# INVESTIGATING THE FACTOR STRUCTURE OF THE BLOG ATTITUDE SCALE

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## ABSTRACT

**Due to the wide application of advanced technology in education, many attitude scales have been developed to evaluate learners' attitudes toward educational tools. However, with the rapid development of emerging technologies, using blogs as one of the Web 2.0 tools is still in its infancy and few blog attitude scales have been developed yet. In view of this need, a lot of researchers like to design a new scale based on their conceptual and theoretical framework of their own study rather than using available scales. The present study reports the design and development of a blog attitude scale (BAS). The researchers developed a pool of items to capture the complexity of the blog attitude trait, selected 29 items in the content analysis, and assigned the scale comprising 29 items to 216 undergraduate students to explore the underlying structure of the BAS. In exploratory factor analysis, three factors were discovered: blog anxiety, blog desirability, and blog self-efficacy; 14 items were excluded. The extracted items were subjected to a confirmatory factor analysis which lent further support to the BAS underpinning structure.**

**Keywords:** **attitude measurement; blog anxiety; blog attitude; blog desirability; blog self-efficacy**

## INTRODUCTION

**In the information age, it is difficult to ignore the role of technology in education; technology has not only developed the field of education, but also extended great learning opportunities in this field (Birisci, Metin, & Karakas, 2009). Many educational tools such as blogs are used in higher education (Sim, 2008, 2010), which provide students with a range of facilities: organising their information, posting straightforward, sharing their ideas and so on (Wang & Woo, 2008; Chen & Bonk, 2008). They also allow students to do essential research on the Web, act autonomously and improve their "motivation, productivity, cultural knowledge, language, and communication" (Rezaee & Oladi, 2008, p. 74).**

**However, understanding these facilities alone cannot fully explain the users' effective application of blogs. To achieve this goal, we should consider learners' blog attitudes as a determinant element (Huang & Liaw, 2005). In support of the importance of attitude towards blog use, Woo and Wang's (2009) pointed out that using any tool appropriately in a learning environment depends on the user's perception of the tool; the user is able to use the tool effectively if s/he has positive attitudes toward using it. Birisci et al. (2009) further pointed out that, irrespective of the complexity of the tool, if the users have positive attitudes toward it, they will use it effectively. In other words, if students' attitudes toward online learning tools are known, we can estimate the extent to which they use it. Therefore before the implementation of online learning tools such as blogs among students, one should consider their attitudes toward it.**

**Defining attitude has been a perennial problem; some scholars regard attitude as a learners' way of thinking positively or negatively (Lopper, 2006). Gibson, Ivancevich, and Donnelly (1994) defined attitude as "a positive or negative feeling or mental state of readiness, learned and organized through experience, that exerts specific influence on a person's response to people, object and situation" (p. 70). Positive attitudes enhance learners' motivation to learn and retain information in particular circumstances while negative attitudes may result in resisting learning (Duda & Garrett, 2008; Shaft, Sharfman, & Wu, 2004). As such, in an on-line learning environment, learners' positive or negative feeling towards online tools will influence their behaviour in using those (Zan & Martino, 2007). Learners with positive attitudes accept using online learning more easily than those with negative attitudes (Tang, Wong, Ahmad Fauzi Mohd Ayub & Rosnaini Mahmud, 2009). For instance, unfamiliarity with computers or "computer phobia" has a negative effect on computer use; students may not be willing to use computers because of their negative attitudes toward it (Tang et al., 2009, p. 248).**

**Attitudes toward technological tools associate with people's technological performance and their satisfaction drawn from their experience (Blignaut, 2006). The more satisfied the learners are of the benefits of online learning, the more positive attitudes they will have toward it. A comprehensive review of available inventories shows that Likert-point questionnaires and interviews are considered as the most reliable ways of measuring attitudes (Colosi, 2006; Devellis 2003; Zan & Martino, 2007). Accordingly, Hebert and Benbasat (1994) pointed out that 77% of the variation in applying information technology (IT) is explained by users' attitudes toward computers and a diverse set of psychometric scales has been designed to study computer attitude since 1966. For instance, Shaft et al. (2004) presented a list of 31 instruments (83% Likert-type) to measure attitudes toward computers. Compared with computers, developing attitude scale towards blogs is still in its infancy. The present study seeks to design a questionnaire to measure learners' attitudes toward blog as a new, powerful, and uncomplicated learning technological tool.**

## METHOD

### Participants

**The researchers assigned the BAS to a sample of 216 undergraduate students in their first (n=69), second (n=47), third (n=56) or fourth year (n=44) of study, aged 20–26 in 2009. Ninety eight (98) participants were male and 118 participants female. Students were enrolled in social science (n=115), or computer engineering (n = 101). All students were familiar with blog as an online learning tool; most of them had personal computers (97%), and home Internet access (60%). Participants were invited to the study by one of the researchers and they agreed to participate anonymously.**

## Procedure

**The first stage in developing the BAS was to compile items. In doing so, we carried out a comprehensive review of online learning attitude scales specially blog instruments designed by Cheong and Cheung (2008), Duda and Garrett (2008), Liaw, Huang, and Chen ( 2006), Loyd and Gressard (1984), Shih and Gamon (2001), and Song and Chan (2008). We also reviewed 31 instruments presented by Shaft et al. (2004) to measure attitudes toward computers.**

**To generate an item pool, we developed items to measure students' attitudes toward blog in a learning environment. To consider internal consistency of the tool, we selected few redundant items which had the same meaning but showed in various ways (Devellis, 2003) (see Appendix B, item 1 &10). Items were examined for avoidance of multiple negative, double barrelled, ambiguous pronouns, and misplaced modifiers. We also considered instrument length, complexity, specialized focus, and psychometric issues. Finally, we considered the major psychometric properties in developing the scale, such as the latent structure and reliability. The detail description is provided below. Furthermore, to present trait levels, we used a four-point Likert scale. The items were content-analyzed and, where needed, reworded. The researchers asked five weblog users to review the BAS and judge the clarity and content of the items. Finally, the BAS consisting of 29 items was assigned to participants.**

## Data Analysis

**To investigate the factor structure of the BAS, we performed exploratory and confirmatory factor analyses. Exploratory factor analysis (EFA) extracts factors and shows how much of the variation is explained by them. Then, we performed a confirmatory factor analysis (CFA) to confirm whether the number of factors extracted and loading patterns of items on factors resonate with the theoretical underpinnings. EFA results give a lead to and *a priori* theory and CFA evaluates the fit of the theory into the data set. CFA further provides fit indexes; the researcher can decide how well the proposed model fits the sample and target population. CFA also shows which items contribute significantly to measure the latent trait (Schumacker & Lomax, 2004).**

# RESULTS

## Descriptive Statistics of Items

**We investigated the general properties of the sample by examining the mean and standard deviation (SD) indices of items on SPSS computer package, Version 16. Because factor analysis methods assume the normality of data, skewness and kurtosis coefficients as indices of univariate normality were further explored. Table 1 presents the results of this analysis.**

**Table: 1**
**Descriptive Statistics of the BAS Items**

| Items | Mean | SD | Skewness | Kurtosis |
|---|---|---|---|---|
| x1 | 2.99 | 0.808 | -0.794 | 0.522 |
| x2 | 2.98 | 0.689 | -0.457 | 0.469 |
| x3 | 1.91 | 0.710 | 0.558 | 0.448 |
| x4 | 2.99 | 0.738 | -0.670 | 0.683 |
| x5 | 2.88 | 0.761 | -0.620 | 0.425 |
| x6 | 2.16 | 0.791 | 0.171 | -0.531 |
| x7 | 2.20 | 0.737 | 0.054 | -0.460 |
| x8 | 2.01 | 0.713 | 0.686 | 0.921 |
| x9 | 2.83 | 0.689 | -0.634 | 0.810 |

| | | | | |
|---|---|---|---|---|
| x10 | 2.76 | 0.734 | -0.364 | 0.056 |
| x11 | 2.85 | 0.733 | -0.480 | 0.289 |
| x12 | 2.06 | 0.780 | 0.471 | -0.027 |
| x13 | 2.15 | 0.729 | 0.207 | -0.219 |
| x14 | 2.05 | 0.652 | 0.311 | 0.373 |
| x15 | 2.95 | 0.690 | -0.731 | 1.222 |
| x16 | 2.89 | 0.681 | -0.440 | 0.505 |
| x18 | 2.07 | 0.768 | 0.445 | -0.006 |
| x19 | 2.19 | 0.797 | 0.231 | -0.410 |
| x20 | 3.15 | 0.762 | -0.889 | 0.930 |
| x21 | 2.49 | 0.729 | 0.190 | -0.268 |
| x22 | 1.95 | 0.728 | 0.652 | 0.697 |
| x23 | 2.10 | 0.784 | 0.439 | -0.075 |
| x24 | 2.04 | 0.770 | 0.638 | 0.401 |
| x25 | 2.75 | 0.742 | -0.323 | -0.036 |
| x26 | 2.67 | 0.745 | -0.386 | -0.025 |
| x27 | 2.74 | 0.725 | -0.217 | -0.122 |
| x28 | 1.93 | 0.711 | 0.545 | 0.443 |
| x29 | 2.79 | 0.681 | -0.228 | 0.042 |
| x30 | 1.85 | 0.757 | 0.716 | 0.390 |

*Note. n* = 2164.
Items 1 to 10 represent blog anxiety, 11 to 20 blog desirability, and 21 to 30 blog self- efficacy.

As Table: 1 shows, all items have a normal distribution because their skewness and kurtosis indexes fall within -1 and +1 (except item 15 which has a kurtosis value greater than +1).

This is evidence of univariate normality in the majority of items. Mean indices show that item 20 has the highest mean score (3.15) and item 30 has the lowest mean score of 1.85, indicating that the former was the easiest to endorse highly and the latter the most difficult.

The internal consistency of the scale as indicated by Cronbach's alpha was.61, implying that the internal consistency of items was medium.

## Exploratory Factor Analysis

Principal component analysis (PCA) with Varimax and Promax rotations was performed. PCA identifies items that should be deleted from the scale because they did not function satisfactorily or showed erratic loading patterns.

The first PCA included 29 items. We determined the number of components based on the Kaiser's eigenvalues greater than one (K>1).

The first solution identified seven components which was excessive and meaningless. We investigated the scree plot which plots the extracted components against their eigenvalues.

This exploration showed that only three components were substantive. The orthogonal Promax rotation separated components better because the intercorrelation of components was moderate.

**Table: 2**
**Factor Loadings for Three Factors after PCA with Promax Rotation and Confirmatory Factor Analysis**

| | PCA | | | CFA | | | |
|---|---|---|---|---|---|---|---|
| Items | Self-efficacy | desirability | Anxiety | Self-efficacy | desirability | Anxiety | Error |
| x29 | .749 | | | .48 | | | .77 |
| x21 | .724 | | | .41 | | | .83 |
| x27 | .641 | | | .61 | | | .63 |
| x23 | .637 | | | .71 | | | .49 |
| x24 | -.449 | | | .65 | | | .58 |
| x14 | | .693 | | | .74 | | .46 |
| x12 | | .627 | | | .76 | | .42 |
| x18 | | .528 | | | .71 | | .49 |
| x19 | | -.424 | | | .59 | | .60 |
| x9 | | | .699 | | | .61 | .63 |
| x2 | -.308 | | .662 | | | .69 | .52 |
| x5 | | | .660 | | | .62 | .61 |
| x10 | | | .591 | | | .55 | .70 |
| x4 | | | .542 | | | .23 | .95 |
| x1 | | | .484 | | | .26 | .93 |
| Self-efficacy | | | | | | | |
| desirability | .52 | | | .82 | | | |
| Anxiety | -.46 | -.50 | | -.77 | -.63 | | |

*Note. n* = 216
The lower part of the table displays factor correlations in PCA and CFA.

Several PCA were further carried out and in each run items which did not meet the expectation of the EFA were examined carefully and some were deleted; eventually, 15 items were retained in and 14 were excluded from the analysis (see Appendix B). The Kaiser-Meyer-Olkin measure of sampling adequacy of the final PCA with 15 items was .882. The results of the PCA solution after rotation are displayed in Table 2. (In this table, the results of confirmatory factor analysis (CFA) and correlations among factors are also presented). Correlations of the selected items are available from Appendix A. Reviewing the content of items, we named the group of items loading on component 1 blog anxiety, component 2 blog desirability, and component 3 blog self-efficacy (see Table 2). In the three factors accounted for 55% of the observed variance. Item 2 had an inter-scale loading. Yet, because its loading on blog anxiety was approximately twice the loading on blog self-efficacy, we kept it on the scale. Factor correlations range from a low of |.46| to a high of |.52| in this PCA solution.

## Confirmatory Factor Analysis

We performed a confirmatory factor analysis (CFA) with the LISREL computer program, Version 8.8 (Jöreskog & Sörbom, 2006) and tested the fit and parsimony of the three-factor model generated in the PCA (blog self-efficacy, blog desirability, and blog anxiety).

**Maximum likelihood (ML) method of parameter estimation was used. We framed the model postulation and fit investigation as a two-stage analysis which is proposed by Kline (1998). In this approach, the measurement model is tested prior to the structural model. The measurement model in our study comprised a latent trait with arrows running from the latent trait, presented as circles, to items presented as squares. The full CFA model includes all relationships among the measurement models. Because the second step includes correlational models, the entire analysis is referred to as CFA (Jöreskog & Sörbom, 2001). As Table 2 shows, items have loaded significantly on the latent traits. Table: 3 presents factor loadings and correlations in CFA, which range from a low of |.66| to a high of |.82|. We also estimated the goodness-of-fit (GOF) indices. We used multiple GOF as follows:**

- **Chi-square test ($\chi^2$): an index showing the difference between the covariance matrix and implied covariance matrix. Because it is sensitive to the sample size, other fit statistics have been developed, which have a penalty for the sample size.**
- **$\chi^2/df$ (normed $\chi^2$): this ratio should be small (preferably below 3).**
- **RMSEA (Root Mean Square Error of Approximation): a measure that corrects for the tendency of the chi-square test to be significant in large samples. Low RMSEA indexes are desirable.**
- **TLI (Tucker-Lewis Index): used to compare the model and a baseline model. TLI has a penalty for the sample size and number of variables.**
- **CFI (Comparative Fit Index): basically very similar to TLI and is an incremental index to evaluate the fit of a model relative to a baseline model.**

**Table: 3 presents the results of the first and second stages of model testing. We constructed the measurement model of each subscale and estimated the fit of the three-factor model. The anxiety model did not fit the data well. Therefore, we applied the modification indexes provided by LISREL; we freed the error terms of item 1 and 4 (covaried the error terms), which resulted in a significant increment in the model fit ($\chi^2$ = 11.13, TLI = 0.98, CFI = 0.99, RMSEA = 0.00). Desirability measurement model fitted the data well ($\chi^2$ = 0.12, TLI = 1.02, CFI = 1.00, RMSEA = 0.00).**
**Self efficacy measurement model did not fit satisfactorily; we modified the model by freeing error terms of item 23 and 24, which resulted in a very good GOF ($\chi^2$ = 2.27, TLI= 1.02, CFI= 1.00, RMSEA= 0.00).**

**Table: 3**
**Measurement and CFA Models of the BAS**

| Model | $\chi^2$ | *df* | $\chi^2/df$ | TLI | CFI | RMSEA | RMSEA 90% confidence interval |
|---|---|---|---|---|---|---|---|
| Anxiety | 40.39** | 9 | 4.48 | 0.79 | 0.88 | 0.12 | 0.083 - 0.16 |
| Anxiety modified | 11.13 | 8 | 1.39 | 0.98 | 0.99 | 0.00 | 0.00 - 0.075 |
| Desirability | 0.12 | 2 | 0.06 | 1.02 | 1.00 | 0.00 | 0.00 - 0.027 |
| Self- efficacy | 15.12** | 5 | 3.02 | 0.92 | 0.96 | 0.10 | 0.051 - 0.16 |
| Self- efficacy modified | 2.27 | 4 | 0.57 | 1.02 | 1.00 | 0.00 | 0.00 - 0.080 |
| Simple BAS model | 206.02** | 87 | 2.37 | 0.92 | 0.94 | 0.068 | 0.064 - 0.092 |
| BAS modified | 173.24* | 85 | 2.03 | 0.94 | 0.95 | 0.048 | 0.043 - 0.083 |

*Note. df* = degree of freedom. TLI = Tucker-Lewis Index. CFI = Comparative Fit Index. RMSEA = Root Mean Square Error of Approximation.

Good fit is indicated by NNFI, CFI ≥ 0.90, RMSEA ≤ 0.05, $\chi^2/df < 3$, and non-significant $\chi^2$.
* $p < 0.05$. ** $p < 0.01$.

A CFA model excluding the freed (covaried) error terms, in which the three latent traits were correlated, was constructed. The TLI and CFI indices were acceptable, but the $\chi^2$ value was significant at 1% and RMSEA index did not meet the condition ($\chi^2$ = 206.02, TLI=0.92, CFI =0.94, RMSEA =0.068). The researchers freed the error terms of the four items in liking and confidence factors and re-evaluated the fit. Some degrees of improvement were observed: an increase in TLI and CFI and a drop in RMSEA, although the $\chi^2$ value was still significant at 5% ($\chi^2$ =173.24, TLI =0.94, CFI =0.95, RMSEA = 0.048). The GOF indices in Table 3 alongside the moderate to strong factor correlations and loading coefficients in Table 2 support the satisfactory fit and function of the model which presents the underlying structure of the WAS.

## DISCUSSION

In this article, we described the design and evaluation of the BAS scale comprising items measuring blog anxiety, blog desirability, and blog self-efficacy. Items were subjected to exploratory factory analysis (EFA) which investigates separability (descriminability) of the hypothesized factors (Kane, 2006). The separability concept is based on the tenets of discriminant validity (Campbell & Fiske, 1959). Campbell and Fisk (1959) argued that a hypothesized factor should be distinguished among other factors. The items that measure the intended factor are expected to load on that factor. Otherwise, they are off-target and are either deleted or content-analyzed and reworded for further analysis. EFA suggested that the BAS has three distinct dimensions. This factor structure was confirmed in the CFA stage after modifying the baseline model.

Our analysis showed that whereas some items functioned satisfactorily and loaded on the hypothesized factors, a few items mal-functioned. These items either loaded significantly on another component or did not load on any component significantly. For example, items 3, 6, 7, 11, and 26 had inter-scale loadings and items 8, 13, 16, 20 and 25 had extremely low loading patterns.

Both observations, EFA and CFA, point to the presence of problems in these items. It may be that the content of items did not capture the intended construct or the item was puzzling. For example, some deleted items (3, 6, 7, and 8) convey a negative sense such as unease, non-comfort, and stressfulness in keeping weblog (see Appendix B).

Findings indicate that attitudes toward blogs can be reliably based around and measured by the three distinct dimensions identified in this scale (anxiety, desirability, and self- efficacy). As such, this assessment tool is useful for researchers who attempt to measure blog attitudes specially learners' anxiety which may have effect on other variables such as students academic achievements in programs where blogs are used as mediums of instruction. It is also useful for teachers who use blogs in their classrooms as an educational instrument. In an ongoing project, blogs have been introduced to English learning programs and the effect of blog anxiety on students' performance is evaluated regularly. The impact of blog anxiety on students' progress in their lessons and learning processes is usefully assessed by the tool.

## FUTURE DIRECTIONS

**While this instrument has shown good psychometric properties, future research may attempt to create a more extensive item pool to enhance the instrument. Also, this study was conducted with undergraduate students; a similar study could be carried out with other students. Thirdly, the sample size, while relatively large, consisted of mostly social science and computer engineering students. The BAS needs to be tested on a wider variety of subject areas where use of blogs could vary widely.**

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## Appendix A Item correlation

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | .229** | 1 | | | | | | | | | | | | | |
| 4 | .407** | .115 | 1 | | | | | | | | | | | | |
| 5 | .092 | .454** | .161* | 1 | | | | | | | | | | | |
| 9 | .224** | .402** | .196** | .363** | 1 | | | | | | | | | | |
| 10 | .091 | .332** | .162* | .359** | .349** | 1 | | | | | | | | | |
| 12 | -.063 | -.414** | -.063 | -.325** | -.304** | -.323** | 1 | | | | | | | | |
| 14 | -.078 | -.385** | -.110 | -.207** | -.314** | -.303** | .545** | 1 | | | | | | | |
| 18 | -.091 | -.281** | -.011 | -.220** | -.242** | -.187** | .528** | .535** | 1 | | | | | | |
| 19 | -.089 | -.302** | -.062 | -.089 | -.146* | -.236** | .435** | .447** | .448** | 1 | | | | | |
| 21 | .025 | .237** | -.095 | .258** | .323** | .243** | -.197** | -.165* | -.135* | -.200** | 1 | | | | |
| 23 | -.088 | -.445** | -.006 | -.305** | -.328** | -.233** | .484** | .405** | .510** | .360** | -.256** | 1 | | | |
| 24 | -.064 | -.244** | -.063 | -.263** | -.237** | -.314** | .512** | .478** | .389** | .406** | -.182** | .475** | 1 | | |
| 27 | .005 | .376** | .040 | .331** | .244** | .354** | -.319** | -.343** | -.249** | -.195** | .360** | -.418** | -.378** | 1 | |
| 29 | .092 | .228** | .089 | .382** | .311** | .239** | -.236** | -.223** | -.277** | -.016 | .321** | -.298** | -.253** | .410** | 1 |

## Appendix B BAS (Blog Attitude Scale)

| | | Strongly Disagree | Disagree | AgAgree | Strongly Agree |
|---|---|---|---|---|---|
| 1* | Weblogs do not scare me at all. | | | | |
| 2* | I would like working with and keeping weblogs. | | | | |
| 3 | Keeping a weblog would make me very nervous. | | | | |
| 4* | I do not feel threatened when others talk about weblogs. | | | | |
| 5* | It wouldn't bother me at all to take courses on weblogs. | | | | |
| 6 | I'm no good with weblogs. | | | | |
| 7 | The challenge of adding a new post on weblogs and keeping them updated does not appeal to me. | | | | |
| 8 | Weblogs make me feel uncomfortable. | | | | |
| 9* | Generally I would feel OK about adding a new post on the weblog. | | | | |
| 10* | I would feel at ease in a weblog class. | | | | |
| 11 | I think working with and keeping weblogs would be enjoyable and stimulating. | | | | |
| 12* | I don't think I would enjoy doing advanced weblog work. | | | | |
| 13 | Figuring out any weblog problem does not appeal to me. | | | | |
| 14* | I get a sinking feeling when I think of trying to keep a weblog. | | | | |
| 15 | I am sure I could do work with weblogs. | | | | |
| 16 | I would feel comfortable working with a weblog (e.g., keeping and updating them, referencing to other sources, etc.). | | | | |
| 18* | I'm not the type to do well with weblogs. | | | | |
| 19* | I don't understand how some people can spend so much time working with weblogs and seem to enjoy it. | | | | |
| 20 | I'm sure I could learn how to keep and use a weblog. | | | | |
| 21* | Once I start to work on a weblog, I would find it hard to stop. | | | | |
| 22 | I think using or keeping a weblog would be very hard for me. | | | | |
| 23* | I will do as little work through weblogs as possible. | | | | |
| 24* | Keeping weblogs make me feel uneasy and confused. | | | | |
| 25 | If a problem with my weblog is left unsolved, I would continue to think about it afterward. | | | | |
| 26 | I could get good grades in weblog courses if there are any. | | | | |
| 27* | I don't enjoy talking with others about weblogs. | | | | |
| 28 | I don't think I could handle a weblog course. | | | | |
| 29* | I have a lot of self-confidence when it comes to working with weblogs. | | | | |
| 30 | I feel aggressive and hostile toward weblogs. | | | | |

*Note.* * shows the selected items in the final structure of the WAS.