog are then used to test the research model using the multiple regression analysis approach.

This research provides an empirical basis for academics and educators to understand the effects of teaching blog use on student learning outcomes in the university instruction context. It also extends our knowledge of and insights into teaching blog use in the higher education domain.

### Study 1

#### Research Model and Hypotheses

The purpose of Study 1 is to examine whether the use of teaching blogs in university course instruction enhances student learning outcomes. The theoretical basis of the blog in this study is based on the socio-technical systems theory (Kim, 2008). In the educational context, blogs (i.e., technical system) can be used as an expressive, reflective, and collaborative tool and enhance interactions among students and between students and teachers (i.e., social system). The research model is shown in Figure 2. The independent variable is whether or not students have access to a course blog intended to assist their learning. The dependent variable is students’ learning outcomes. Sim and Hew (2010) also indicated blog use effectiveness can be measured from two perspectives, that is, affective outcomes and performance outcomes. In this study, learning satisfaction and learning achievement are adopted as the criteria for measuring students’ learning outcomes: the former is a subjective, affective measure, while the latter is objective, performance-based outcome. These two variables are usually used as proxies or criteria of students’ learning outcomes: Eom et al., 2006; Maki et al., 2000; Summers et al., 2005; Wan et al., 2008; Wright & Furneaux, 2021; Zhao et al., 2021). Therefore, it is rational to use them as the criteria for measuring student learning outcomes.

Teachers can create teaching blogs to share course materials and resources, announce notes and assignments, and obtain feedback. Students can use them to read materials, ask questions, and discuss and collaborate on topics. Students can share their learning experiences and express their ideas with teachers and classmates more courageously through teaching blogs (Magg, 2005). Blogs can strengthen students’ critical thinking, writing, and reflection skills (Kalk et al., 2019; Pownall et al., 2021; Zhang et al., 2007). Teaching blogs can facilitate a series of extended discussions beyond class lectures and provide students with social collaborative environments that they may not experience in classrooms (Hendron, 2008; Kim, 2008; Top et al., 2010). Therefore, blogs can support teaching and learning, and enhance students’ learning outcomes. Furthermore, some studies claim that blogs have potentials to enhance students’ learning interest and effectiveness (Ajjan & Hartshorne, 2008; Ferdig, 2004; Garcia et al., 2019; Halic et al., 2010), and solicit rigorous empirical evidence (Churchill, 2009; Top et al., 2010). Based on the above discussion, we hypothesize that:

#### H1. Students who have a teaching blog to support learning will have higher learning satisfaction.
H2. Students who have a teaching blog to support learning will have higher learning achievement.

Method

This study adopted a field quasi-experiment in two statistics classes at a national university in the middle of Taiwan. Participants in the experiment were students who took this statistics course, and there were 112 in total. Before the experiment, the researcher explained the purpose and content of the experiment to the participants and obtained the consent of the participants. All students participated in this experiment under their own will. These participants could withdraw from participating in the experiment at any time.

Statistics is an important course that focuses on multiple subjects including mathematics, probability, inference, and application. College students often fear statistics courses, or feel anxious when taking them. Therefore, this study utilized statistics courses to test the hypotheses. Within this university, statistics are covered in two classes from the accounting department, eliminating the possibility of random assignment of students. As such, these two classes were randomly assigned as the control and experimental groups. Due to the influence of students’ choice of courses, the number of students in the two groups was not equal. There were 50 students in the control group and 62 students in the experimental group. The sample size of these two groups has exceeded the minimum threshold of 20 per group required for statistical analysis (Hair et al., 2006). The purpose of the control group was to serve as a benchmark for comparison. The control group class utilized the traditional teaching mode—that is, there was no blog to support students’ learning, and all course lectures, assignments (individual and group) on various topics, and examinations followed the traditional pattern. The instructor, textbooks, assignments, and teaching materials for both classes were identical. According to scores released from the Taiwan College Entrance Examination, these students had similar mathematical ability and all were accounting majors at the same university. Furthermore, they had all previously taken a calculus course. Table 1 shows the profiles of the participants in this study. Approximately 83% of the participants were sophomores and the average age was 20.27. Figure 3 shows the research procedure. This study included three stages: pretest, formal experiment, and posttest.

Pretest stage. The pretest stage continued for 5 weeks. Three basic statistical topics were covered during those weeks (the nature of statistics, organizing data, and descriptive statistics). All students wrote a basic statistics test to serve as a pretest at the beginning of this stage. This pretest was used to ensure the similarity of students’ basic statistics knowledge between the control and experimental groups before the treatment was applied. Table 2 presents the pretest results: there was no significant difference between the two groups with respect to their statistical knowledge at the beginning of the term.

Formal experimental stage. Following the pretest, a teaching blog was developed and published. The students in the experimental group could access the blog; the students in the control group could not, and maintained traditional curriculum activities. Both groups still had to attend 3 hours of lectures each week, but the teaching blog was used to assist students in the experimental group to study outside the classroom.
The blog design was based on the framework for educational blogs suggested by Deng and Yuen (2011) and had reading, writing, and comment features enabled. The basic functions included posting, article categories, article titles, article content, comments and feedback, and tracebacks. The teacher used the blog to upload course materials, review students’ homework, interact with students, post matters related to the course, share information and useful links, and follow students’ learning process. Students could publish their opinions, provide comments, and give feedback on the blog. Figure 4 is a screenshot of the teaching blog developed for this study.

Although the teaching blog was created by the teacher, the main content and purpose of the blog was centered on student learning. That is to say, students actively and autonomously used this blog to ask questions or express their views, discuss learning experiences, respond to other people’s questions and opinions, and provide related resources and links for individual or group assignments and various statistical topics. Since statistics is a subject that combines theory and application, this blog provided a platform for students to learn, discuss, and help each other. In order to avoid disputes among students, effectively manage the course, or give more correct suggestions and answers, the course instructor and teaching assistant moderated all comments.

Furthermore, this teaching blog differed from traditional learning management systems (LMSs). Traditional LMSs are centralized and teacher-centered (Y. S. Wang et al., 2016). Usually, teachers post questions or assign homework, and students answer on the LMS. In the LMS environment, students always learn according to the learning structure and paths designed by the teacher. Teaching blogs are student-centered. Students can take the initiative to post questions, opinions, and thoughts, and can use functions such as reply, be notified about replies, subscribe to topics, and link to resources. Compared with the traditional LMS, the teaching blog is more user-friendly and interactive. It allows students to express and interact more actively and without pressure.

Table 2. t-Test Results and Descriptive Statistics of the Pre-Test.

| Group             | n  | M   | SD  | t-Value |
|-------------------|----|-----|-----|---------|
| Experimental group| 62 | 64.73 | 16.69 | -0.32   |
| Control group     | 50 | 65.70 | 15.07 |         |

Posttest stage. At the end of the semester, the two groups wrote a learning achievement posttest to compare their learning outcomes, and completed a learning satisfaction questionnaire. The measure of learning satisfaction drew items from Eom et al. (2006) and Wan et al. (2008). Respondents responded using five-point Likert-type scales anchored by 1 = strongly disagree and 5 = strongly agree. The measurement items are reported in Table 3.

The learning achievement posttest covered topics relating to probability, random variables, discrete probability distributions, continuous probability distributions, sampling, and sampling distributions.

Data Analysis and Results

Reliability and validity. Exploratory factor analysis was performed to ascertain the validity of the learning satisfaction measure. Table 4 shows the results of the factor analysis, where the factor explained 72.69% of the variance. This is a good factor structure because all factor loadings exceeded 0.7. The internal consistency reliability (Cronbach’s alpha value) was .90, above the recommended level of .7. The measure for learning satisfaction showed acceptable validity and reliability.

Results. We used a t-test to compare the differences in learning satisfaction between the two groups: the results appear in Table 5. The learning satisfaction of the experimental group students (i.e., $M=3.65$) was significantly higher than that of the control group students (i.e., $M=3.32$), with $t=2.81$ and $p<.01$. Thus, H1 is supported.
An analysis of covariance (ANCOVA), in which the pretest score was the covariate and the posttest score was the dependent variable, was conducted to examine whether a difference in learning achievement existed between the two groups. The ANCOVA results (Table 6) indicate the learning achievement of the experimental group students (i.e., $M = 75.32$) was significantly better than that of the control group students (i.e., $M = 67.06$), with $F = 7.94$ and $p < .01$. This supports H2.

**Findings**

Study 1 adopts the field experiment to empirically examine whether the use of teaching blogs in university course instruction could enhance student learning outcomes. The
experiment was conducted involving 112 college students from two classes enrolled in the basic statistics course. The results empirically demonstrate teaching blogs can not only enhance learning satisfaction, but also enhance the learning achievement of the university students.

Study 2

Research Model and Hypotheses

Use is an important and core concept in measuring the success of innovation and technology. Lankshear and Knobel (2006) pointed out that blog participation is an important topic that should be studied. Therefore, Study 2 focused on revealing the extent of teaching blog use and further analyzed the determinants and impacts of students’ blog use on university course instruction via a questionnaire. Many e-learning studies also emphasize the importance of use: by understanding and improving the critical factors, changes can be made that can effectively increase students’ e-learning usage. The research model for Study 2 is shown in Figure 5 and was developed based on information system (IS) success model (Delone & McLean, 1992, 2003) and the framework of virtual learning environments (Piccoli et al., 2001). Piccoli et al. (2001) postulate three dimensions to analyze the effectiveness of web-based learning systems: human, design, and effectiveness. The human and design factors are the two main antecedents determining the effectiveness of these systems. Usage is a necessary condition for ensuring payoffs and effectiveness from IS implementation (Igbaria & Tan, 1997). System use is one of the most frequent success measures of an information system (Delone & McLean, 1992; H. H. Lin et al., 2017). Delone and McLean (1992, 2003) claim information system qualities influence system use, which in turn affects user satisfaction and individual impact (net benefits). Drawing on the perspectives of these studies and previous e-learning studies (Chu, 2010; Eom et al., 2006; Eom & Ashill, 2016; Freeze et al., 2010; Joo et al., 2000; H. H. Lin et al., 2017; Tsai, 2004; Tsai & Tsai, 2003; Y. S. Wang et al., 2016; Y. Y. Wang et al., 2019; A. Y. Wang & Newlin, 2002), this study designated one main design factor (blog quality) and one main human factor (students’ Internet self-efficacy) as the primary antecedents of students’ blog use, and two outcome variables (learning satisfaction and learning achievement) as the impacts of students’ blog use.

Delone and McLean (1992, 2003) argued system quality and information quality jointly influence system use. When the response time is too long, the IS is seen as unstable; when the content and output information in the IS are outdated, unreliable, and inaccurate, use of the system will decrease. Comparatively, a current information system with high information quality will facilitate users’ intention and actual usage. As blogs are a type of IS, these points are also relevant for blog contexts. Some studies indicate blog quality is an important factor affecting user behaviors (Liao et al., 2013; Lu & Lee, 2010; Y. S. Wang et al., 2016). Lankshear and Knobel (2006) also pointed out that the continuous update of blog content and interesting topics are important keys for users to be willing to participate in the use of blogs over an extended period. Referring to web-quality work conducted by Al-Debei et al. (2015) as well as by Hwang and Kim (2007), most users cannot clearly distinguish between high and low system quality and information quality. Therefore, we merged system quality and information quality into one construct, that is, blog quality. The relevant hypothesis is as follows:

H1. The teaching blog quality perceived by students is positively associated with the extent of their teaching blog use.

Internet self-efficacy refers to an individual’s belief regarding his abilities to use the Internet effectively (Torkzadeh et al., 2006). When a person is not confident with respect to utilizing Internet functions (i.e., has low Internet self-efficacy), he/she will think using the Internet requires a lot of effort and is difficult, and is thus less likely to use the Internet (Hsu & Chiu, 2004). Therefore, Internet self-efficacy affects Internet use. The effect of self-efficacy should be examined when researching the extent of use of the information system or Internet (Torkzadeh & van Dyke, 2001; Torkzadeh et al., 2006). In the e-learning context, many studies (e.g., Chu, 2010; Eastin & LaRose, 2000; Tsai & Tsai, 2003; Yi & Hwang, 2003) found students’ Internet self-efficacy has a significantly positive influence on students’ e-learning system use.

| Table 5. t-Test Result and Descriptive Statistics of Learning Satisfaction. |
| --- | --- | --- | --- | --- |
| Dependent variable | Group | n | M | SD | t-Value |
| Learning satisfaction | Experimental group | 62 | 3.65 | 0.59 | 2.81* |
| | Control group | 50 | 3.32 | 0.65 |  |

*p < .05.

| Table 6. ANCOVA Result of the Learning Achievement. |
| --- | --- | --- | --- | --- |
| Source of variance | SS | df | MS | F value |
| Covariate (pretest) | 11,046.52 | 1 | 11,046.52 | 40.27*** |
| Group | 2,177.13 | 1 | 2,177.13 | 7.94** |
| Error | 29,903.85 | 109 | 274.35 |  |

**p < .01. ***p < .001.
Tsai (2004) developed a reliable and valid instrument for measuring Internet self-efficacy. The instrument has two dimensions: online exploration and online communication. The former assesses the confidence level concerning basic skills associated with navigating or searching for information on the Internet. The latter evaluates the confidence level with communication ability on the Internet (Chu, 2010; Tsai, 2004).

Blogs are one kind of Internet application. Effective use of blogs necessitates online exploration and online communication skills. Therefore, Internet self-efficacy has an important influence on blog usage. Students with low Internet self-efficacy think they may have difficulties and lack the ability to use the Internet effectively. Their Internet use intention is relatively lower. Therefore, they will have a weaker intention to use teaching blogs. Comparatively, students with high Internet self-efficacy have higher confidence and interest in using the Internet. They will have a greater intention to use teaching blogs. Accordingly, the following hypothesis is proposed:

H2. Students’ Internet self-efficacy is positively associated with the extent of their teaching blog use.

Many studies have provided empirical support that system use has significantly positive effects on user satisfaction and individual impacts (benefits) (Delone & McLean, 1992, 2003; Igbaria & Tan, 1997; Salam & Farooq, 2020; Y. S. Wang et al., 2016). When users have positive perceptions of information system quality, they will be inclined to use that system.

In the teaching blog-learning context, teachers can upload course materials, post course notes, assign and review homework, understand student learning processes, and students can discuss and share learning experiences, and learn collaboratively. Blog discussions can help students understand other viewpoints and provide a variety of opportunities to facilitate social knowledge construction (Halic et al., 2010; Pownall et al., 2021; Y. S. Wang et al., 2014). Therefore, a teaching blog is a knowledge learning platform. Students who frequently use and browse teaching blogs will have better learning outcomes. Y. S. Wang et al. (2014) conducted an analysis on the context of blog-based learning systems and found that user satisfaction and system use influence learning performance. Based on the above, the following hypotheses are proposed:

H3. The extent of students’ teaching blog use is positively associated with their learning satisfaction.
H4. The extent of students’ teaching blog use is positively associated with their learning achievement.

Method

To ensure the teaching blog quality and exclude external interferences, a single course at a university in the middle of Taiwan was selected. Sixty-two undergraduate students enrolled in a statistics course agreed to participate in the empirical survey. These were the same students who made up the experimental group in Study 1. The sample consisted of 28 males and 34 females, aged from 20 to 22. To effectively and objectively record student use behaviors, the teaching blog used in this study was developed using Joomla, PHP, Javascript, Jquery, and MSQL.

Figure 6 shows a log screenshot of this teaching blog. The teacher could gather information on students’ blog use by viewing the log record. This teaching blog was designed based on the framework for educational blogs suggested by Deng and Yuen (2011). Both the teacher and the students had access to reading, writing, and commenting features; these features were identical to those noted in Study 1. The teacher taught the statistics course in the usual way. The students had 12 weeks to use the blog voluntarily: they were not forced to use it. In order to encourage students to use it, the teacher assigned homework for each topic and gave bonus points to students who posted more valuable opinions or information. As previously noted, the purpose of this teaching blog was to
support students’ learning by posting opinions, as well as having discussions and interactions, providing feedback, and sharing information and resources.

At the end of the semester, the students were invited to fill in a questionnaire consisting of statements regarding perceived blog quality, Internet self-efficacy, and learning satisfaction. These three constructs were rated on five-point Likert-type scales, anchored by (1) “strong disagreement” and (5) “strong agreement.” The blog use extent was measured from the log file. Since the scales among the items measuring blog use differed, a variable standardization was utilized. The learning achievement was measured based on the final exam score. The final measurement items are reported in Table 7. They were drawn from existing instruments and modified to fit the context of teaching blog use.

Data Analysis and Results

Reliability and validity. The empirical data was analyzed using principal-components factor analysis as the extraction technique and Varimax as the rotation method. Since there is only one item measuring learning achievement, this variable was excluded from factor analysis. The purpose of performing factor analysis was to confirm the validity of the main four constructs in the research model (Figure 5). Table 8 shows the factor analysis results. The results confirm the existence of four factors with eigenvalues greater than 1.0 that explain 70.34% of the total variance. There is a good and consistent factor structure because all items appropriately loaded on their anticipated constructs and all factor loadings exceed the recommended level of 0.5. The internal consistency reliability coefficients (Cronbach’s α) for all the constructs exceeded the common recommended threshold value of .7. The results indicate a good level of reliability and validity for the construct measures.

Hypotheses testing results. Since all the independent variables and dependent variables in the research model (Figure 5) are numeric, the multiple regression analysis method was used for testing the hypotheses. These results are shown in Table 9. Hypotheses 1 and 2 concern the effects of students’ perceived blog quality and Internet self-efficacy on the extent of their blog use. The results show that students’ perceived blog quality had a significant influence (β = .27, t = 2.10, p < .05), but students’ Internet self-efficacy did not significantly influence (β = .02, t = 0.15, p > .05) teaching blog use. Moreover, Hypotheses 3 and 4 were supported; Table 9 depicts that the extent of students’ teaching blog use positively affected their learning satisfaction (β = .34, t = 2.76, p < .05) and learning achievement (β = .43, t = 3.64, p < .01).
Table 7. Measurement Items Used in this Study.

| Construct               | Items                                                                 | References       |
|-------------------------|----------------------------------------------------------------------|-----------------|
| Blog quality            | BQ1. Blog discussions help me to share my knowledge and experience with my peers. | Halic et al. (2010) |
|                         | BQ2. I believe incorporating blogs into teaching practices can enhance my learning experience in general. |                 |
|                         | BQ3. Other peers' comments on my blog posts are important.            |                 |
|                         | BQ4. Blog discussions help me understand other points of view.       |                 |
|                         | BQ5. Blog discussions made me think about nutrition concepts outside of this class. |                 |
|                         | BQ6. My point of view has been acknowledged by my peers and/or teacher in this course. |                 |
| Internet self-efficacy  | ISE1. I can key in a URL in a web browser to open a specific website. | Tsai and Tsai (2010) |
|                         | ISE2. I can click a hyperlink to open another webpage in a web browser. |                 |
|                         | ISE3. I can use keywords to search for information on the Internet. |                 |
|                         | ISE4. I can read the content of information provided on a website. |                 |
|                         | ISE5. I can download information or materials provided on a website. |                 |
|                         | ISE6. I can read messages in online chat rooms or on discussion boards. |                 |
|                         | ISE7. I can make a nickname for myself in online chat rooms or on discussion boards. |                 |
|                         | ISE8. I can respond to others' questions in online chat room or on discussion boards. |                 |
|                         | ISE9. I can present ideas in online chat rooms or on discussion boards. |                 |
| Blog use extent         | BU1. Number of blog entries                                          | Alzahrani et al. (2020); Connell (2006) |
|                         | BU2. Aggregate number of words for all blog entries                   |                 |
|                         | BU3. Number of links included                                        |                 |
|                         | BU4. Number of times visiting the blog                               |                 |
|                         | BU5. Amount of time spent on the blog                                |                 |
| Learning satisfaction   | LS1. I am satisfied with the quality of the course.                  | Eom et al. (2006); Wan et al. (2008) |
|                         | LS2. I would recommend this course to other students.                |                 |
|                         | LS3. I am satisfied with the learning flexibility and independence in this course. |                 |
|                         | LS4. I am satisfied with the instructional model.                    |                 |
|                         | LS5. I am satisfied with the learning environment.                   |                 |

Table 8. Factor Analysis Result and the Reliability of the Constructs.

| Items                      | BQ | ISE | BU | LS | Alpha |
|----------------------------|----|-----|----|----|-------|
| Blog quality (BQ)          |    |     |    |    | .90   |
| BQ1                        | .75|     |    |    |       |
| BQ2                        | .76|     |    |    |       |
| BQ3                        | .75|     |    |    |       |
| BQ4                        | .84|     |    |    |       |
| BQ5                        | .80|     |    |    |       |
| BQ6                        | .61|     |    |    |       |
| Internet self-efficacy (ISE)|    |     |    |    | .93   |
| ISE1                       | .57|     |    |    |       |
| ISE2                       | .79|     |    |    |       |
| ISE3                       | .91|     |    |    |       |
| ISE4                       | .91|     |    |    |       |
| ISE5                       | .92|     |    |    |       |
| ISE6                       | .89|     |    |    |       |
| ISE7                       | .86|     |    |    |       |
| ISE8                       | .69|     |    |    |       |
| ISE9                       | .70|     |    |    |       |
| Blog use extent (BU)       |    |     |    |    | .86   |
| BU1                        | .91|     |    |    |       |
| BU2                        | .85|     |    |    |       |
| BU3                        | .53|     |    |    |       |

Table 8. (continued)

| Items                      | BQ | ISE | BU | LS | Alpha |
|----------------------------|----|-----|----|----|-------|
|                          |    |     |    |    |       |
|                          |    |     |    |    |       |
|                          |    |     |    |    |       |
|                          |    |     |    |    |       |
|                          |    |     |    |    |       |
|                          |    |     |    |    |       |

Table 9. Results of Regression Analysis and Hypotheses Testing.

| Hypotheses     | Std. β | SE  | t-Value | p-Value | Results |
|----------------|--------|-----|---------|---------|---------|
| H1: BQ → BU   | .27    | .64 | 2.10    | .04     | Supported |
| H2: ISE → BU  | .02    | .83 | 0.15    | .88     | Not supported |
| H3: BU → LS   | .34    | .02 | 2.76    | .01     | Supported |
| H4: BU → LA   | .43    | .50 | 3.64    | .00     | Supported |

Findings

Study 2 adopted the survey method to empirically examine the determinants and impacts of the extent of students' teaching blog use within the university course. The results for the
62 students enrolled in the course demonstrate that using teaching blogs can enhance university students’ learning satisfaction and learning achievement. The extent of students’ teaching blog use was positively associated with their learning satisfaction and learning achievement. The results also suggest that blog quality positively influences students’ blog use, but that students’ Internet self-efficacy is insignificant.

Discussion and Conclusions

This research empirically examines the effectiveness of teaching blog use on university course instruction. Several findings are summarized and discussed below.

First, the results suggest that teaching blogs are an effective mechanism to support university student learning, and enhance both learning satisfaction and achievement. According to the empirical results of Study 1, students in the experimental group (with blog support learning) had higher learning outcomes (satisfaction and achievement) than students in the control group (without blog support learning). This finding supports previous claims that blogs are helpful in student learning (Chen et al., 2015; Halic et al., 2010; Kim, 2008; Mansor, 2011; Top, 2012), and also provides empirical data support. Therefore, teachers can develop and use blogs to enhance students’ learning effects. There are two modes to utilize teaching blogs to better facilitate student learning:

1. Teaching blogs can be used as a repository of instructional resources. Educators can upload course materials, post examples or notes, assign homework or questions, and provide solutions on teaching blogs. Students can conveniently and efficiently acquire learning resources from these blogs.

2. Teaching blogs can be used as an interactive learning platform. Students and teachers can present their opinions, share experiences, and provide comments and feedback via teaching blogs (Kim, 2008; Magg, 2005; Y. S. Wang et al., 2010) to assist students as they develop skills associated with critical thinking, writing, and reflection (Blush et al., 2020; Onete et al., 2020; Top et al., 2010). Through the use of blog, students can ask and receive answer to questions, reduce learning problems and obstacles, and also organize, externalize and internalize their knowledge through discussion, reflection, and publication. This is also the reason why students in the experimental group (with blog support for learning) demonstrated better learning results.

Second, this research finds blog quality has a significantly positive influence on the extent of student blog use. This finding is consistent with the arguments of previous related studies (Y. S. Wang et al., 2014, 2016). Blog quality consists of system quality and information quality. This is consistent with Y. S. Wang et al.’s (2014) belief that blog quality should include both technological and instructional aspects. From the perspective of system quality, educators should consider blog server performance and system stability, network bandwidth, response time, and a user-friendly interface when implementing teaching blogs. Excellent teaching blog system quality will increase student use intention. Information quality captures the content issue of teaching blogs (Freeze et al., 2010). Top et al. (2010) also indicated student blog usage will not directly increase their learning without appropriate content. When a teaching blog can provide students with useful course content, sufficient materials, accurate hyperlinks to more extensive content, and meaningful feedback, the students will better understand the course, and thus are more likely to have a higher intention to use the teaching blog (Y. S. Wang et al., 2014). Y. S. Wang et al. (2016) also particularly emphasized the importance of blog content and linkage quality, which has a high influence on the success of blogs in educational applications. Therefore, educators should be actively involved in managing teaching blogs, continuously update content, and frequently encourage students to use the blogs to post comments and respond.

Third, the empirical findings did not suggest any significant effect between students’ Internet self-efficacy and teaching blog use. This finding differs from the results of many previous e-learning studies (e.g., Carini et al., 2006; Mohammadi, 2015). One possible explanation is most university students have high levels of Internet self-efficacy (Y. S. Wang et al., 2014) and Internet experience already, making the factor unimportant and indiscriminate in influencing blog use. Another possible explanation is Internet self-efficacy may be a threshold variable (van der Heijden et al., 2003). When students have low Internet self-efficacy, their perceptions may negatively affect their blog use. That is, low Internet self-efficacy may be a barrier to using teaching blogs for students. However, high Internet self-efficacy may not contribute to students’ positive intentions to use teaching blogs.

Implications

There are three practical implications associated with the findings in this study.

First, our rigorous experimental and survey methods empirically support that blogs are helpful for university students. Teachers or schools can develop teaching blogs as a platform for teacher-student and student-student learning exchanges, and encourage students to actively express their opinions, conduct student-centered discussions, and reflect on their learning. Teaching blogs allow students to learn not only in the classroom, but also to continue to discuss and communicate outside of class, and expand their learning horizons through links.

Second, this research empirically supports that “blog use” (participation) is an important core factor for the success of
teaching blogs. When students use and participate in blogs highly, they will frequently browse various course materials; read, think about, and respond to other people’s posts; post their own opinions; and provide relevant resources. Student learning will no longer be limited to classrooms and individuals. Therefore, teachers should consider and develop relevant strategies to encourage and support students to actively use teaching blogs.

Third, blog quality has a great influence on students’ blog use (participation). Therefore, careful attention must be paid to the currency and value of blog-related content, student interaction and usage, and overall blog atmosphere. Teachers and schools can use the measurement items in this study to continuously track the quality of blogs to understand whether there are items that should be improved or updated.

**Limitations**

Although this research contains several meaningful empirical findings and implications for teaching blogs, the limitations need to be noted so they can be addressed in future research.

First, the sample size of the research subjects is somewhat small. Although the ratio of sample size to the number of predictors for regression analysis was above 10 to 15 cases per predictor (Field, 2018), more samples are required to generalize the findings. In addition, all participants were from one university. Caution needs to be taken when generalizing the findings to all universities in Taiwan or beyond, since the findings may have been affected by the university’s sociocultural context. More samples from different countries and universities are required.

Second, Churchill (2009) proposed four types of educational blogs for supporting teaching and learning: each is associated with different blog activities. Yousef et al. (2020) used different blog design characteristics to analyze the learning support provided by these four types. The analysis and findings in this research were based on a particular type of blog, that is, teaching blogs. Teaching blogs are implemented by teachers. The blog effectiveness in education applications could be strengthened if future research incorporates a wider spectrum of educational blog types.

Third, future researchers can analyze and compare blog effectiveness among different teaching strategies, student learning styles, and disciplines. More relevant and important variables affecting the extent of student teaching blog use and other important learning outcomes, for example, continuous use intention, can be addressed in future studies.

Fourth, the teacher’s perception, preference and use of blogs in teaching may also affect the effectiveness of teaching blogs and the extent of students’ use of blogs. Kalk et al. (2019) also indicated that students learning in a blog community may be influenced by the behaviors of tutor or mentor. Future research should incorporate teacher-related influencing variables.

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**Ethical Approval**

Ethical review and approval were not required for the study in accordance with the review comments of the research project and institutional requirements. All respondents participated in the experiment and filled in the questionnaire from their perspective under their own free will. In addition, the researchers also guarantee to the respondents that the research data will not be transferred to a third party.

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**References**

Ajjan, H., & Hartshorne, R. (2008). Investigating faculty decisions to adopt Web 2.0 technologies: Theory and empirical tests. *The Internet and Higher Education, 11*(2), 71–80.

Al-Debei, M. M., Akroush, M. N., & Ashouri, M. I. (2015). Consumer attitudes towards online shopping: The effects of trust, perceived benefits, and perceived web quality. *Internet Research, 25*(5), 707–733.

Alzahrani, A. I., Ramayah, T., Suppiah, N., Alfarraj, O., & Alalwan, N. (2020). Modeling blog usage from a developing country perspective using structural equation modeling (SEM). *SAGE Open, 10*(3).

Amasha, M., & Al Saif, A. (2009). *A model of e-learning course for teaching and learning with edublog and social network services (SNS)*. Damietta University Publication.

Barari, N., Rezazaddeh, M., Khorasani, A., & Alami, F. (2020). Designing and validating educational standards for E-teaching in virtual learning environments (VLEs), based on revised Bloom’s taxonomy. *Interactive Learning Environments*. Advance online publication. https://doi.org/10.1080/10494820.2020.1739078

Blush, J. M., Schleicher, K. M., & Kidder, C. K. (2020). Teaching in the 21st century: How blogs and other alternative outlets can transform our teaching. In T. M. Ober, E. Che, J. E. Brodsky, C. Raffaele, & P. J. Brooks (Eds.). *How we teach now: The GSTA guide to transformative teaching* (pp. 42–53). Society for the Teaching of Psychology. http://teachpsych.org/ebooks/howweteachnow-transformative
Carini, R. M., Kuh, G. D., & Klein, S. P. (2006). Student engagement and student learning: Testing the linkages. *Research in Higher Education*, 47(1), 1–32.

Chen, C. P., Lai, H. M., & Ho, C. Y. (2015). Why do teachers continue to use teaching blogs? The roles of perceived voluntariness and habit. *Computers & Education*, 82, 236–249.

Chen, Y. C., Shang, R. A., & Li, M. J. (2014). The effects of perceived relevance of travel blogs’ content on the behavioral intention to visit a tourist destination. *Computers in Human Behavior*, 30, 787–799.

Chu, R. J. C. (2010). How family support and internet self-efficacy influence the effects of e-learning among higher aged adults–Analyses of gender and age differences. *Computers & Education*, 55(1), 255–264.

Churchill, D. (2009). Educational applications of Web 2.0: Using blogs to support teaching and learning. *British Journal of Educational Technology*, 40(1), 179–183.

Connell, S. L. (2006). Comparing blogs, wikis, and discussion boards as collaborative learning tools. Unpublished. http://soozzone.com/pdfs/plan_connelled690.pdf

Delone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(4), 60–95.

Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9–30.

Deng, L., & Yuen, A. H. (2011). Towards a framework for educational affordances of blogs. *Computers & Education*, 56(2), 441–451.

Eastin, M. S., & LaRose, R. (2000). Internet self-efficacy and the psychology of the digital divide. *Journal of Computer-mediated Communication*, 6(1), JCMC611

Elega, A. A., Özad, B. E., Oloyede, F., Omosore, O. T., & Abu Arqoub, O. (2020). Has blog reader–Focused research evolved? *SAGE Open*, 10(4).

Eom, S. B., & Ashill, N. (2016). The determinants of students’ perceived learning outcomes and satisfaction in university online education: An update. *Decision Sciences Journal of Innovative Education*, 14(2), 185–215.

Eom, S. B., Wen, H. J., & Ashill, N. (2006). The determinants of students’ perceived learning outcomes and satisfaction in university online education: An empirical investigation. *Decision Sciences Journal of Innovative Education*, 4(2), 215–235.

Ferdig, R. E., & Trammell, K. D. (2004). Content delivery in the blogosphere. *T.H.T. Journal*, 31(7), 12–20.

Field, A. (2018). *Discovering statistics using IBM SPSS statistics*. SAGE.

Freeze, R. D., Alshare, K. A., Lane, P. L., & Wen, H. J. (2010). IS success model in e-learning context based on students’ perceptions. *Journal of Information Systems Education*, 21(2), 173–184.

Garcia, E., Moizer, J., Wilkins, S., & Haddoud, M. Y. (2019). Student learning in higher education through blogging in the classroom. *Computers & Education*, 136, 61–74.

Halic, O., Lee, D., Paulus, T., & Spence, M. (2010). To blog or not to blog: Student perceptions of blog effectiveness for learning in a college-level course. *The Internet and Higher Education*, 13(4), 206–213.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. (2006). *Multivariate data analysis*. Uppersaddle River.

Hendron, J. G. (2008). RSS for educators: Blogs, newsfeeds, podcasts, and wikis in the classroom. *International Society for Technology in Education*.

Hsu, M. H., & Chiu, C. M. (2004). Internet self-efficacy and electronic service acceptance. *Decision Support Systems*, 38(3), 369–381.

Hwang, Y., & Kim, D. J. (2007). Customer self-service systems: The effects of perceived web quality with service contents on enjoyment, anxiety, and e-trust. *Decision Support Systems*, 43(3), 746–760.

Igbaria, M., & Tan, M. (1997). The consequences of information technology acceptance on subsequent individual performance. *Information & Management*, 32(3), 113–121.

Joo, Y. J., Bong, M., & Choi, H. J. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and internet self-efficacy in web-based instruction. *Educational Technology Research and Development*, 48(2), 5–17.

Kalk, K., Luik, P., & Taimalu, M. (2019). The characteristics of students, blog groups and blogging that predict reflection in blogs during teaching practice and induction year. *Teaching and Teacher Education*, 86, 102900.

Kim, H. N. (2008). The phenomenon of blogs and theoretical model of blog use in educational contexts. *Computers & Education*, 51(3), 1342–1352.

Lankshear, C., & Knobel, M. (2006). *Blogging as participation: The active sociality of a new literacy* [Paper presentation]. American Educational Research Association, San Francisco, CA.

Liao, C., To, P. L., & Liu, C. C. (2013). A motivational model of blog usage. *Online Information Review*, 37(4), 620–637.

Lin, H. H., Wang, Y. S., Li, C. R., Shih, Y. W., & Lin, S. J. (2017). The measurement and dimensionality of mobile learning systems success: Two-stage development and validation. *Journal of Educational Computing Research*, 55(4), 449–470.

Lin, W. J., Yueh, H. P., Liu, Y. L., Murakami, M., Kakusho, K., & Minoh, M. (2006, July). Blog as a tool to develop e-learning experience in an international distance course. Sixth IEEE International Conference on Advanced Learning Technologies, IEEE, Kerkrade, NL.

Lu, H. P., & Lee, M. R. (2010). Demographic differences and the antecedents of blog stickiness. *Online Information Review*, 34(1), 21–38.

Magg, M. (2005). The potential use of “blogs” in nursing education. *Computers, Informatics, Nursing*, 28(1), 16–24.

Maki, R. H., Maki, W. S., Patterson, M., & Whittaker, P. D. (2000). Evaluation of a web-based introductory psychology course: I. Learning and satisfaction in on-line versus lecture courses. *Behavior Research Methods, Instruments, & Computers*, 32(2), 230–239.

Makri, K., & Kynigos, C. (2007). The role of blogs in studying the discourse and social practices of mathematics teachers. *Educational Technology & Society*, 10(1), 73–84.

Mansor, A. Z. (2011). The use of blog in decision making skills course. *Procedia-Social and Behavioral Sciences*, 18, 491–500.

Matheson, D. (2004). Weblogs and the epistemology of the news: Some trends in online journalism. *New Media & Society*, 6(4), 443–468.

Milutinović, V., Savić, V., & Teo, T. (2017). Predicting the use of blog for teaching EFL by Serbian teachers during the COVID-19 pandemic. *Proceedings of the Impact of Artificial Intelligence on Business and Society*, Paris, France.
Mohammadi, H. (2015). Social and individual antecedents of m-learning adoption in Iran. Computers in Human Behavior, 49, 191–207.

Onete, B. C., Budz, S., Vargas, V. M., & Chiţa, S. D. (2020). The relationship between e-learning and sustainability. The blog as a future e-learning tool [Conference session]. New Trends in Sustainable Business and Consumption, Messina, Italy.

Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic IT skills training. MIS Quarterly, 25(4), 401–426.

Pownall, M., Havelka, J., & Harris, R. (2021). Scientific blogs as a psychological literacy assessment tool. Teaching of Psychology. Advance online publication. https://doi.org/10.1177%2F00986283211027278

Ray, J. (2006). Welcome to the blogosphere: The educational use of blogs (aka edublogs). Kappa Delta Pi Record, 42(4), 175–177.

Salam, M., & Farooq, M. S. (2020). Does sociability quality of web-based collaborative learning information system influence students’ satisfaction and system usage? International Journal of Educational Technology in Higher Education, 17, 1–39.

Sim, J. W. S., & Hew, K. F. (2010). The use of weblogs in higher education settings: A review of empirical research. Educational Research Review, 5(2), 151–163.

Summers, J. J., Waigandt, A., & Whittaker, T. A. (2005). A comparison of student achievement and satisfaction in an online versus a traditional face-to-face statistics class. Innovative Higher Education, 29(3), 233–250.

Top, E. (2012). Blogging as a social medium in undergraduate courses: Sense of community best predictor of perceived learning. The Internet and Higher Education, 15(1), 24–28.

Top, E., Yuksekturk, E., & Inan, F. A. (2010). Reconsidering usage of blogging in preservice teacher education courses. The Internet and Higher Education, 13(4), 214–217.

Torkzadeh, G., Chang, J. C. J., & Demirhan, D. (2006). A contingency model of computer and internet self-efficacy. Information & Management, 43(4), 541–550.

Torkzadeh, G., & van Dyke, T. P. (2001). Development and validation of an internet self-efficacy scale. Behaviour & Information Technology, 20(4), 275–280.

Tsai, M. J. (2004). Developing the internet self-efficacy scale (ISES). In L. Cantoni & C. McLaughlin (Eds.), Proceedings of Ed-Media 2004: World Conference on Educational Multimedia, Hypermedia & Telecommunications (pp. 4406–4408). Association for the Advancement of Computing in Education (AACE).

Tsai, M. J., & Tsai, C. C. (2003). Information searching strategies in web-based science learning: The role of Internet self-efficacy. Innovations in Education and Teaching International, 40(1), 43–50.

Tsai, M. J., & Tsai, C. C. (2010). Junior high school students’ Internet usage and self-efficacy: A re-examination of the gender gap. Computers & Education, 54(4), 1182–1192.

van der Heijden, H., Verhagen, T., & Creemers, M. (2003). Understanding online purchase intentions: contributions from technology and trust perspectives. European Journal of Information Systems, 12(1), 41–48.

Wan, Z., Wang, Y., & Haggerty, N. (2008). Why people benefit from e-learning differently: The effects of psychological processes on e-learning outcomes. Information & Management, 45(8), 513–521.

Wang, A. Y., & Newlin, M. H. (2002). Predictors of web-student performance: The role of self-efficacy and reasons for taking an on-line class. Computers in Human Behavior, 18(2), 151–163.

Wang, Y. S., Li, C. R., Yeh, C. H., Cheng, S. T., Chiou, C. C., Tang, Y. C., & Tang, T. I. (2016). A conceptual model for assessing blog-based learning system success in the context of business education. International Journal of Management Education, 14(3), 379–387.

Wang, Y. S., Li, H. T., Li, C. R., & Wang, C. (2014). A model for assessing blog-based learning systems success. Online Information Review, 38(7), 969–990.

Wang, Y. S., Lin, H. H., & Liao, Y. W. (2010). Investigating the individual difference antecedents of perceived enjoyment in the acceptance of blogging. World Academy of Science, Engineering and Technology, 67(1), 1014–1023.

Wang, Y. Y., Wang, Y. S., Lin, H. H., & Tsai, T. H. (2019). Developing and validating a model for assessing paid mobile learning app success. Interactive Learning Environments, 27(4), 458–477.

Wright, C., & Furneaux, C. (2021). ‘I am proud of myself’: Student satisfaction and achievement on an academic english writing MOOC. International Journal of Computer-Assisted Language Learning and Teaching (IJCALLT), 11(1), 21–37.

Yi, M. Y., & Hwang, Y. (2003). Predicting the use of web-based information systems: Self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. International Journal of Human-Computer Studies, 59(4), 431–449.

Yousef, A. M. F., Salah, R. A., & Makram, E. M. (2020). Investigating different educational blog characteristics to support collaborative learning based on connectivism learning theory [Conference session]. 12th International Conference on Computer Supported Education, Setubal, Portugal.

Zhang, S. X., Olfman, L., & Ractham, P. (2007). Designing ePortfolio systems for enhancing users' learning. Journal of Information Systems Education, 18(2), 203–214.

Zhao, Q., Wang, J. L., & Liu, S. H. (2021). A new type of remedial teaching of educational technology in higher education. Asia-Pacific Journal of Educational Technology, 38(2), 1–39.

Züniga, V. T. (2009). Blogs as an effective tool to teach and popularize physics: A case study. Latin-American Journal of Physics Education, 3(2), 214–220.