**Virtual Appendix**

**Data Analysis Plan**

Several steps were used to test the fit of the previously proposed models. First, confirmatory factor analyses through MPlus version 7.4 (Muthén & Muthén, 1998-2015) with the weighted least squares with means and variance adjustment estimator (WLSMV; Brown, 2006) were utilized to determine the fit of the present data to Handelsman et al.’s four-factor and Taylor et al.’s five-factor model. Criteria for good model fit were determined by the following fit indexes: Comparative Fit Index (CFI), Tucker-Lewis Fit Index (TLI), and root mean square residual (RMSEA). Values at or above .95 on the CFI and TLI have been advised as the cutoff that represents a well-fitting model (Hu & Bentler, 1999). Hu and Bentler (1999) suggested that a RMSEA value of 0.06 represents a good model fit, RMSEA values above 0.10 indicate a poor fitting model, and values of .08 indicating adequate fit ( Browne & Cudeck, 1993; MacCallum, Browne, & Sugawara, 1996; Steiger, 1989).

After the fit of the previously proposed models was determined, a series of exploratory and confirmatory analyses were conducted to determine the model that best fit the current data. While we acknowledge that this type of exploratory approach would lead to a model with superior fit to the study’s data, we sought to determine the extent to which this exploratory approach, similar to the ones used in previous empirical investigations of the SCEQ, would lead to a similar factor structure of the measure. First, an exploratory factory analysis with promax rotation was used to determine the number of latent factors that were present in the data. These exploratory models did not restrict the item loadings and allowed all 23 items in the model to load on all of the factors in the model. An examination of the scree plot and the fit indices for each of the factor solutions was used to determine the number of factors that provided the most parsimonious fit to the data while still reflecting the theoretical conceptualization of a classroom engagement model. Once we discovered the number of latent factors that best fit the data, a confirmatory factor analysis approach was utilized as a scale reduction technique. The preliminary confirmatory factor analysis (CFA) model used those items that had an EFA factor loading above .30 on only one factor. Items from the EFA that had factor loadings above .30 on multiple factors were not included in the CFA. During the CFA iterative process, items that cross-loaded were dropped one-by-one in accordance with their loadings, and the CFA model was re-estimated until a model with acceptable fit was found.

After the model of best fit was determined from this exploration, the internal reliability of the factors from the three models was estimated using Cronbach’s alpha. Zero-order correlations and associated 95% confidence intervals were then calculated between each factor and the student outcomes. These correlation coefficients were first used to compare the differential criterion-related validity between the Handelsman et al. (2005), Taylor et al. (2011), and newly-created model of best fit.

Finally, the criterion-related validity of the three models was explored through the use of multiple regression paired with a relative weights analysis (RWA; Johnson, 2000). This set of analyses first included all of a model’s factors as predictors of an outcome in separate regression analyses to the joint prediction of the factors on a specific outcome. Next, a RWA was conducted to determine the relative contribution that each factor made to the prediction of each outcome. This determination could not be made by examining the zero-order correlations or the regression weights due to multicollinearity (see Johnson & Lebreton, 2004; Lebreton, Ployhart, & Ladd, 2004), which necessitated the need for RWA. RWA computes an estimate of the proportionate contribution that each predictor makes to *R*2 by considering both a predictor’s independent relationship with an outcome and the joint relationship a predictor has with an outcome when considered with the other predictors in a regression analysis. The results of a RWA can be expressed as both a relative weight (RW) for each predictor, which sum to the overall model *R*2, and a relative importance (RI) score, which is the percentage of the *R*2 value accounted for by a predictor, summing to 100%. The results of the correlation, regression, and RWA were used to determine the extent to which each factor was both a statistically and practically significant predictor of a specific outcome.

**CFAs of Proposed Structure of the SCEQ**

CFA using all 23 items included in Handelsman et al.’s (2005) original model for the SCEQ showed the current data were a poor fit to the hypothesized four-factor model, χ2 (224) = 2635.86, *p* < .001, CFI = .88, TLI = .87, RMSEA = .12. An examination of the model’s CFA factor loadings and modification indices revealed a number of potential cross-loading items (see Table 1). Confirmatory factor analysis of the 15 items included in Taylor et al.’s (2011) five-factor model showed the data were an adequate fit, χ2 (80) = 489.50, *p* < .001, CFI = .97, TLI = .96, RMSEA = .08. An examination of the model’s CFA factor loadings and modification indices, however, revealed a number of potential cross-loading items (see Table 2), and the internal consistency of the out-of-class skills factor was unacceptable (Cronbach’s alpha =.50).

Although Taylor et al.’s (2011) model indicated an “adequate” fit and a better fit than the Handelsman et al. (2005) model, fit indices suggested a more appropriate model could be derived. To determine the model that best fit the data in the present study, an exploratory factor analysis (EFA) was conducted that allowed all 23 items in the model to load on models with one to ten factors. An examination of the scree plot and fit indices for each of the proposed EFA models indicated that a five-factor solution provided the most parsimonious and best fit to the data, χ2 (148) = 556.223, *p* < .001, RMSEA = .06. An iterative CFA process for scale reduction was conducted until an acceptable fit was achieved (see Tables 3 and 4). The study’s final model included 16-items that loaded on five-factors (see in Table 1) and had a good fit to the data, χ2 (94) = 401.93, *p* < .001, CFI = .98, TLI = .98, RMSEA = .06. All five of the factors in the study’s final model were found to have acceptable internal reliability estimates (see Table 5).

The study’s final 16-item, five-factor model resembled Taylor et al.’s (2011) model, although more items were retained within the participation and skills domains (see Tables 2 and 4). Similar to Taylor et al.’s (2011) model, the final model indicated the divergence of the skills component of engagement into two factors; however, the present model retained a three-item out-of-class skills factor. Individual items retained in both models tended to load within the same theoretical domains, with the exception of “putting forth effort”, which loaded on the out-of-class skills factor in Taylor et al.’s (2011) model and on the in-class skills factor in the current model. Interestingly, “doing all of the homework problems” loaded on the *in*-class skills factor in the final model, as it had in Taylor et al.’s (2011) model. The study’s participation factor included three items, compared to Taylor et al.’s (2011) five items with only two overlapping items (i.e., “asking questions when I don’t understand the instructor” and “participating actively in small-group discussions”). Both models indicated identical two-item emotional and performance engagement factors.

**Factor to Outcomes Relationships Across Models**

To test the discriminant validity of the factors in the three models, zero-order correlations, regression analyses, and RWA were considered (see Tables 6 and 7). Examination of the zero-order correlations revealed a number of overlapping 95% confidence intervals across domains (see Table 6). Thus, regression and RWA were employed to better understand the relationships between factors and outcomes (see Table 7).

 **Skills engagement.** To investigate the predictive validity of skills engagement, the results of the correlations, regression, and RWA were examined. Results indicated that the single skills factor in the Handelsman et al. (2005) model was a statistically significant, but only marginally important predictor of final grade. Equivalently, in the Handelsman et al. (2005) model, the combined skills engagement scale failed to be a statistically significant predictor of web activity in the regression analysis, but was found to have a statistically significant zero-order correlation. A slightly different pattern of results emerged when looking at the regression results for the two models that separated skills engagement into in- and out-of-class skills engagement. As shown in Table 7, in-class skill engagement was a relatively stronger predictor of final grades in both the Taylor et al. and current study models. These results are consistent with the zero-order correlations showing in-class engagement having a stronger relationship with final grade than out-of-class skill engagement (see Table 6). These results suggest there could be value in separating in- versus out-of-class skill engagement.

 Further support of the potential value of separating in- versus out-of-class skill engagement comes from the results of the other regression models. Specifically, the in-class skills factor was found to be a statistically and practically significant predictor for course satisfaction, whereas the out-of-class skills factor was not. However, out-of-class skills engagement was a statistically significant predictor of web activity in both regression models (see Table 7). Interestingly, out-of-class skills engagement was found to be a statistically significant and negative predictor of final grade in both regression models (see Table 7). These results were unexpected, given that the out-of-class skills engagement factor in Taylor’s model had a modest, but statically significant, positive zero-order correlation with final grades but a non-significant zero-order relationship in the study’s model (see Table 6). An examination of the RWA revealed that the out-of-class skills engagement factor was a relatively unimportant predictor of final grades in both models, explaining less than 1% of the total variance in final grade when considered alongside the other factors (RWTaylor=.008; RWStudy=.009) and making a relatively unimportant contribution to model *R*2 (RITaylor=.03; RIStudy=.04), see Table 7. Despite this surprising finding, the apparent differential prediction of in-class and out-of-class skills across outcomes provides some support for the discriminant validity of these engagement factors.

 **Emotional engagement.** The results of the correlations, regression, and RWA were examined to determine the predictive validity of emotional engagement when considered alongside the other engagement factors. An examination of the results from the regression models revealed that emotional engagement was the dominant predictor of course satisfaction in the Handelsman et al. (2005) model (see Table 7). A similar pattern of results emerged when looking at the Taylor et al. (2011) and current study models in which emotional engagement was a statistically significant predictor that made the relatively strongest contribution to the models’ *R*2 (see Table 7). Interestingly, the emotional engagement factor in the Handelsman model was a slightly stronger predictor of course satisfaction than in either the Taylor or study models (see Tables 6 and 7). However, the emotional engagement factor did emerge as the strongest predictor of course satisfaction in all three models and did not meaningfully contribute to the prediction of final grade or web activity (see Table 7). These results provide evidence of the discriminant validity of the emotional engagement factor.

 **Participation engagement.** When the predictive validity of participation engagement was examined in the regression analyses, results indicated that participation engagement was not a positive, statistically significant predictor of any outcomes (see Table 7). Specifically, despite having statistically significant zero-order correlations with course satisfaction and web activity (see Table 6), participation engagement was not a significant contributor to the prediction of these outcomes in the regression models. In fact, the regression results indicated that participation engagement had a statistically significant and negative relationship with final grade (see Table 7). These results were unexpected, given that the participation factor had a non-significant zero-order correlation with final grade in the Handelsman, Taylor, and study models (see Table 6). Further investigation of the results from the RWA indicated that participation engagement was an extremely weak and practically unimportant factor in the three regression models, contributing to less than 1% of the total prediction (RWHandelsman=.007; RWTaylor=.007; RWStudy=.004) and making a relatively feeble contribution to the regression models’ *R*2 (RIHandelsman=.03; RiTaylor=.02; RIStudy=.02). Together, these results call into question discriminant validity of the participation engagement factor.

 **Performance engagement.** The results of the regression analyses revealed that performance engagement was a statistically significant, yet modest predictor of course satisfaction in the Handelsman et al. (2005) model, but it did not contribute to course satisfaction in the other two models (see Table 7). Evidence of discriminant validity for the performance engagement factor was found in the strength of the results of the correlation (see Table 6) and regression analyses (see Table 7) predicting final grades. Performance engagement was found to be the strongest and most dominant predictor of final grade in all three models.

Table 1

*CFA Results- Handelsman et al. (2005) Model*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Skills | Emotional | Participation | Performance |
| 1. Making sure to study on a regular basis.
 | **.72** |  |  |  |
| 1. Putting forth effort.
 | **.85** |  |  |  |
| 1. Doing all the homework problems.
 | **.72** |  |  |  |
| 1. Staying up on the readings.
 | **.67** |  |  |  |
| 1. Looking over the class notes between classes to make sure I understand the material.
 | **.66** |  |  |  |
| 1. Being organized.
 | **.66** |  |  |  |
| 1. Taking good notes in class.
 | **.70** |  |  |  |
| 1. Listening carefully in class.
 | **.78** |  |  |  |
| 1. Coming to class every day.
 | **64** |  |  |  |
| 1. Finding ways to make the course material relevant to my life.
 | *119.74(-.36)* | **.82** | *103.45(-.34)* |  |
| 1. Applying the course material to my life.
 | *116.22(-.34)* | **.80** | *113.79(-.38)* |  |
| 1. Finding ways to make the course material interesting to me.
 |  | **.79** |  |  |
| 1. Thinking about the course between class meetings.
 |  | **.71** | *92.34(.30)* |  |
| 1. Really desiring to learn the material.
 |  | **.81** | *113.05(.34)* |  |
| 1. Raising my hand in class.
 |  | *123.52(-.34)* | **.81** |  |
| 1. Asking questions when I don’t understand the instructor.
 |  |  | **.80** |  |
| 1. Having fun in class.
 |  | *173.61(.40)* | **.78** |  |
| 1. Participating actively in small-group discussions.
 |  |  | **.80** |  |
| 1. Going to the professor’s office hours to review assignments or tests or to ask questions.
 |  |  | **.50** |  |
| 1. Helping fellow students.
 |  |  | **.70** |  |
| 1. Getting a good grade.
 |  |  |  | **.89** |
| 1. Doing well on the tests.
 |  |  |  | **.80** |
| 1. Being confident that I can learn and do well in the class.
 | *138.14(.36)* | *258.44(.43)* | *191.09(.38)* | **.87** |

*Notes:* Factor loadings in bold are the standardized CFA factor loadings from the data in the current study. Numbers in italics are the modification indices (i.e., approximate decrease in model chi-square if parameter were to be estimated in a subsequent model) and the estimated standardized expected parameter change from the CFA model that indicated potential cross-loading items.

Table 2

*CFA Results- Taylor et al. (2011) Model*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Item | Skills-In | Skills-Out | Emotional | Participation | Performance |
| 1. Making sure to study on a regular basis.
 | - | - | - | - | - |
| 1. Putting forth effort.
 | *17.90(1.23)* | **.78** |  | *47.97(-.41)* | *52.92(.42)* |
| 1. Doing all the homework problems.
 | **.74** |  |  |  |  |
| 1. Staying up on the readings.
 | - | - | - | - | - |
| 1. Looking over the class notes between classes to make sure I understand the material.
 | *17.96(-.79)* | **.50** |  |  |  |
| 1. Being organized.
 | - | - | - | - | - |
| 1. Taking good notes in class.
 | **.72** |  |  |  |  |
| 1. Listening carefully in class.
 | **.81** | *15.76(.50)* |  |  |  |
| 1. Coming to class every day.
 | **.67** |  |  |  |  |
| 1. Finding ways to make the course material relevant to my life.
 |  |  | **.91** |  |  |
| 1. Applying the course material to my life.
 |  |  | **.88** |  |  |
| 1. Finding ways to make the course material interesting to me.
 | - | - | - | - | - |
| 1. Thinking about the course between class meetings.
 | - | - | - | - | - |
| 1. Really desiring to learn the material.
 | - | - | - | - | - |
| 1. Raising my hand in class.
 | - | - | - | - | - |
| 1. Asking questions when I don’t understand the instructor.
 |  |  |  | **.77** |  |
| 1. Having fun in class.
 |  |  |  | **.76** |  |
| 1. Participating actively in small-group discussions.
 |  |  |  | **.73** |  |
| 1. Going to the professor’s office hours to review assignments or tests or to ask questions.
 |  |  |  | **.47** |  |
| 1. Helping fellow students.
 |  |  |  | **.71** |  |
| 1. Getting a good grade.
 |  |  |  |  | **.98** |
| 1. Doing well on the tests.
 |  |  |  |  | **.83** |
| 1. Being confident that I can learn and do well in the class.
 | - | - | - | - | - |

*Notes:* Factor loadings in bold are the standardized CFA factor loadings from the data in the current study. Numbers in italics are the modification indices (i.e., approximate decrease in model chi-square if parameter were to be estimated in a subsequent model) and the estimated standardized expected parameter change from the CFA model that indicated potential cross-loading items. “-“ represents items not included in the final Taylor et al. (2011) model.

Table 3

*Confirmatory Factor Analysis Fit Indices for Each Iteration Towards the Final Model*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Iteration # | χ2 | *df* | CFI | TLI | RMSEA |
| 1 | 1821.11 | 179 | .92 | .90 | 0.11 |
| 2 | 1507.86 | 160 | .93 | .91 | 0.10 |
| 3 | 1108.44 | 142 | .95 | .94 | 0.09 |
| 4 | 873.52 | 125 | .96 | .95 | 0.09 |
| 5 | 665.03 | 109 | .97 | .96 | 0.08 |
| **6- Final Model** | **401.93** | **94** | **.98** | **.98** | **0.06** |

*Note:* Items were removed between iterations due to cross-loadings. Iterations continued until a “good fit” (see Browne & Cudeck, 1993; MacCallum et al., 1996; Steiger, 1989) determined by fit indices cutoffs was achieved.

Table 4

*Iterative Item Removal Process to Derive Current Study’s Final Model Factor Loadings*

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Study Model Final Loadings | When Item was Dropped from Final Model | Notes |
| ***Skills*** |  |  |  |
| 1. Making sure to study on a regular basis.
 | .85 (1) |  |  |
| 1. Putting forth effort.
 | .86 (2) |  |  |
| 1. Doing all the homework problems.
 | .74 (2) |  |  |
| 1. Staying up on the readings.
 | .78 (1) |  |  |
| 1. Looking over the class notes between classes to make sure I understand the material.
 | .74 (1) |  |  |
| 1. Being organized.
 | .69 (2) |  |  |
| 1. Taking good notes in class.
 | .72 (2) |  |  |
| 1. Listening carefully in class.
 | .78 (2) |  |  |
| 1. Coming to class every day.
 | .65 (2) |  |  |
| ***Emotional*** |  |  |  |
| 1. Finding ways to make the course material relevant to my life.
 | .91 |  |  |
| 1. Applying the course material to my life.
 | .89 |  |  |
| 1. Finding ways to make the course material interesting to me.
 | - | CFA #3 (Cross-loaded) | Skills-Out: 142.43 (.33)Skills-In: 182.73 (.36)Participation: 111.15(.28)Performance: 103.74(.27) |
| 1. Thinking about the course between class meetings.
 | - | EFA (Cross-loaded) | Skills-Out (.30)Emotional (.33) |
| 1. Really desiring to learn the material.
 | - | CFA #2 (Cross-loaded) | Skills-Out: 111.40(.32)Skills-In: 158.00(.38)Participation: 235.51(.44)Performance: 125.05(.29) |
| ***Participation*** |  |  |  |
| 1. Raising my hand in class.
 | .87 |  |  |
| 1. Asking questions when I don’t understand the instructor.
 | .83 |  |  |
| 1. Having fun in class.
 | - | CFA #5 (Cross-loaded) | Skills-Out: 146.64 (.28)Skills-In: 211.86 (.31)Emotion: 196.15(.35)Performance: 138.55(.28) |
| 1. Participating actively in small-group discussions.
 | .85 |  |  |
| 1. Going to the professor’s office hours to review assignments or tests or to ask questions.
 | - | EFA (Cross-loaded) | Skills-Out (.42)Participation (.39) |
| 1. Helping fellow students.
 | - | CFA #4 (Cross-loaded) | Skills-Out: 128.49 (.28)Skills-In: 124.76(.25) |
| ***Performance*** |  |  |  |
| 1. Getting a good grade.
 | .99 |  |  |
| 1. Doing well on the tests.
 | .82 |  |  |
| 1. Being confident that I can learn and do well in the class.
 | - | CFA #1 (Cross-loaded) | Skills-Out: 135.58(.30)Skills-In: 136.12(.38)Emotion: 262.91(.42)Participation: 193.49(.36) |

*Notes:* Study Model Final Loadings are standardized loadings from the final CFA. (1) indicates the out-of-class skills factor. (2) indicates the in-class skills factor. “-“ represents items not included in the final CFA model.

The standardized factor loadings above .30 are presented for the two items dropped during the EFA.

Modification indices (i.e., approximate decrease in model chi-square if parameter were to be estimated in a subsequent model) and the estimated standardized expected parameter change from the CFA model that indicated potential cross-loading items are shown for items removed during the iterative CFA process.

Table 5

*Zero-Order Correlations Between Factors in Each Engagement Model*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Factor | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |  |
| Handelsman et al. Model |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  1. Skills | *3.58* | *0.69* | (.87) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  2. Emotional | *3.52* | *0.72* | **0.58** | (.83) |  |  |  |  |  |  |  |  |  |  |  |  |
|  3. Participation | *3.06* | *0.75* | **0.49** | **0.53** | (.83) |  |  |  |  |  |  |  |  |  |  |  |
|  4. Performance | *3.91* | *0.68* | **0.48** | **0.38** | **0.37** | (.82) |  |  |  |  |  |  |  |  |  |  |
| Taylor et al. Model |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  5. Out-of-Class Skills | *3.50* | *0.77* | 0.85 | 0.55 | 0.46 | 0.40 | (.50) |  |  |  |  |  |  |  |  |  |
|  6. In-Class Skills | *3.83* | *0.74* | 0.89 | 0.52 | 0.44 | 0.48 | **0.64** | (.77) |  |  |  |  |  |  |  |  |
|  7. Emotional | *3.58* | *0.88* | 0.43 | 0.88 | 0.36 | 0.29 | **0.41** | **0.38** | (.85) |  |  |  |  |  |  |  |
|  8. Participation | *3.10* | *0.73* | 0.50 | 0.54 | 0.99 | 0.38 | **0.48** | **0.44** | **0.37** | (.78) |  |  |  |  |  |  |
|  9. Performance | *3.93* | *0.73* | 0.44 | 0.29 | 0.30 | 0.95 | **0.35** | **0.44** | **0.22** | **0.31** | (.83) |  |  |  |  |  |
| Study Model |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  10. Out-of-Class Skills | *3.10* | *0.88* | 0.82 | 0.50 | 0.43 | 0.27 | 0.84 | 0.52 | 0.35 | 0.44 | 0.24 | (.79) |  |  |  |  |
|  11. In-Class Skills | *3.83* | *0.71* | 0.94 | 0.54 | 0.44 | 0.53 | 0.71 | 0.96 | 0.40 | 0.45 | 0.48 | **0.57** | (.84) |  |  |  |
|  12. Emotional | *3.58* | *0.88* | 0.43 | 0.88 | 0.36 | 0.29 | 0.41 | 0.38 | 1.00 | 0.37 | 0.22 | **0.35** | **0.40** | (.85) |  |  |
|  13. Participation | *3.08* | *0.93* | 0.40 | 0.43 | 0.92 | 0.32 | 0.38 | 0.39 | 0.28 | 0.86 | 0.26 | **0.32** | **0.38** | **0.28** | (.85) |  |
|  14. Performance | *3.93* | *0.73* | 0.44 | 0.29 | 0.30 | 0.95 | 0.35 | 0.44 | 0.22 | 0.31 | 1.00 | **0.24** | **0.48** | **0.22** | **0.26** | (.83) |

*Note:* Correlations greater than .07 in absolute magnitude were significant at *p*<.05, correlations greater than .10 in absolute magnitude were significant at *p*<.01, and correlations greater than .13 in absolute magnitude were significant at *p*<.001. Internal reliability estimates presented on the diagonal. Correlations in bold represent correlations among factors in the same model.

Table 6

*Zero-Order Correlations Between Factors and Outcome Variables*

|  |  |  |  |
| --- | --- | --- | --- |
| Factor | Course Satisfaction | Final Grade | Web Activity |
| Handelsman et al. (2005) Model |  |  |  |
|  Skills | 0.31 (0.25, 0.37) | 0.25 (0.18, 0.31) | 0.16 (0.09, 0.23) |
|  Emotional | 0.41 (0.35, 0.47) | 0.11 (0.04, 0.18) | 0.12 (0.05, 0.18) |
|  Participation | 0.23 (0.17, 0.30) | 0.04 (-0.04, 0.11) | 0.14 (0.07, 0.21) |
|  Performance | 0.25 (0.19, 0.32) | 0.47 (0.41, 0.52) | 0.02 (-0.05, 0.09) |
|  |  |  |  |
| Taylor et al. (2011) Model |  |  |  |
|  Out-of-Class Skills | 0.28 (0.21, 0.34) | 0.13 (0.06, 0.20) | 0.18 (0.11, 0.24) |
|  In-Class Skills | 0.31 (0.24, 0.37) | 0.31 (0.25, 0.38) | 0.08 (0.01, 0.15) |
|  Emotional | 0.32 (0.26, 0.38) | 0.09 (0.02, 0.15) | 0.09 (0.02, 0.16) |
|  Participation | 0.25 (0.18, 0.31) | 0.05 (-0.02, 0.12) | 0.14 (0.07, 0.21) |
|  Performance | 0.20 (0.14, 0.27) | 0.50 (0.47, 0.55) | 0.04 (-0.03, 0.11) |
|  |  |  |  |
| Study Model |  |  |  |
|  Out-of-Class Skills | 0.20 (0.13, 0.27) | 0.04 (-0.03, 0.11) | 0.20 (0.13, 0.27) |
|  In-Class Skills | 0.33 (0.26, 0.39) | 0.33 (0.27, 0.39) | 0.11 (0.04, 0.18) |
|  Emotional | 0.32 (0.26, 0.38) | 0.09 (0.02, 0.15) | 0.09 (0.02, 0.16) |
|  Participation | 0.18 (0.11, 0.24) | 0.05 (-0.02, 0.12) | 0.14 (0.07, 0.21) |
|  Performance | 0.20 (0.14, 0.27) | 0.50 (0.47, 0.55) | 0.04 (-0.03, 0.11) |

*Note:* 95% confidence interval is indicated in parentheses.

Table 7

*Regression and Relative Importance Analysis Results*

|  |  |  |  |
| --- | --- | --- | --- |
| Engagement Factor | Course Satisfaction | Final Grade | Web Activity |
| Handelsman et al. (2005) Model | β | RW | RI | β | RW | RI | β | RW | RI |
|  Skills | 0.08 | 0.04 | 0.21 | 0.11\* | 0.03 | 0.13 | 0.14 | 0.02 | 0.37 |
|  Emotional | 0.33\* | 0.10 | 0.57 | -0.05 | 0.01 | 0.03 | 0.07 | 0.01 | 0.22 |
|  Participation | -0.01 | 0.02 | 0.10 | -0.14\* | 0.01 | 0.04 | 0.10 | 0.02 | 0.30 |
|  Performance | 0.09\* | 0.02 | 0.12 | 0.45\* | 0.16 | 0.80 | -0.12 | 0.01 | 0.10 |
|  | *R2* = 0.18 | *R2* = 0.21 | *R2* = 0.05 |
| Taylor et al. (2011) Model |  |  |  |  |  |  |  |  |  |
|  Out-of-Class Skills | 0.05 | 0.03 | 0.16 | -0.11\* | 0.01 | 0.03 | 0.21\* | 0.03 | 0.51 |
|  In-Class Skills | 0.14\* | 0.04 | 0.24 | 0.22\* | 0.05 | 0.21 | -0.10 | 0.00 | 0.08 |
|  Emotional | 0.20\* | 0.06 | 0.38 | 0.00 | 0.00 | 0.01 | 0.04 | 0.01 | 0.14 |
|  Participation | 0.07 | 0.02 | 0.14 | -0.13\* | 0.01 | 0.03 | 0.10 | 0.01 | 0.25 |
|  Performance | 0.07 | 0.01 | 0.08 | 0.44\* | 0.17 | 0.72 | -0.04 | 0.00 | 0.02 |
|  | *R2* = 0.15 | *R2* = 0.24 | *R2* = 0.05 |
| Study Model |  |  |  |  |  |  |  |  |  |
|  Out-of-Class Skills | -0.02 | 0.01 | 0.08 | -0.15\* | 0.01 | 0.04 | 0.21\* | 0.04 | 0.60 |
|  In-Class Skills | 0.21\* | 0.05 | 0.32 |  0.23\* | 0.06 | 0.23 | -0.05 | 0.00 | 0.06 |
|  Emotional | 0.22\* | 0.07 | 0.43 | -0.02 | 0.00 | 0.01 | 0.04 | 0.01 | 0.13 |
|  Participation | 0.03 | 0.01 | 0.07 | -0.08\* | 0.00 | 0.02 | 0.11 | 0.01 | 0.19 |
|  Performance | 0.06 | 0.01 | 0.09 | 0.41\* | 0.17 | 0.69 | -0.03 | 0.00 | 0.01 |
|  | *R2* = 0.15 | *R2* = 0.24 | *R2* = 0.06 |

*Note:* β = standardized regression coefficient; RW = raw relative weight for each predictor, which sum to the overall model R2; RI = relative importance score, which is the percentage of the R2 value accounted for by the predictor. Rounding error may result in these values not summing to unity. \**p* < .05.