

*Critique of a Research Report*  
**EPSY 636**

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**Personal Relevance:** This study has exciting life-skills conclusions that can be generalized to a larger student population, and I believe that larger population includes learners who are at-risk, developmentally-delayed and suffer from sensory integration issues. My young son currently struggles with some of these challenges, and I am on fire to find all the effective and useful interventions to help not only him but also other learners in need. The research team of Robbins, Le, Langley and Casillas produced an initial study, and this is their follow-up to that initial study. They document well their extensive use of statistics which is very helpful to my learning. I learn new things from this report with every reading.

## **SUMMARY**

### **Introduction**

**Problem or Issue:** Can a list of predictors of college success be assimilated? Can this list then be useful to educators to prepare interventions for the at-risk college student?

**Rationale:** If colleges and universities can predict what the at-risk college student will need to achieve success in school, they can provide the appropriate interventions before they are needed and thus be more effective at retaining their students.

**Theoretical Background:** This research relates to the theories of educational psychology in the specific area of psychosocial and skill factors that predict or influence the students success in college. The authors do say that what exists of these published theories is limited. Their initial research (Robbins et al, 2005) sought to improve the integration of psychosocial and study skills theories into a more solid whole (Le et al., 2005, p. 483).

**Prior Research:** The research team published their prior research in Robbins, Lauver, Le, Davis, Langley and Carlstrom (2004). Their first study, a meta-analysis, set up the initial item pool of skill factors, building on the work of Pascarella & Terenzini (1991) and Tinto (1975, 1993). In their second study, Le et al. (2005), the team of researchers continued to build on prior research by Covington (2000) and Eccles and Wigfield (2002) in the area of self-motivation theories of college students. They also tie in the work on self-regulated learning models (Schunk & Zimmerman, 2003; Zimmerman, 1986; Zimmerman & Martinez-Pons, 1986) and the work of Pintrich on test anxiety, expectancy-value and goal theories (Pintrich, 1989, 2000; Pintrich & De

Groot, 1990). Aspects of educational persistence in the research of Tinto (1975, 1993) and Bean (1980, 1985) are also included in their list of skill factors (Le et al., 2005, pp. 483-485).

The findings of the prior research helped to add to and better organize the factors in their list to better mirror life skills of the successful, be it in college or in the workplace. As an example, some of the five personality characteristics including emotional stability, extroversion, conscientiousness, agreeableness and openness (Digman, 1990; Goldberg, 1993; John, 1990) have been referenced in organizational literature as contributing to job performance (Barrick & Mount, 1991; Hertz & Donovan, 2000; Saldago, 1997; Tett, Jackson, & Rothstein, 1991) and to employee stability in low turnover in Caligiuri, 2000; and Saldago, 2002 (Le et al., 2005, p. 485). All-in-all, a total of 109 prior studies were used as resources (Le et al., 2005, p. 483).

**Research Questions or Hypotheses:** Can an inventory of psychosocial and skill factors (based on cited previous works) predictive of college success be captured and validated (Le et al., 2005, pp. 499-500)?

### Method

**Participants:** First-year students at 22 high schools, 22 community colleges, and six 4-year universities returned a total of 6,456 questionnaires, of which 5,970 contained usable data. The largest groups were: Females 57.2%, and Caucasians 66.9%. The average mean age was 20. The SD was 5.90 years, with a range of 16 to 68 years. Two of the smaller groups were: 48 Native Americans, and 23 Native Hawaiian/Pacific Islanders. All were volunteers.

**Research Design:** This is a “two-facet nested design” correlational study using questionnaires to gather self-data, and using the measurements of Pearson’s  $r$ , scale scores, Cronbach’s coefficient  $\alpha$ , factor analysis for 1<sup>st</sup> order and 2<sup>nd</sup> order factors, oblique rotation, regression weights, means, standard deviations, chi-square, skewness and kurtosis (Le et al., 2005, pp. 489-493, 498, 503, 508).

**Independent/Predictor variables (if appropriate):** The study measured ten “empirically-derived psychosocial and skill factors” as predictors of successful decisions in college (Le et al., 2005, p. 500).

**Dependent Variables:** The study evaluated seemingly every intra-relationship possible among the 10 factors. Some of these relationships include (but aren’t limited to) how outcomes could lead to effective interventions for the at-risk college student, what the relationships were by subgroups of age, income, and ethnicity minority (Le et al., 2005, p. 503).

**Instruments:** They derived a questionnaire using a “research team of three applied psychologists”. The first questionnaire contained 320 items in two forms when it was presented to a small number ( $n=38$ ) of high school students. Later, the questionnaire was reduced to 160 items in the 2<sup>nd</sup> field test which was circulated to SMEs for clarity. The list was finally revised and reorganized to 305 items which were “randomly assigned to five nonoverlapping item clusters, each with 61 items”. Then they made 10 different questionnaires by grouping three of those clusters into 183 items per questionnaire (Le et al., 2005, pg 488-489).

**Procedure:** The ten forms of the questionnaire were then spirally distributed to volunteer students in the classroom setting during multiple test administration sessions. It took approximately 30 minutes for a student to complete the questionnaire. Then the fun began. Of the 6,456 questionnaires completed and returned, 5,970 were fully readable. The number of no-fault questionnaires was eventually winnowed down to  $n=2,670$  (Le et al., 2005, pp. 489-490).

## Results

**Reliability and Validity of the Data:** Step 3, under Analysis and Results, validated for the spiral distribution of the questionnaires (not all students responded to the same data) by using scale scores. The distributions of 7 out of 10 scales were “approximately normal” prior to this validity filter. The remaining 3 scales were “somewhat negatively skewed” prior to the calculations. Table 2 in the study displays the number of items, Cronbach’s coefficient  $\alpha$ , M and SD (Le et al, 2005, p 493).

Also in Step 3 was the correlation between Study Skills scale and age ( $r=.21$ ), which was larger than the other correlations of scales and age (range  $-.15$  to  $.21$ ). The authors felt that this relatively high  $r$  was due to older students were more likely enrolled in community college and university. They addressed this validity concern by “partialing out student status”, giving a resultant  $r=.19$ , barely smaller than the zero-order correlation. They will address this issue in their next replication opportunity (Le et al., pp. 493, 497).

Step 3 also addressed 5 scales correlated with gender (range  $r=.14$  to  $.24$ ), indicating that females “tend to score higher on these scales than men”. Previous findings of cited studies led them to this general expectation (Le et al., 2005, p. 497).

Step 3 discusses validity involving achievement values. High school GPA and ACT scores consistently related in expected patterns. Commitment to College, Social Connection, Academic Discipline, Academic Self-Confidence related to high school GPA in a range of  $r = .20$  to  $.32$  and to ACT scores with  $r=.32$ . They compare observed correlations and true correlations, with the difference due to measurement error (Le et al., 2005, p. 497).

In Step 4, the authors carried out additional analysis to address potential subgroup (gender, student status, and ethnicity) differences. Table 5 reflects the results of these comparisons, indicating the factor structure was “invariant across subgroups” (Le et al, 2005, p. 499).

**Analyses:** The data was analyzed in four steps. Throughout the report, the authors offer all data calculations upon request; five tables are published within the study.

Step 1 was an exploratory factor analysis examining principal-axis factoring using SAS FACTOR procedure, with a scree plot, using parallel analysis and factor interpretability, all allowing the factors to be correlated (Le et al., 2005, p. 490).

Step 2 was a confirmatory factor analysis to confirm the factors from the previous step and to reselect items that represented the factors; they used the pattern of item-latent factor relationships from Step 1. They used a combination of several “fit indexes”, and then reselected on the basis

of the path coefficients using LISREL. There were 10 items reselected per factor (Le et al., 205, p. 491).

Step 3 was analyses to determine scale properties, using the entire sample to estimate the internal consistency reliability by Cronbach's coefficient  $\alpha$  of scores from Step 2. They used the SAS CORR procedure to estimate the intercorrelations of scales and correlations with demographic variables of age, gender, ethnicity and family income and with achievement scores of ACT scores and GPA (Le et al., 2005, p. 491).

Step 4 was 2<sup>nd</sup> order analyses of the higher factor scales structure. This was then compared to the concept model using Steps 1 and 2. They randomly split the entire sample (n=5,970) into 2 new and independent subsamples. Subsample 1 explored the higher order factor structure in Steps 1 and 2. Subsample 2 was used to confirm factor structure by 2<sup>nd</sup> order confirmatory analysis. The authors also did measurement equivalence analyses for factorial equivalence of scales across the subgroups of gender, ethnic minority or not, high school vs. community college vs. university. The path coefficients and interfactor covariances weren't expected to vary much across the subgroups (Le et al., p. 491).

**Results:** In Step 1, the exploratory factor analysis, they randomly chose 3,300 responses from the N=5,970 response for further analysis, expecting to "maximize clean factor structure" Pairwise deletion was carried out in the principal-axis factoring. Then, using the "oblimin rotation method", the factors were rotated using different oblique and orthogonal methods. They got very similar results. They extracted 11 factors, and then compressed 2 factors into 1 for clarity. They then reran the exploratory factor analysis on a 10-factor solution. After oblique rotation, the percentage of variance "appeared to be acceptable" (the 10 factors accounted for 37.4% of total variance). The factors had a low to moderate correlation with each other. The mean of the interfactor correlations was .06, and SD was .19. They selected 145 items with magnitudes of pattern coefficient  $>.30$  on the principal factor and  $<.20$  on the secondary factors (Le et al., 2005, pp. 490-492).

Step 2 was the confirmatory factor analysis, carried out on the remaining 2,670 responses. They examined 10 latent factors with 145 items as indicators. Using the maximum likelihood estimation method, they confirmed the factor structures from Step 1. They then reselected items on the basis of the magnitude of regression weights. 95 items were chosen (Le et al., 2005, pp. 492-493).

Step 3 was the examination of scale properties, using the entire sample N=5,970 by averaging, not summing, each factor's line items. Table 2 in the study displays the calculations in this validity to remedy that not all students responded to the same questionnaire. This is also discussed previously in Reliability and Validity, under Step 3. Tables 3 and 4 display scale intercorrelations and their correlations with other variables of interest (demographics, high school GPA, and ACT scores). The relationships are stronger where they were "conceptually designed" to be stronger. Then, to "better examine the underlying structure of the scales", the authors went on to Step 4, higher order analysis. Within the relationships of ethnicity and family income, the correlations were in the range of  $r=.00$  to  $-.10$ , taken by the authors that the scales "do not discriminate" based on these demographic variables. There was also a low correlation between age and Study Skills ( $r=.21$ ), as mentioned in Reliability and Validity, Step

3. Gender correlations are also addressed above in Reliability and Validity, Step 3 (Le et al., 2005, pp. 493, 497).

Step 4 involved a 2<sup>nd</sup> order analysis built on results from the 1<sup>st</sup> order analysis. The scree plot results suggested 4 second order factors (Motivation, Skills, Social Engagement and Self-Management) “underlying” the 10 first order factors. To confirm these 2<sup>nd</sup> order factors, they calculated geometric mean of the sample (n=2000, the remaining hold-out sample from Step 1), finding all the bivariate correlations. The result (n=1,060) was used in the confirmatory factor analysis, with the eventual result that Sills and Motivation constructs were merged into 1 factor, forming Model 2 which was nested within Model 1. They calculated chi-square values of Models 1 and 2, and compared degrees of freedom, finding that Model 2 did not fit the data as well as Model 1. Bearing on the works of Cheung and Rensvold (2002), they retained Model 2, being “more parsimonious”, over Model 1 (Le et al., 2005, pp. 498-499).

**Effects Sizes:** Effect size is mentioned once in the entire article, describing the works of Evans and Burck (1992) (Le et al., 2005, p. 505).

## Discussion

**Conclusions and Implications:** The authors concluded from their research that their original findings (Robbins et al., 2004) “partially confirmed” their revised conceptual model. Four of the first order factors (Academic Discipline, General Determination, Communication Skills, and Emotional Control) are “new” to the list, based on new literature available since their initial study. They also concluded that three of the 2<sup>nd</sup> (higher) order factors in Social Engagement (underlying the 1<sup>st</sup> order factors) remain in their original conceptual model. Motivation and Academic Related Skills were merged into a single Motivation and Skills as previously noted, combining motivation, conscientiousness, academic skills and communication skills. A new “important predictor” factor of Self-Management emerged, containing Academic Self-Confidence and Emotional Control, which the authors feel is consistent with recent research (Le et al, 2005, pp. 501-502).

**Threats to Validity of the Research:** They discuss within the context of Motivation described as a psychological characteristic in the pursuit of academic behaviors, compared to Skills as proficiency in academic performance, that despite their “relatively distinct research histories, the implications of the “jingle jangle jangle” fallacy (Block, 1995) of using different words for the same issues. They question if they are measuring the same characteristics with different labels. Nonetheless, they say cite that existing empirical evidence highly correlates Motivation and Skills, and in Robbins et al. (2004) the  $r=.65$ . Therefore, they retain the Motivation and Skills single factor (Le et al, 2005, pp. 502-503).

The normalizing of the spirally-distributed questionnaires and the possible inaccuracies of mean, SD, skewness and kurtosis are cited as both a concern and a future opportunity (Le et al, 2005, p. 503).

Other validity threats were previously mentioned in Reliability and Validity of the Data.

**Next Steps:** The authors are currently collecting replication data on demographic variables (gender, income, and ethnicity are mentioned) (Le et al., 2005, p. 503).

They also question their data collection techniques of the spirally-distributed questionnaires, and suggest that a further study with “traditional, fully crossed design” is needed to obtain the fullest understanding of their scales (Le et al, 2005, p. 503).

The possible nuances between Motivation and Skills is “an interesting research question that requires further examination” (Le et al, 2005, p. 503).

The authors say that the most important criteria for collecting and honing these scales or predictors of success is to “assist in identifying students who are at higher risk for falling behind academically or dropping out”. Once fully validated, the predictors can be linked with “criterion data” (GPAs and enrollment status are mentioned), then theoretically, can begin to help students. “However, despite our confidence, it is necessary to directly estimate the magnitudes of the validities” and to use other established measures to collect and examine “whether the pattern of convergent-discriminant relations with such measures is supportive of the construct validity of the current inventory” (Le et al., 2005, p. 504).

The authors are “currently surveying a national sample of entering 1<sup>st</sup> year students” at 2-year and 4-year colleges and universities. Aided with their ACT scores, they “will control for measures of standardized achievement, high school academic performance and socioeconomic status” before they apply the noncognitive factors from their Student Readiness Inventory (Le et al., 2005, p. 504).

Finally, they address the “practical value” of the inventory of factors: “If at-risk students are to be identified, can educational institutions use interventions to help these students improve their chances of success? They cite Hattie, Biggs, and Purdie (1996) and Evans and Burck (1992) as research on which they wish to build, and state that they are “interested in forming partnerships with institutions” committed to exploring such interventions for at-risk students identified in their 1<sup>st</sup> year. They also are interested in noncognitive factors able to influence course placement decisions for those students in the “decision zone”, going back to that Motivation and Skills magic power previously mentioned. The authors express strong hope and ask appropriate rhetorical questions for their future research (Le et al, 2005, pp. 504-505).

## CRITIQUE

**Title:** Now that I have read and re-read this report, I understand the title as comprehensive and as a quantitatively accurate description of their research. At first reading, the title was unclear to me, but now it communicates the three categories of their 2<sup>nd</sup> order factors. “Motivational” should have been “Motivation”. It would have flowed better if they had rearranged the title:

*Constructing the Student Readiness Inventory as Predictors of College Outcomes: Social, Self-Management, and Motivation & Skills Factors.*

**Questions and Hypotheses:** I think the initial experimental question was clearly drawn, now that I have digested it several times. On the first few readings, the basis of the hypotheses was

so comprehensive that it was confusing. What could improve the clarity of the experimental question is to say that these are pieces of a whole, that we are constructing a hierarchy or taxonomy of characteristics that predict success in college, and we will conclude with an outline the 10 constructs of 1<sup>st</sup> order and 2<sup>nd</sup> order, based on domain. The descriptive titles of the pieces often overlap because the domains overlap and the factors are continually merged down to 10. The typical first-time reader does not yet know what the first study concluded, what the second study proposes, what the second study concludes and how the domains lace together. A mind map would come in very handy or an Inspiration-type outline showing the hierarchy of all the concepts, but I don't think peer-reviewed, journal-published quantitative research uses graphics. Yes, the research reported addressed them appropriately. I found their research, results and applied statistics daunting at first, and then inspirational. With each reading, I understood a bit more of what they were trying to support. It was only in Future Directions, page 504, that they discussed the second of their research questions: How would colleges and universities use their results to improve student retention? I wish they had explored that implementation at length in pages, not merely in two paragraphs. This is the more exciting part of their work: What will the interventions look like and how will educators use them effectively?

**Design and Procedure:** This is my first reading of such a design and procedure as many-layered as theirs is. I found their design and procedures profoundly impressive and appropriate to their purpose as stated in their two research questions, given that they shorted the second question.

There are two aspects not covered of which I am curious: How did they manage all that paper? I estimate a minimum of 120 reams of paper coming back at them. How did all the data get entered into the software? Was it all scanned? They discuss their research team of 3 professionals preparing the questionnaires, but how were they processed?

**Reliability and Validity of Data:** It makes me smile to think I could give any constructive criticism to this seasoned team of professionals. All the statistics decisions were described in such a way that I really enjoyed their format and absorbed much of the rationale. I did my best to represent in my own words their validity methods. While I could not explain the specific techniques of their calculations, I felt like I understood much of the bigger picture.

**Analyses:** There was a diverse list of statistical methods described and applied to the data. I don't know enough to say they were inappropriate, incorrect or insufficient. I do know enough to say I was in awe of their statistics.

**Validity of the Research:** The authors thoroughly explored possible internal and external threats in their validity treatments. Based on their analysis, the threats did not seem to be serious.

Regarding the second research question, they did not explore threats to validity in the implementation into college and university interventions, which could include possible external threats to population validity (every student learns differently) and ecological validity (explicit descriptions of the factors in the treatment questionnaire and how to score it) (Gall et al., 2007, pp. 388-390).

Dr. [Steven Robbins](#) and Dr. [Ronelle Langley](#) work for ACT Inc. According to Le et al., 2005, p. 504, this team of researchers is currently gathering data to match students with their ACT scores database. Does ACT have impetus into this team's continuing research, and does ACT provide their research funds? Does this skew their team's research? They do not address this, but I am curious about that relationship. Judging from the thorough way validation is addressed in this study (Le et al., 2005), I am surprised they haven't documented their corporate involvement and corrected in some way for possible corporate researcher bias.

**Implications:** In addition to the learner ages they target, there are many practical applications for younger at-risk students, school-to-work at-risk students, and older at-risk college students. Since these factors cover the spectrum of academic, motivational, and self-management characteristics, the mind map of these factors would be a blueprint to success in many parts of life for learners of all ages. Parents could use these tools with their children. Meta-cognitive students lucky enough to be self-aware could benefit for a lifetime. Employers could use these tools in their human resources and OTJ training.

### **Summative Evaluation:**

There is research momentum that comes from successfully being published in peer-reviewed journals, which they have accomplished at least twice already. This team is still together, which says that they have been able to work out any professional ego differences and have been able to continually hone their focus on research objectives. They have important work to do, for they are doing what is missing in educational research: using the published meta-analysis works of others as the basis for on-going quantitative, scientific educational research. Their second study, this study (Le et al., 2005) cites and incorporates the works of others repeatedly. They modestly self-cite only once or twice. It is striking how much Le and team pulled in and built on the works and theories of others.

This list of predictors of success in college can also be used to predict success in life skills readiness outcomes for learners, in transitions as learners move on to the next learning environment, in effective job mentoring, and in areas of self-management requiring intrinsic motivation. Real-life applications of these learner characteristics are valid whether learners are college-bound or entering the workplace.

Continuing economic woes are affecting how the schools operate and budget their funds. The financial resources of students are also affected by economic uncertainty. Effective interventions could be emotional and financial lifesavers to overwhelmed students.

This team's ongoing research can also be used to extrapolate interventions for other overwhelmed learners as they transition into employment, citizenship, and society responsibilities. The learners are all human, with the relatively same brain function (plus and minus individual learning abilities). The magic is intrinsic motivation. The energy of volition can accomplish great things. The more we understand about these psychosocial and skill factors, the more effective educators can be in shepherding our learners.

The second research question should address how a postsecondary educational institution could help at-risk students experience "contextual influence pertaining to an institution", "perceived

social support”, “social involvement” and “academic engagement which includes commitment to an academic institution” (Le et al., 2005, p. 485). It is not stated, but implied, that these answers will be coming when they publish their current research in progress.

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