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FACTOR STRUCTURE OF THE LEARNING-TO-LEARN SCALES WITH AN  
ELEMENTARY AND SECONDARY EDUCATION SAMPLE

An Honors Thesis submitted to the

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And  
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Allison M. Dart

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### **Factor Structure of the Learning-to-Learn Scales with an Elementary and Secondary Education Sample**

Researchers and educators note that to be successful from an early age, students rely on many different abilities, including specific “learning behaviors” (McDermott, 1999). In fact, researchers found learning behaviors to be the chief difference between good and poor academic performance. A 1973 “panel of experts” convened to try to define the meaning of “social competency” in children. They delineated 29 specific facets of social competency, or behaviors, that could be used in school programs to help develop and strengthen learning. These behaviors were seen as the most important in developing strong students. (Anderson & Messick, 1974). Control of behavior and positive and affectionate personal relationships are some of these behaviors. Not only were these behaviors believed to be key to academic success, but they were also shown to have substantial positive influence on cognitive development, social competence, and other areas of development (McDermott, 1999).

#### **The Learning Behaviors Scale**

Over the years, researchers have made various attempts to measure the behaviors and characteristics defined in the 1973 panel study. An early attempt resulted in the publication of the Learning Behaviors Scale (LBS; McDermott, Green, Francis, & Stott, 1999). The LBS is a measure of behaviors related to efficient and effective learning. It was developed as a means of collecting normative data of learning-related behavior for less money and time than previous methods. The LBS was constructed for use with students aged 5 to 17 years. Each of the 29 items of the LBS is related to a specific learning behavior. The wording of each item varies between positive and negative to reduce the influence of response sets. The teacher or observer responds to each item whether the behavior *Most often applies*, *Sometimes applies*, or *Doesn't*

*apply* to that particular student.

Standardization and norming of the LBS included 225 doctoral-level, master's-level, and graduate student psychologists were recruited and trained as field coordinators. Standardization sample data came from 201 public and private schools from 70 metropolitan test areas, totaling a normative sample of 1,500 students, 750 female students and 750 male students (McDermott, 1999). Field coordinators administered the LBS forms to teachers after each teacher had observed target students at least 50 school days. The sample was consistent with U. S. census demographics; therefore, the sample included 67.7% White/Caucasian students, 15.9% Hispanic students, 12.1% Black/African-American students and 4.3% students from other ethnic groups. Moreover, 23.4% of the students came from single-parent households and 76.6% came from dual-parent households. The Differential Ability Scales (DAS; Elliott, 1990) was administered in order to assess cognitive and academic functioning of students, and it was established that the LBS normative sample was well within the norm.

Results suggested that as many as 10 dimensions could be extracted from the scales with 4 dimensions being extracted reliably and replicated (McDermott, 1999). Results showed that the model retaining 4 factors was the most stable. McDermott also established that higher values indicated good learning behavior and low values indicated faulty learning behavior. Results demonstrated considerable continuity and distinction of the dimensions across demographic subsamples. No observer effects were identified, signifying that the LBS was consistent across observers. All Pearson product-moment coefficients between LBS dimensions and the assorted ability and achievement measures were positive and almost all were statistically significant. Item-total correlation coefficients were computed within dimensions and no additional items were discarded due to relatively high or low item total or reduction of internal consistency as per

conditional alpha coefficients. Raw scores were transformed by area conversion into normally distributed *T* scores based upon the normative sample.

The raw scores from 25 of the items on the LBS are used to compute a total score and four subscale scores, including: Attention/Persistence (AP), Attitude Toward Learning (AL), Competence Motivation (CM), and Strategy Flexibility (SF). Attention and Persistence focuses on the behaviors related to distractibility and task completion. Attitude Toward Learning encompasses willingness to participate in learning related activities. Competence Motivation items are composed of the behaviors involved in anticipation of success. Attitude Toward Learning encompasses willingness to participate in learning related activities. Strategy and Flexibility items signify the way that the child approaches the task.

In a later factor analytic replication study, 10 teachers reported on 257 students from a southwestern elementary school (Worrell, Vandiver, & Watkins, 2001). The students were from 10 classrooms (grades 1 through 5) and ages ranged from 6-12. The sample was made up of approximately half male and half female students. Researchers did not collect further demographic information, but school-wide demographic data showed the school population was 94% white and 6% other ethnic groups. The school was determined to be middle class based on participation of students in the free or reduced lunch costs programs, which was less than 10%. The scores ranged from the fifty-fifth to the seventy-fifth percentile for the third through fifth grades. The teachers rated the students on the LBS. As only 10 teachers participated, each rating about 26 students, they were given several weeks to complete the ratings in order to avoid fatigue and carryover effects. The factor structure was found to be invariant across ethnicity, gender, and age.

The results of the Worrell et al. (2001) study suggested that three factors were reliably

extracted from the LBS items. Factor analysis was generally supportive of validity of the LBS structure. Three of the four subscales were substantially replicated, but the Attention/Persistence subscale was not. Results suggested that it was possible that the fourth factor may not have emerged due to smaller sample size, using a single-school as a sample, or sampling error. Guided by the results, researchers also proposed that the two scales Strategy/Flexibility and Attention/Persistence be used with caution for individuals because of lower reliability estimates (high .70 range). The study suffered from several limitations, including unequal numbers of students in each grade level, low response rate of teachers, and only one classroom for three of five grades were included. Researchers advised that the LBS be replicated in single-school contexts. However, similarity between these results and McDermott's (1999) results indicated that the LBS was a potentially useful instrument for identifying and intervening with learning-related behaviors in students.

Compared to McDermott's 1999 study, the Worrell et al (2001) study exhibited limitations affecting generalizability. Where McDermott's study included many schools from many different geographic areas and had a representative sample, the Worrell et al. study came from only one school in one area and therefore is not nationally representative. In addition, only limited demographic information was collected in the Worrell et al. study, although, school-wide demographics, indicated that the school was 94% white and therefore other ethnic groups were not well represented as in the McDermott (1999) study.

After critically reviewing some of the available behaviorally based rating scales, and determining their lack of reliability and validity, Worrell and Schaefer (2004) examined the LBS in two cohorts of academically talented students. The first cohort included 387 students from 28 classes, ranging in age from 11 to 18 from grades 5-11. The sample included 31.8% Chinese

Americans, 25.6% White/Caucasian Americans, with other groups contributing less than 8% of the sample. The students in this cohort had an average GPA of 3.7. In the second cohort, there were 287 students from 21 classes also ranging in age from 11-18. However, these students ranged in grade from 5th-10th. Like the first cohort, the largest ethnic groups were Chinese Americans and White/Caucasian Americans with all other groups comprising less than 11% of the sample. This group also had an average GPA of 3.7. The two groups did not differ significantly by gender, age, grade placement, or family income. A substantial portion of the participants came from middle- and high-income families; 30% reported annual family incomes of more than \$100,000 and only 18% had annual incomes below \$30,000. Teachers completed the LBS at the end of a 6-week summer program for gifted and talented students.

Results showed that the LBS raw scores were 1-6 points higher on average than the normative sample but did not differ significantly from other gifted and talented samples. This finding suggested that academically gifted students tend to be rated higher on the LBS, in other words, having better learning behaviors, than other samples. Additionally, internal consistency and stability indexes were in the moderate range. It was concluded that the LBS was more internally consistent and stable when compared to other behaviorally based rating scales. The factor analysis of the LBS resulted in viable four-factor structures in both study groups. Two of these factors were considerably replicated in independent samples, despite the more constrained range of scores. This replication showed that the scores of the LBS had substantially stronger evidence than other tests examined in the study. Additionally, the LBS scores in this study, accounted for more than 10% of the variance in student achievement. This was greater than the contributions of GPA, standardized achievement tests, and SES variables. This attribution of variance suggests that, in gifted populations, LBS scores may have the ability to predict teacher-

assigned grades even better than the contributions of ability. However, this phenomenon could also be a method effect, as teachers were also the ones who assigned grades. Marginally larger contributions were found with the total LBS score than with LBS subscale scores, due to the fact that they were somewhat more reliable (Worrell & Schaefer, 2004).

Canivez, Willenborg, and Kearney (2006) examined the LBS structure with 241 randomly selected students, ages 6-14, from nine schools in rural Illinois. Twenty-seven teachers completed the LBS. The majority of the students were Caucasian and the sample had approximately equal proportions of male and female students. The teachers randomly selected and rated a minimum of 4 male and 4 female students that they had observed for at least 40 school days before completing the LBS. No personally identifying information was collected in order to maintain anonymity of the students (Canivez et al., 2006).

Results showed that internal consistency reliability estimates were all acceptable for the LBS factors, however the AP and AF factors again had alpha coefficients that were slightly lower, advising caution in individual decision-making. Like previous studies, this study also provided support of the four-factor model of the LBS supporting the Attention/Persistence factor as observed in McDermott (1999). Coefficients of congruence for the four-factor model were actually higher than those for the three-factor model in this study in comparison to LBS standardization sample results. This result was similar to the results reported by McDermott (1999) although generalizability was limited as some ethnic groups were underrepresented in the study, due to location of the schools (Canivez et al., 2006).

Similarities can be drawn between this study and the study by Worrell et al. (2001). Both samples produced high item mean scores and had similar skewness and kurtosis estimates. In addition, means and standard deviations were near normative values of 50 and 10 in both studies,



and internal consistency estimates were quite close, as well.

In another study of the factor structure of the LBS, Canivez and Beran (2011) collected data on 393 Canadian students, approximately half of them male and half of them female. These students ranged in grade from kindergarten to grade 12 and ages 5 to 17. The race/ethnicity of students involved in the study were as follows: 74.8% White/Caucasian, .9% African/Black, .9% Hispanic/Latino, 1.8% Native American/First Nation, 4.5% Asian, 10.8% Other, and 6.3% not reported/missing. Classroom teachers from a large western-Canadian city completed the LBS for randomly selected students in their classroom. The forms were later collected by a certified school psychologist and returned to the lead author for scoring and analysis (Canivez & Beran, 2011).

Canivez and Beran used exploratory factor analyses to analyze reliable common variance from the LBS item correlation matrix using SPSS. The scree test was used to determine the optimal number of factors to retain. LBS scale raw scores from the Canadian sample and U. S. standardization sample were compared using MANOVA and ANOVA. Coefficients of congruence between the Canadian and U.S. standardization sample were in the good to excellent range. Statistically significant MANOVA was followed by univariate ANOVAs. ANOVA was also used to evaluate differences between the Canadian sample and U.S. standardization on the LBS Total raw scores. Mean differences were also evaluated using Cohen's *d* effect size estimate.

Canivez and Beran's results replicated the four-factor structure of the LBS and there was a strong correspondence of sample and factor invariance statistics between the Canadian and U.S. samples. The coefficients were close to the *a priori* criterion and it is likely that the lack of achievement of this criterion for some items was due to sampling error. Internal consistency

estimates were also similar to the LBS standardization sample and the U.S. samples (Canivez & Beran, 2011).

Rikoon, McDermott, and Fantuzzo (2012) examined the LBS with Head Start children to determine the external validity and dimensionality. Their teachers rated 900 kindergarteners and first graders, in 158 classrooms, from 97 schools. The researchers generated a polychoric item correlation matrix using two-stage maximum-likelihood estimation. Exploratory factor analysis and confirmatory factor analysis were used to calculate a polychoric correlation matrix for the reserve sample. Guiding criteria included evidence of a comparative fit index, root mean squared error of approximation (RMSEA), and an upper 90% confidence level for it. For ease of interpretation, they used a linear conversion to transform the scaled scores to *T* scores (Rikoon et al., 2012).

Rikoon et al. (2012) found that, once again, a four-factor model was superior and satisfied all criteria, which was confirmed in an independent subsample. The study demonstrated acceptable levels of internal consistency and also provided evidence supporting the external predictive validity of scores in Head Start samples. In addition, higher scores on all four LBS factors assessed in kindergarten and first grade were associated with substantially reduced risk for future behavioral maladjustment. This finding suggested that it was possible that low-income children showing below-average learning behaviors may benefit from targeted strategies to improve their academic skills (Rikoon et al., 2012).

Canivez and McDermott (2016) reexamined the LBS using the U. S. standardization sample. Exploratory and confirmatory factor analyses results showed that polychoric correlations were usually higher than the Pearson correlations for the item ratings. Eight of the 29 items exhibited non-normal distribution, presenting skewness estimates greater than  $|2.0|$  and 9 of the

items had kurtosis estimates greater than  $|3.0|$ . Bartlett's Test of Sphericity,  $\chi^2 = 32,604.84$ ,  $p < .0001$  indicated that the smoothed LBS item polychoric correlation matrix was not random. Factor analyses were deemed appropriate given communality estimates and sample size. The eigenvalue  $> 1$  criteria recommended extracting five factors and the Scree test criteria recommended extracting as many as seven. Horn's Parallel Analysis (HPA), in agreement with the results of McDermott, 1999, recommended a four-factor model. However, the Scree and MAP recommended only three factors. EFA results showed that all 29 LBS items had salient factor pattern coefficients in the three-factor model obliquely rotated. Previous investigations of LBS structure (Canivez & Beran, 2011; Canivez et al., 2006; McDermott, 1999; Worrell & Schaefer, 2004; Worrell et al., 2001) that used and described results based on an orthogonal equamax rotation may not have sufficiently represented LBS structure and investigation of obliquely rotated factors and possible higher-order factor analyses may provide an alternative structure of the LBS.

Additionally, the earlier studies employed Pearson product-moment correlations. Because Pearson correlations from ordinal/graded response data are not multivariately normal, they may produce differentially diminished correlations. This miscalculation can be corrected by employing polychoric correlations, which will often produce higher correlations. The Schmid-Leiman (SL; Schmid & Lieman, 1957) procedure was used to apportion common variance first to the higher-order factor, and to assign the residual common variance to the group factors. The SL procedure is an approximate bifactor structure and showed that the general learning behaviors dimension accounted for 35.8% total variance and 65.8% of the common variance. All compared models produced statistics that were considered adequate or good. Correlations were estimated between the LBS Total raw scores and teacher assigned grades, DAS achievement scores, and

BASIS scores. All of these correlations were statistically significant. Despite the information that as many as seven factors may be extracted, Canivez and McDermott decided that a three factor model, in agreement with Worrell et al. (2001), was the optimal model. EQS was used to conduct confirmatory factor analysis. Four models with different numbers of factors were examined. It was determined that, due to the high factor correlations of the three oblique factor model, the higher-order or bifactor model should be favored.

The Learning Behavior Scale was a sufficient measure for learning behaviors. However, it did not have enough items to allow it to extract more than 3 or 4 factors. In order to extract a larger number of factors, the LBS would have to be altered or replaced.

### **The Learning-to-Learn Scales**

In 2011, McDermott et al. developed the Learning to Learn Scales (LTLS; McDermott, 2014) as an extension of the Learning Behaviors Scale (LBS; McDermott, Green, Francis, & Stott, 1999). The LTLS was designed for use with preschool, kindergarten, and early elementary school children. Compared to its predecessor, the LTLS would be considered a stronger scale because of its increase in number of items that could capture more learning behavior dimensions. Statistically, the larger number of items may strengthen reliability and validity within scales. Furthermore, the LTLS is not restricted to a preschool-aged sample. The increase in items, however, could also be seen as a downfall, because it may make it more difficult for educators to complete. The LTLS retained the utility of the LBS.

The LTLS (McDermott, 2011) was used with 1,980 Head Start children from 80 school districts in Philadelphia, PA. The children's ages ranged from 2-5 years and there were approximately half male and half female students. These students belonged to the following ethnic groups: 74% African American, 14% Latino, 5% Caucasian, and 7% other. Of these

students, 12% were English Language Learners, and 10% qualified as special needs children. The 80 teachers involved in the study had 2 to 44 years of teaching experience and the majority were in the Head Start program. The teachers could respond to the LTLS items online.

The researchers calculated polychoric item correlations for the exploratory subsample using two-stage maximum-likelihood estimation, and they smoothed for nonsingularity and positive semidefiniteness (McDermott et. al., 2014). They used minimum average partialing to suggest the number of factors for retention. Ideally, the structure would satisfy the following criteria: (a) estimate simple structure as shown in maximum hyperplane count and item coverage, (b) produce the highest goodness-of-fit index and smallest root mean squared residual, (c) have at least four salient items per factor, (d) yield internally consistent factors, and (e) make theoretical sense in terms of sparing coverage of the data and compatibility with leading research in the area.

McDermott et al. found that seven viable factors might be extracted from the LTLS items, as the seven-factor scale satisfied all the criteria. Strong evidence existed for a general factor of good learning behavior that conveyed the basic construct while also producing more specific subtypes of learning behavior that might inform research and practice.

The seven factors identified in the LTLS were named Strategic Planning, Effectiveness Motivation, Interpersonal Responsiveness in Learning, Vocal Engagement in Learning, Sustained Focus Learning, Acceptance of Novelty and Risk, and Group Learning. Strategic Planning is the ability to consider consequences and develop a plan of action. Effectiveness Motivation is when the child willingly attempts activities that have challenged him or her in the past. Interpersonal Responsiveness in Learning is the child's ability to positively respond to suggestions of alternatives to attempt a task. Vocal Engagement in Learning is a child's

voluntary demonstration of knowledge and skills. Sustained Focus Learning is the child's ability to stay focused on an activity and self-directed. Acceptance of Novelty and Risk is a child's tendency to react confidently and receptively to a request to participate in a new activity. Finally, Group Learning is a child's ability to initiate appropriate action with other children without outside direction. McDermott et al. developed the LTLS to improve the sensitivity of previous learning behavior measures to show change within a given school year. It was also a goal to convey more information from a single test.

The LTLS showed a possible improvement on the LBS in that it extracted more factors while retaining reliability and validity estimates. However, only one published study examining the internal structure of the LTLS was available at the time of this study. More research is needed to evaluate this scale.

Previously, the LTLS had been examined with preschool children, its target demographic. In the case of the LBS, the scale was extended down to include a younger sample. Perhaps, the LTLS could be extended up to an older sample of students. To determine if the LTLS (LTLS; McDermott, 2014) measures the same dimensions of learning behaviors in a sample of elementary and secondary students, the LTLS was administered to teachers of K-12 students in 23 school districts in Illinois.

## **Method**

### **Participants**

Data were collected on a total of 313 K-12 students from 23 schools across the state of Illinois. Teachers ranged in age from 22-65 years ( $M = 39.71$ ;  $SD = 11.16$ ) and their number of years teaching ranged from 1-42 years ( $M = 13.71$ ;  $SD = 9.22$ ). There were 197 (92%) female teachers and 16 (8%) male teachers. The majority of the teachers were White/Caucasian (98%)

followed by Hispanic/Latino and Black/African American (1% each), and fewer than 1% belonged to multiracial groups.

Table 1 presents demographic information for the rated children. A total of 213 teachers from 23 schools in Illinois completed 313 LTLS forms. Distributions of ratings per grade were highly similar. Grade 10 had the least ratings (10) while grade 3 had the most ratings (36).

### **Instrument**

The Learning-to-Learn Scale (LTLS; McDermott, 2014) is a teacher report questionnaire, derived from the Learning Behaviors Scale (LBS; McDermott, et al., 1999), that is designed to measure student behaviors related to effective and efficient learning. It is composed of 55 items that correspond to some of the 29 learning behaviors outlined in Anderson and Messick (1974). Each item is rated on a 3-point scale (0 = *Does not apply*, 1 = *Sometimes applies*, 2 = *Consistently applies*). These 55 items were found to produce 7 group factors, based on previous research with preschool children; the factors were named Strategic Planning, Effectiveness Motivation, Interpersonal Responsiveness in Learning, Vocal Engagement in Learning, Sustained Focus in Learning, Acceptance of Novelty and Risk, and Group Learning.

### **Procedure**

Prior to data collection, the study method and procedure was reviewed and approved by Eastern Illinois University's Institutional Review Board. Teachers were recruited via email and asked to complete the LTLS by email. The teachers were invited to participate at will and complete the LTLS on randomly selected students from their classrooms who they had been observing for at least 50 school days. They were directed not to provide any student's identifying information in order to maintain anonymity. They completed the LTLS online using Qualtrics

survey software. Data were stored on the password-protected Qualtrics program. Twenty-two participants with missing data were deleted from the analyses.

### ***Data Analyses***

Due to the ordinal nature of the LTLS item ratings, polychoric correlations were estimated using EQS (Bentler & Wu, 2012). Principal axis exploratory factor analyses were employed in order to analyze reliable common variance from the LTLS item polychoric correlation matrix using SPSS (Fabrigar, Wegener, MacCallum, & Strahan, 1999). The goal of factor analysis is to reveal the structure of the variables within a scale. Multiple criteria were examined in order to determine the optimal number of factors to retain including the Kaiser-Guttman Unity-Eigenvalue rule (Guttman, 1954), scree test (Cattell, 1966), Horn's Parallel Analysis (1965), and theoretical convergence. Item factor saliency was determined using a criterion of a minimum factor pattern coefficient of 0.40 (McDermott et al., 2011). Viable factors were required to have at least 4 salient items per factor was set as an *a priori* requirement while producing internally consistent factors ( $\alpha \geq .70$ ). Factors were obliquely rotated through Promax ( $k = 4$ ) in order to allow for correlated factors.

Higher-order EFA was performed using the first-order factor correlations and results were converted using the Schmid and Leiman (1957) transformation. The Schmid-Leiman procedure was used to partition item variance to the higher- and lower-order factors and the residual common variance among items was apportioned to the lower-order factors using the MacOrtho program (Watkins, 2004).

Following the Schmid-Leiman procedure, omega-hierarchical ( $\omega_H$ ) and omega-hierarchical subscale ( $\omega_{HS}$ ; Reise, 2012) coefficients were estimated. Omega-hierarchical subscale is the model-based reliability estimate for the group factor with all other group and



general factors removed. These omega estimations are more appropriate reliability indexes than Cronbach's coefficient alpha when considering a bifactor model, and therefore should be used when exploring the reliability of a structural model (Rodriguez, Reise, & Haviland, 2015). The omega estimates were produced using the Omega program (Watkins, 2013) and Cronbach's coefficient alphas were estimated using SPSS for comparison.

## Results

### Descriptive Statistics

Table 2 presents the smoothed polychoric and Pearson product-moment correlations and descriptive statistics for the LTLS items. As expected, the polychoric correlations were higher than the Pearson correlations for these ordinal item ratings. Univariate skewness estimates ranged from -0.24 to 1.41; with none of the 55 items greater than |2.0|; univariate kurtosis estimates ranged from -1.44 to 0.94 with none of the 55 items greater than |5.0|. These estimates indicated that LTLS items were sufficiently normally distributed (Onwuegbuzie & Daniel, 2002; West, Finch & Curran, 1995). Mardia's (1970) normalized multivariate kurtosis estimate of 37.73, however, indicated these data were highly multivariately non-normally distributed (Bentler, 2005). Communality estimates ranged from .44 to .79. The sample size was adequate for EFA given the community estimates (Fabrigar et al., 1999).

### Exploratory Factor Analyses

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy of .931 far exceeded the .60 minimum standard (Kaiser, 1974) and Bartlett's Test of Sphericity (Bartlett, 1954),  $\chi^2 = 18,707.32$ ,  $p < .0001$  indicated that the smoothed LTLS item polychoric correlation matrix was not random. Initial communality estimates ranged from .707 to .892. Based on these analyses, it

was deemed that data for factor analyses were appropriate (Fabrigar et al., 1999; Floyd & Widaman, 1995; MacCallum et al., 1999). The eigenvalue  $> 1$  criterion, as well as the  $SE_{scree}$  suggested retaining six factors while HPA suggested retaining three (see Figure 1). The visual scree also suggested retaining three factors. Previous research had suggested retaining seven factors (McDermott, et al., 2011). Extraction of seven factors produced factors containing too few items ( $< 4$ ) with salient factor pattern coefficients and, working backwards, it was found that a six-factor extraction also had too few salient factor pattern coefficients on the sixth factor to meet the criterion. A five-factor solution produced the required  $\geq 4$  salient factor pattern coefficients and thus, this was the first examined solution. The five-factor solution satisfied all *a priori* criteria.

### **Five-Factor Extraction**

Table 3 presents first-order EFA results with five factors extracted illustrating 51 of the 55 LTLS items had salient factor pattern loadings and four of the 51 had salient loadings on two factors (cross-loading). First unrotated factor structure coefficients ( $g$  loadings) showed most LTLS items were “good” (41 items) or “fair” (11 items) indicators of general Learning-to-Learn Behaviors and only 3 items were “poor” indicators according to Kaufman’s (1994) criteria ( $\geq .70$  = good;  $.50-.69$  = fair;  $< .50$  = poor). Item associations in the present sample were compared to the factors previously identified by McDermott et al. (2011).

Factor I included 21 total items with 7 from the LTLS Effectiveness Motivation (EM), 7 items from LTLS Strategic Planning (SP), 4 items from LTLS Sustained Focus in Learning (SF), and one item each from LTLS Interpersonal Responsiveness in Learning (IR), Acceptance of Novelty and Risk (AN), and not associated with a previous LTLS factor. Factor II included 13 total items with 6 items from LTLS Interpersonal Responsiveness in Learning (IR), 3 items from

LTLS Acceptance of Novelty and Risk (AN), and one item each from LTLS Effectiveness Motivation (EM), Strategic Planning (SP), and not associated with a previous LTLS factor. There was also one item that cross-loaded and was from both Effectiveness Motivation (EM) and Acceptance of Novelty and Risk (AN). Factor III included 7 total items with 6 from LTLS Vocal Engagement (VE) and one item from LTLS Effectiveness Motivation (EM). Factor IV included 6 total items with 2 items from LTLS Group Learning (GL) and one item each from LTLS Vocal Engagement (VE), Interpersonal Responsiveness in Learning (IR), Acceptance of Novelty and Risk (AN), and not associated with a previous LTLS factor. Factor V included 4 total items with 2 items from LTLS Group Learning (GL), and one item each from LTLS Strategic Planning (SP), and not associated with a previous LTLS factor. Table 3 includes coefficients alpha to estimate internal consistency of factors based on a salient pattern coefficient, which ranged from .74-.97.

Because the items loaded onto factors in a way that was conducive to naming factors, the five-factor structure appeared to be the most logical for this sample. The factors were renamed. Factor I combined previous factors Strategic Planning, Effectiveness Motivation, and Sustained Focus in Learning and relabeled as Planning and Sustained Motivation in Learning (PM). Factor II combined Interpersonal Responsiveness in Learning and Acceptance of Novelty and Risk so relabeled External Responsiveness to Novelty and Risk (EN). Factor III was made up of mostly Vocal Engagement in Learning (VE) and therefore retained the VE name. Factor IV mainly included behaviors related to interpersonal interaction and was named Interpersonal Responsiveness in Learning (IR). Factor V was mainly behaviors related to effectiveness in groups and was renamed Group Learning (GL). The moderate to high factor correlations

presented in Table 2 suggested the presence of a more general Learning-to-Learn behavior factor (Gorsuch, 1983; Thompson, 2004).

#### **Four-Factor Extraction**

Table 6 present first-order EFA results with four factors extracted illustrating that 49 of the 55 LTLS items had salient factor pattern loadings and three of the 49 items had salient loadings on two factors (cross-loading). First unrotated factor structure coefficients (*g* loadings) showed most LTLS items were “good” (42 items) or “fair” (10 items) indicators of Learning-to-Learn behaviors and only 3 items were “poor” according to Kaufman’s (1994) criteria ( $\geq .70$  = good;  $.50$ -. $.69$  = fair;  $< .50$  = poor). Item associations in the present sample were compared to the factors previously identified by McDermott et al. (2011).

Factor I included 22 total items with 7 items from the LTLS Effectiveness Motivation (EM), 7 items with Strategic Planning (SP), 4 items from LTLS Sustained Focus in Learning (SF) and one item each from LTLS Acceptance of Novelty and Risk (AN) and Interpersonal Responsiveness (IR), and 2 items not associated with any previous LTLS factor. Factor II included 12 total items with 5 items from LTLS Vocal Engagement (VE), 2 items each from LTLS Group Learning (GL) and Strategic Planning (SP), and one each from LTLS Acceptance of Novelty and Risk (AN) and Effectiveness Motivation (EM). One item was not associated with any previous factor. Factor III included 12 total items with 7 items that were from LTLS Interpersonal Responsiveness in Learning (IR), 2 items from LTLS Group Learning (GL), and one item each from Vocal Engagement (VE), Acceptance of Novelty and Risk (AN), and not associated with any previous LTLS factor. Factor IV included a total of 3 total items with one item each from LTLS Acceptance of Novelty and Risk (AN) and not associated with any

previous factor. One item was also cross-loaded onto Effectiveness Motivation (EM) and Acceptance of Novelty and Risk (AN).

### **Second-Order EFA**

Once it was determined that the 5-factor model was optimal, the Schmid and Leiman (SL, 1957) procedure was used to investigate the hierarchical internal structure of the LTLS. Employing the factor pattern coefficients from the obliquely rotated first-order EFA solution, the SL procedure was applied using the *MacOrtho* program (Watkins, 2004). This technique apportioned the common variance to the higher-order factor and then the residual common variance was apportioned to the first-order group factors. Results of this analysis are presented in Table 5, which shows that a general Learning-to-Learn behavior dimension accounted for 48.6% of the total variance and 75.7% of the common variance. At the first-order level, Planning and Sustained Motivation in Learning (PM) accounted for an additional 4.1% of the total variance and 6.4% of the common variance, External Responsiveness to Novelty and Risk (EN) accounted for an additional 4.0% of the total variance and 6.2% of the common variance, Interpersonal Responsiveness in Learning (IR) accounted for an additional 2.9% of the total variance and 4.6% of the common variance, Vocal Engagement in Learning (VE) accounted for an additional 2.5% of the total variance and 3.8% of the common variance, Group Learning (GL) accounted for an additional 2.1% of the total variance and 3.3% of the common variance. The first and second-order factors combined to measure 64.3% of the variance in the LTLS scores resulting in 35.7% unique variance, which is a combination of specific and error variance.

Also seen in Table 6, Omega-hierarchical ( $\omega_H$ ) and omega-hierarchical subscale coefficients ( $\omega_{HS}$ ; Reise, 2012) were calculated to estimate the reliability of the general factor and subscales. The  $\omega_H$  coefficient indicated that the general factor claimed a large portion of true

score variance and is interpretable. The  $\omega_{HS}$  was estimated to allow for assessment of the internal consistency of the general factor without the influence of specific group factors. Likewise, the internal consistency of the specific factors can be examined excluding the influence of the general factor and other group factors when  $\omega_{HS}$  is estimated. The omega coefficient is more appropriate when estimating latent factor reliabilities in the presence of multidimensionality. The omega hierarchical coefficient for a general Learning-to-Learn Behavior was high (.939), indicating its capture of a large portion of unique true score variance. The omega-hierarchical subscale coefficients for the five group factors were small (.136-.303), showing substantially less unique true-score variance of unit weighted scale scores based on the items, that limits confident interpretation of the unit weighted scores (Reise, 2012; Reise et al., 2013).

### **Discussion**

The purpose of the present study was to examine the factor structure of the Learning-to-Learn Scale (LTLS; McDermott et al., 2014) with a randomized sample of K-12 students. In previous research, the LTLS was developed for use with a large sample of preschool students only (McDermott et al., 2014), leaving a curiosity on the utility of the scale in an elementary and secondary school sample. The present thesis sought to determine how many first-order factors would be suggested based on *a priori* criteria, and how much item variance was apportioned to a general hierarchical factor. These questions were guided by appropriate methods in determining the internal structure of multidimensional constructs (Gorsuch, 1983, 2003; Thompson, 2004).

#### **Learning Behaviors Scale Comparison**

Compared to its predecessor, the Learning Behaviors Scale, the LTLS also did well for the total LTLS score, maintaining acceptable alpha and omega coefficients and strong internal

consistency. Community estimates for the LTLS were higher than those on the LBS. The present study, however, found that a five-factor model was the best fit compared to the three- and four-factor models typically found with the LBS. While this finding seems optimistic, results of this study showed that a general Learning-to-Learn factor captured the largest portion of variance. Additionally, the omega-hierarchical coefficient indicated that a total score would be sufficiently reliable, but that the 5 group factors had omega-hierarchical coefficients that were much too low and would not capture enough of the unique true score variance to be of use, despite the relatively high alpha coefficients reported. If the larger number of items does not offer good measurement of any of the subscales, it may not be a real improvement on the utility offered from the LBS, because it may not offer better information.

### **Learning-to-Learn Scale Comparison**

Results of Exploratory Factor Analysis (EFA) indicated a five-factor solution was optimal for the Learning-to-Learn Scale in the present sample. In the initial study, McDermott et al. (2014) extracted 7 factors through first-order EFA in the preschool sample the LTLS was developed for. One explanation for the decrease in the number of extracted factors in the present study is the lack of differentiation among older students. It may be possible that some behaviors, which can be easily viewed and separated with the younger preschool students, consolidate with age, making them more difficult to see and differentiate. Factor I was named Planning and Sustained Motivation in Learning (PM), Factor II was named External Responsiveness to Novelty and Risk (EN), Factor III was named Vocal Engagement in Learning (VE), Factor IV was named Interpersonal Responsiveness in Learning (IR), and Factor V was named Group Learning (GL). All items except 4 loaded onto their theoretically consistent factors with only four cross-loadings.

Compared to the 7 factors originally reported, the current study collapsed some of the factors, resulting in 5 factors. While Vocal Engagement in Learning, Group Learning, and Interpersonal Responsiveness in Learning remained nearly the same and somewhat apart, Strategic Planning and Effectiveness Motivation combined to create Planning and Sustained Motivation in Learning. Acceptance of Novelty and Risk and some Interpersonal Responsiveness in Learning combined to create External Responsiveness to Novelty and Risk. This finding may be representative of conformity in older students. The K-12 sample may not have as many clear differences as did the preschool-aged sample.

As the omega coefficients suggest, one general factor apportions most of the variance leaving little to the group factors. This lends some information not previously seen in research. Even though the 5 factor solution is the best model, there is little evidence that the group factors have enough unique variance to be used for interpretation.

### **Limitations**

With all studies come limitations. The sample of teachers came from rural school districts in the Midwest. This limitation would mean that the results are not generalizable to the U.S. population, or even to the state of Illinois. The demographics of students in the sample, unfortunately, are not representative of the U. S. population, which restricts the results to being generalized to a small area. The combined sample size of 313 cases allowed researchers to analyze the data, but is still small for the study.

Replication of the current research may clarify some of the current findings. Items that did not saliently load or loaded on more than one factor may be clarified in a larger and more representative sample. Future research may also expand the number of factors extracted or support the five-factor solution. EFA provides limited interpretation regarding the internal



structure of a construct and conducting Confirmatory Factor Analysis (CFA) could shed more light on the internal structure of the LTLS.

**Conclusion**

This study was an investigation of the internal structure of the Learning-to-Learn Scale (McDermott, et al., 2011) in a sample of K-12 students. After EFA and Omega Analyses, the results suggest that a five-factor solution is most appropriate and that most of the true score variance is allocated to one general Learning-to-Learn factor, rendering the factor scores unfit for interpretation.

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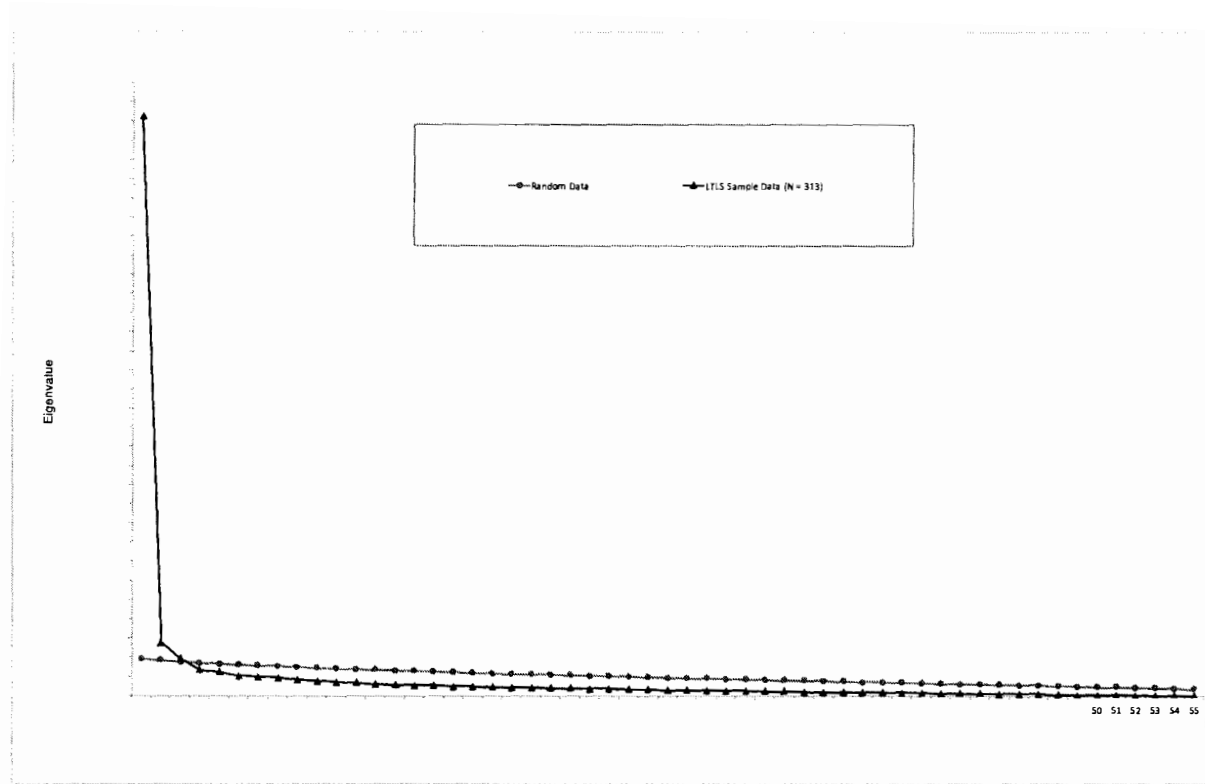


Figure 1. Scree plots for Horn's Parallel Analysis for the Learning-to-Learn Scale standardization sample.

Table 1:  
*Student Demographics for the Convenience Sample (N = 313) rated on the Learning-to-Learn Scales (LTLS)*

<u>Grade</u>	<i>n</i>	Percent
K	27	9
1	18	6
2	24	8
3	36	12
4	33	11
5	29	9
6	25	8
7	26	8
8	22	7
9	22	7
10	10	3
11	18	6
12	21	7
<u>Ethnicity</u>		
White/Caucasian	184	59
Black/African American	52	17
Asian American	17	5
Hispanic/Latino	40	13
Native American	11	4
Other	10	3

**Table 2**  
*First-Order Factor Correlations Based on Principal Factors Extraction with Promax Rotation (K = 4)*  
*of the Learning-to-Learn Scales with an Elementary and Secondary School Sample (N = 313)*

	F1	F2	F3	F4	F5
F1	—				
F2	.725	—			
F3	.717	.527	—		
F4	.705	.644	.639	—	
F5	.559	.440	.642	.512	—
F1	—				
F2	.699	—			
F3	.749	.686	—		
F4	.548	.381	.537	—	

Table 3

*Learning-to-Learn Scales (LTLS) Item Exploratory Factor Analysis Promax Rotated (K = 4) Factor Pattern (Structure) Coefficients for an Elementary and Secondary School Sample (N = 313): Five Oblique Factor Solution*

Item number/Abbreviated item content	g	F1	F2	F3	F4	F5	H <sup>2</sup>
4. Screens out noise and distractions (~)	75	70 (77)	44 (74)	-14 (45)	-15 (50)	-07 (35)	70
5. Shows basic understanding of cause and effect (SP)	79	44 (76)	12 (65)	-05 (58)	34 (72)	05 (49)	65
11. Given a choice, takes new task rather than familiar one (AN)	72	62 (74)	-07 (50)	12 (63)	-05 (53)	21 (58)	59
14. Changes strategies when one solution doesn't work (SP)	81	58 (81)	08 (63)	16 (67)	04 (63)	04 (53)	68
16. Stays focused in individual, self-selected activity > 20 min. (SF)	74	88 (80)	21 (66)	-16 (47)	-13 (50)	-06 (36)	68
22. Self-corrects errors on projects or activities (SP)	78	71 (80)	-02 (59)	13 (63)	10 (62)	-09 (43)	66
25. Compares new to old tasks as per what worked (SP)	83	79 (86)	-10 (59)	05 (66)	12 (66)	03 (53)	75
26. Stays focused on group activity > 10 min., w/out direction (SF)	77	73 (79)	29 (70)	-10 (50)	-07 (54)	-07 (37)	67
27. Actively perseveres difficult task with little teacher input (EM)	82	76 (85)	12 (68)	-03 (59)	05 (63)	-03 (46)	73
28. Develops plan for multi-stage activity (SP)	80	79 (83)	-05 (59)	-11 (59)	08 (62)	17 (56)	70
29. Stays focused in individual, self-selected activity > 30 min. (SF)	72	1.03 (80)	04 (58)	-25 (43)	-07 (49)	-06 (34)	69
30. Works independently at assigned task, minimal supervision (EM)	83	56 (82)	36 (78)	-02 (56)	11 (66)	-12 (39)	75
32. Teaches another child new task or skill (SP)	76	47 (75)	-05 (53)	32 (73)	-02 (58)	18 (62)	66
36. Remains attentive when teacher leads group activity (IR)	83	53 (80)	38 (77)	07 (59)	05 (64)	-10 (41)	72
42. Communicates problems have more than one solution (SP)	82	65 (83)	-06 (58)	20 (72)	05 (64)	08 (57)	73
43. Stays focused in individual, self-selected activity > 10 min. (SF)	76	62 (77)	33 (70)	01 (53)	-10 (53)	-05 (39)	64
44. Keeps trying difficult task when solution not forthcoming (EM)	80	78 (83)	-12 (57)	08 (63)	22 (67)	-13 (41)	72
45. Perseveres challenging task even with distractions (EM)	83	88 (88)	11 (67)	04 (61)	-09 (58)	-09 (43)	78
46. Practices activity without teacher prompting (EM)	84	70 (86)	19 (71)	07 (64)	-03 (62)	-04 (47)	75
48. Voluntarily engages activity previously found challenging (EM)	78	59 (78)	-06 (56)	16 (68)	10 (63)	10 (56)	65
55. Engages new activity without constant need for approval (EM)	87	44 (83)	19 (74)	05 (66)	30 (77)	00 (52)	78
1. Perseveres difficult task with teacher encouragement (EM)	68	12 (62)	54 (68)	41 (60)	-18 (46)	-11 (37)	56
2. Attempts a task after previous attempts unsuccessful (EM and AN)	70	07 (62)	64 (73)	21 (56)	-19 (47)	13 (48)	60
3. Develops plan after considering possible consequences (SP)	72	40 (70)	46 (70)	07 (55)	-25 (46)	16 (51)	61
6. Takes turns in small group without reminder (IR)	67	06 (58)	51 (70)	-12 (43)	23 (59)	14 (44)	54
7. Shows acceptance of peer advice by following it (IR)	74	13 (66)	44 (74)	-17 (47)	39 (71)	11 (46)	65
9. Listens and waits for turn in group activity (IR)	72	32 (67)	57 (77)	-32 (38)	13 (58)	13 (42)	66
10. Self-selects activity without direction (~)	73	27 (68)	47 (70)	06 (55)	-14 (50)	23 (55)	60
18. Refrains from acting out aggressively when frustrated (IR)	61	-03 (51)	42 (66)	-30 (30)	68 (71)	-04 (28)	64
19. Responds positively to suggestions for alternative approach (IR)	76	06 (66)	48 (75)	08 (55)	34 (71)	-06 (40)	66
20. Participates in lesson introduced by teacher (AN)	81	-06 (69)	70 (85)	26 (64)	10 (66)	-01 (48)	77
21. Acts positive and confident in new task or activity (AN)	79	14 (71)	45 (75)	25 (64)	14 (66)	-05 (46)	66
37. Shows acceptance of teacher advice by following it (IR)	82	09 (72)	58 (83)	06 (58)	27 (72)	-04 (44)	75
41. Maintains positive attitude toward new/unfamiliar activities (AN)	85	14 (76)	43 (78)	20 (68)	21 (73)	04 (54)	74

(Table 3 continues)



(Table 3 continued)

Item number/Abbreviated item content	g	F1	F2	F3	F4	F5	R <sup>2</sup>
12. Vocally demonstrates skills and knowledge (VE)	61	15 (56)	-10 (37)	67 (73)	00 (48)	01 (48)	54
31. Asks teacher for task to perform or activity to engage in (VE)	67	23 (63)	09 (48)	50 (72)	-23 (44)	25 (62)	60
34. Willingly asks questions and shares ideas (VE)	76	05 (67)	03 (54)	52 (79)	27 (69)	07 (58)	69
39. Verbalizes frustration with task and asks teacher for help (VE)	42	-31 (33)	17 (31)	81 (63)	-14 (30)	06 (41)	44
40. Seeks answers by engaging materials, children, and adults (VE)	85	25 (79)	03 (62)	50 (84)	21 (74)	02 (60)	80
50. Verbalizes pride in accomplishments by showing to others (VE)	57	-12 (49)	07 (38)	89 (76)	-07 (43)	-07 (43)	59
52. Verbalizes frustration on task but continues working (EM)	58	-04 (51)	-02 (38)	72 (71)	14 (51)	-09 (41)	51
15. Demonstrates sense of humor about errors (~)	70	19 (64)	-04 (50)	25 (64)	42 (69)	00 (47)	56
23. Willingly participates in unfamiliar group activities (AN)	76	09 (67)	13 (61)	15 (65)	40 (73)	17 (58)	63
24. Responds to questions about ideas without becoming upset (IR)	65	16 (58)	08 (55)	-20 (42)	71 (75)	02 (37)	59
33. Works cooperatively with another child or small group (GL)	75	12 (66)	30 (68)	-07 (53)	42 (73)	16 (52)	63
49. Helps, shares, discusses with peers in a group (GL)	79	13 (70)	09 (62)	28 (70)	45 (77)	-02 (50)	68
54. Willingly guesses, even when unsure if response is correct (VE)	47	-26 (36)	-15 (29)	21 (48)	72 (63)	12 (41)	47
8. Plays with at least one other child during free play (GL)	46	-41 (32)	16 (37)	-02 (45)	24 (46)	82 (77)	66
13. Initiates proper activity with another child without direction (GL)	75	13 (67)	23 (63)	-02 (61)	16 (64)	49 (73)	68
38. Identifies alternative uses for an object (~)	57	17 (52)	-03 (38)	13 (57)	-08 (41)	60 (72)	55
47. Verbalizes possible consequences of act or event (SP)	58	21 (54)	-12 (35)	21 (60)	02 (46)	47 (67)	52
17. Attentive when spoken to directly by teacher (~)	72	29 (67)	28 (65)	07 (53)	27 (65)	-10 (37)	55
35. Others depend on this child's directions during activity (~)	82	37 (78)	04 (61)	28 (73)	23 (71)	04 (55)	70
51. Learns by accepting constructive feedback (~)	78	32 (74)	28 (69)	21 (62)	24 (68)	-19 (37)	65
53. Responds positively to assistance (IR)	71	-06 (61)	26 (62)	23 (62)	36 (68)	10 (52)	57
Eigenvalue		30.26	2.77	1.95	1.34	1.25	
% Variance		55.03	5.03	3.55	2.44	2.27	
R <sup>2</sup>		.97	.92	.86	.84	.74	

Note. SP = Strategic Planning, EM = Effectiveness Motivation, IR = Interpersonal Responsiveness in Learning, VE = Vocal Engagement, SF = Sustained Focus in Learning, AN = Acceptance of Novelty and Risk, GL = Group Learning, ~ = No original LTLS assignment, R<sup>2</sup> = Communality. General structure coefficients are based on the first unrotated factor coefficients (g loadings). Salient factor pattern coefficients (≥ .40) are presented in bold.

Table 4  
Smoothed Polychoric Correlations (below diagonal) and Pearson Product Moment Correlations (above diagonal) and Descriptive Statistics for the Learning-to-Learn Scales (LTLS) Elementary and Secondary School Sample (N = 313)

LTLS Item	Learning-to-Learn Scales (LTLS) Item													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	—	.524	.507	.441	.346	.331	.379	.178	.374	.406	.324	.359	.399	.466
2	.667	—	.537	.406	.393	.380	.413	.258	.405	.514	.386	.238	.424	.444
3	.596	.627	—	.542	.514	.386	.506	.244	.507	.558	.487	.351	.493	.570
4	.556	.519	.621	—	.500	.456	.444	.109	.511	.483	.423	.273	.459	.558
5	.461	.523	.621	.637	—	.445	.486	.256	.457	.403	.412	.374	.431	.559
6	.440	.500	.471	.585	.580	—	.538	.246	.563	.387	.292	.282	.439	.460
7	.479	.523	.574	.539	.605	.662	—	.231	.562	.507	.373	.267	.464	.492
8	.262	.378	.323	.168	.384	.348	.327	—	.233	.282	.222	.230	.468	.237
9	.491	.525	.601	.649	.596	.705	.679	.336	—	.427	.363	.185	.426	.467
10	.497	.620	.612	.576	.504	.478	.585	.367	.524	—	.448	.375	.526	.498
11	.429	.520	.578	.535	.550	.393	.468	.322	.481	.559	—	.401	.464	.516
12	.466	.317	.413	.349	.486	.361	.337	.309	.242	.450	.514	—	.411	.442
13	.515	.548	.572	.575	.556	.561	.572	.611	.549	.621	.608	.518	—	.494
14	.573	.554	.634	.667	.687	.573	.577	.335	.577	.576	.633	.539	.598	—
15	.445	.455	.485	.456	.609	.382	.557	.372	.424	.446	.569	.556	.572	.567
16	.446	.492	.541	.706	.563	.520	.531	.195	.589	.560	.551	.397	.499	.604
17	.454	.530	.532	.530	.707	.527	.593	.297	.563	.424	.460	.449	.475	.592
18	.357	.421	.407	.466	.525	.486	.632	.297	.521	.451	.325	.187	.493	.418
19	.504	.596	.543	.599	.651	.572	.646	.321	.560	.573	.471	.421	.522	.563
20	.593	.692	.573	.607	.606	.569	.676	.404	.631	.674	.538	.435	.574	.596
21	.571	.589	.593	.595	.624	.530	.604	.337	.594	.599	.547	.465	.536	.624
22	.514	.487	.556	.567	.643	.498	.579	.235	.502	.511	.557	.513	.497	.735
23	.446	.522	.449	.474	.504	.509	.546	.421	.534	.533	.567	.484	.619	.612
24	.375	.386	.406	.430	.601	.441	.573	.281	.493	.423	.469	.317	.525	.491
25	.520	.518	.672	.615	.735	.544	.565	.265	.565	.529	.666	.487	.609	.767
26	.518	.541	.528	.689	.631	.476	.502	.254	.579	.567	.495	.382	.526	.597
27	.594	.573	.593	.655	.623	.526	.558	.299	.586	.643	.638	.500	.580	.720
28	.449	.513	.580	.667	.712	.531	.548	.369	.556	.534	.581	.483	.598	.710
29	.439	.444	.530	.648	.585	.415	.502	.154	.559	.498	.549	.338	.464	.563

(Table 4 continues)

(Table 4 continued)

LTLS Item	Learning-to-Learn Scales (LTLS) Item													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
30	.611	.572	.586	.710	.653	.556	.668	.310	.625	.630	.546	.421	.580	.663
31	.480	.493	.494	.432	.395	.377	.490	.353	.437	.507	.647	.547	.547	.534
32	.531	.516	.562	.512	.568	.415	.552	.427	.455	.578	.592	.508	.618	.644
33	.532	.463	.481	.528	.549	.579	.608	.437	.575	.496	.518	.331	.630	.547
34	.512	.545	.462	.415	.606	.504	.470	.458	.401	.516	.565	.671	.648	.602
35	.548	.537	.575	.577	.668	.576	.558	.382	.550	.542	.585	.570	.630	.670
36	.596	.585	.587	.667	.655	.583	.614	.275	.644	.600	.578	.475	.567	.661
37	.581	.556	.616	.659	.709	.642	.699	.329	.675	.600	.478	.435	.565	.585
38	.330	.349	.410	.341	.417	.272	.345	.584	.294	.461	.469	.456	.511	.452
39	.311	.303	.339	.238	.284	.275	.230	.305	.194	.268	.306	.351	.337	.368
40	.539	.554	.581	.573	.663	.476	.577	.440	.494	.610	.595	.612	.641	.680
41	.621	.657	.628	.669	.624	.615	.603	.396	.643	.631	.575	.477	.650	.676
42	.544	.588	.596	.598	.689	.501	.568	.321	.568	.555	.647	.480	.558	.677
43	.518	.528	.565	.616	.526	.471	.545	.278	.565	.575	.477	.373	.496	.574
44	.510	.486	.537	.608	.598	.426	.564	.243	.572	.532	.627	.491	.537	.696
45	.589	.558	.613	.719	.579	.492	.595	.202	.597	.594	.645	.420	.610	.655
46	.574	.606	.586	.667	.600	.547	.595	.299	.576	.718	.650	.520	.611	.680
47	.297	.380	.426	.303	.522	.382	.438	.463	.321	.440	.473	.401	.451	.473
48	.498	.541	.519	.546	.572	.460	.506	.358	.465	.564	.625	.499	.571	.603
49	.561	.520	.497	.511	.610	.581	.563	.366	.552	.521	.528	.475	.573	.604
50	.435	.367	.386	.312	.385	.328	.294	.303	.236	.369	.395	.643	.426	.490
51	.557	.506	.558	.635	.661	.510	.633	.270	.559	.557	.510	.433	.503	.629
52	.411	.363	.312	.307	.440	.261	.350	.318	.305	.349	.468	.446	.391	.457
53	.450	.468	.496	.514	.565	.490	.526	.426	.496	.552	.442	.460	.564	.549
54	.260	.246	.159	.182	.351	.284	.426	.410	.236	.284	.301	.321	.419	.351
55	.604	.588	.610	.634	.687	.571	.687	.397	.677	.618	.630	.472	.584	.709
<i>M</i>	1.59	1.52	1.89	1.88	1.49	1.55	1.65	1.49	1.59	1.68	2.01	1.73	1.70	1.82
<i>SD</i>	.61	.59	.73	.68	.59	.62	.62	.73	.62	.69	.62	.72	.74	.67
<i>Sk</i>	.49	.66	.17	.15	.78	.68	.43	1.15	.54	.52	.00	.47	.54	.23
<i>K</i>	-.63	-.52	-1.11	-.84	-.37	-.51	-.66	-.18	-.61	-.83	-.33	-.97	-.99	-.79

(Table 2 continues)

(Table 4 continued)

LTLS Item	Learning-to-Learn Scales (LTLS) Item																	
	15	16	17	18	19	20	21	22	23	24	25	26	27	28				
1	.352	.372	.377	.259	.395	.425	.473	.439	.341	.302	.409	.416	.503	.372				
2	.349	.409	.445	.323	.483	.516	.489	.406	.402	.309	.400	.435	.478	.424				
3	.421	.499	.492	.342	.471	.458	.536	.521	.381	.365	.594	.464	.551	.542				
4	.366	.617	.457	.360	.492	.445	.492	.497	.372	.354	.504	.570	.569	.584				
5	.482	.471	.622	.410	.534	.445	.518	.549	.390	.514	.586	.519	.527	.614				
6	.295	.431	.444	.380	.464	.418	.430	.417	.394	.366	.424	.377	.437	.444				
7	.456	.466	.525	.513	.550	.511	.518	.522	.439	.499	.469	.414	.491	.485				
8	.258	.131	.215	.204	.219	.271	.235	.168	.295	.201	.183	.172	.208	.269				
9	.331	.501	.483	.403	.453	.468	.493	.423	.422	.408	.447	.473	.496	.471				
10	.371	.506	.375	.368	.496	.536	.531	.463	.444	.366	.443	.486	.582	.480				
11	.455	.449	.384	.256	.377	.391	.444	.478	.445	.392	.531	.389	.539	.485				
12	.445	.331	.383	.144	.336	.309	.381	.442	.376	.267	.386	.306	.426	.411				
13	.457	.421	.406	.396	.423	.419	.450	.422	.492	.450	.493	.422	.493	.516				
14	.471	.539	.531	.325	.472	.446	.541	.694	.503	.422	.658	.510	.653	.643				
15	—	.426	.490	.352	.492	.393	.421	.443	.410	.428	.524	.317	.440	.450				
16	.497	—	.526	.348	.485	.485	.545	.576	.411	.378	.558	.616	.615	.614				
17	.569	.567	—	.463	.548	.465	.546	.546	.389	.438	.547	.540	.542	.576				
18	.445	.419	.537	—	.530	.455	.413	.389	.372	.561	.350	.366	.423	.325				
19	.599	.549	.606	.612	—	.548	.598	.518	.496	.527	.490	.490	.520	.517				
20	.528	.603	.580	.577	.677	—	.651	.455	.518	.437	.407	.516	.499	.432				
21	.514	.603	.601	.505	.671	.778	—	.564	.589	.476	.549	.531	.570	.542				
22	.507	.611	.579	.457	.584	.587	.622	—	.518	.426	.659	.588	.689	.645				
23	.518	.488	.462	.481	.611	.695	.694	.597	—	.528	.483	.428	.525	.521				
24	.501	.428	.481	.629	.588	.550	.538	.473	.620	—	.486	.358	.483	.471				
25	.639	.641	.626	.442	.593	.569	.650	.717	.602	.571	—	.526	.632	.657				
26	.390	.674	.594	.456	.571	.652	.608	.651	.527	.421	.627	—	.634	.582				
27	.512	.655	.582	.518	.602	.644	.637	.712	.615	.544	.714	.706	—	.664				
28	.523	.649	.614	.405	.585	.550	.599	.673	.606	.512	.734	.644	.700	—				
29	.478	.760	.471	.374	.512	.525	.530	.609	.465	.432	.657	.704	.623	.631				

(Table 4 continues)

(Table 4 continued)

LTLS Item	Learning-to-Learn Scales (LTLS) Item																	
	15	16	17	18	19	20	21	22	23	24	25	26	27	28				
30	.533	.680	.638	.563	.648	.702	.656	.652	.551	.529	.650	.752	.706	.672				
31	.434	.428	.411	.253	.430	.528	.498	.547	.490	.284	.535	.405	.516	.518				
32	.580	.574	.539	.362	.458	.491	.588	.637	.516	.375	.695	.526	.615	.631				
33	.517	.538	.524	.598	.556	.669	.612	.514	.662	.553	.602	.579	.567	.540				
34	.623	.450	.560	.386	.568	.559	.643	.538	.612	.523	.608	.474	.578	.578				
35	.587	.518	.591	.418	.505	.629	.662	.648	.649	.478	.734	.573	.673	.660				
36	.533	.676	.640	.541	.654	.691	.654	.596	.582	.518	.647	.709	.711	.657				
37	.544	.581	.622	.620	.724	.726	.689	.597	.615	.621	.597	.632	.638	.618				
38	.409	.371	.325	.225	.417	.407	.430	.399	.469	.310	.473	.424	.397	.491				
39	.312	.210	.255	.111	.322	.412	.312	.315	.344	.159	.359	.203	.242	.251				
40	.633	.575	.603	.457	.604	.675	.678	.692	.722	.550	.702	.596	.666	.676				
41	.540	.590	.565	.577	.715	.717	.726	.651	.698	.553	.616	.598	.670	.624				
42	.604	.630	.554	.385	.522	.595	.610	.692	.629	.492	.744	.606	.687	.685				
43	.491	.749	.611	.502	.562	.629	.550	.594	.478	.424	.629	.759	.671	.600				
44	.557	.623	.534	.522	.574	.566	.567	.678	.581	.524	.670	.621	.736	.657				
45	.511	.697	.546	.454	.564	.622	.628	.685	.590	.500	.701	.699	.761	.704				
46	.535	.680	.595	.475	.628	.663	.627	.686	.579	.524	.672	.711	.773	.702				
47	.333	.338	.380	.212	.343	.428	.366	.468	.497	.368	.501	.386	.406	.516				
48	.563	.576	.430	.410	.577	.614	.565	.647	.645	.508	.700	.610	.680	.630				
49	.594	.478	.577	.473	.559	.650	.594	.621	.656	.553	.632	.576	.609	.603				
50	.467	.334	.401	.226	.368	.449	.488	.395	.456	.227	.464	.364	.368	.445				
51	.562	.572	.606	.550	.650	.677	.581	.628	.531	.537	.623	.653	.604	.564				
52	.451	.344	.361	.261	.420	.503	.457	.414	.442	.387	.466	.370	.400	.386				
53	.561	.473	.574	.447	.578	.598	.572	.504	.585	.516	.478	.549	.520	.470				
54	.454	.205	.297	.393	.371	.321	.330	.303	.461	.364	.315	.258	.322	.322				
55	.651	.672	.624	.571	.668	.713	.701	.673	.646	.603	.715	.665	.775	.691				
M	1.81	1.78	1.56	1.36	1.45	1.33	1.55	1.82	1.66	1.57	1.89	1.61	1.87	1.82				
SD	.69	.77	.62	.60	.58	.51	.64	.65	.64	.68	.72	.71	.74	.75				
Sk	.28	.39	.67	1.41	.87	1.15	.76	.19	.44	.79	.17	.71	.21	.30				
K	-.90	-1.22	-.52	.94	-.23	.20	-.46	-.67	-.69	-.52	-1.05	-.72	-1.14	-1.15				

(Table 4 continues)

(Table 4 continued)

LTLS Item	Learning-to-Learn Scales (LTLS) Item																												
	29	30	31	32	33	34	35	36	37	38	39	40	41	42	29	30	31	32	33	34	35	36	37	38	39	40	41	42	
1	.378	.520	.382	.441	.420	.396	.433	.500	.467	.257	.237	.422	.506	.440	.378	.520	.382	.441	.420	.396	.433	.500	.467	.257	.237	.422	.506	.440	
2	.375	.481	.398	.418	.358	.419	.418	.485	.441	.267	.225	.430	.539	.475	.375	.481	.398	.418	.358	.419	.418	.485	.441	.267	.225	.430	.539	.475	
3	.497	.542	.442	.524	.422	.394	.504	.537	.536	.348	.287	.501	.560	.542	.497	.542	.442	.524	.422	.394	.504	.537	.536	.348	.287	.501	.560	.542	
4	.579	.621	.356	.443	.424	.331	.474	.569	.537	.271	.186	.460	.553	.504	.579	.621	.356	.443	.424	.331	.474	.569	.537	.271	.186	.460	.553	.504	
5	.493	.554	.310	.459	.431	.478	.521	.555	.584	.317	.214	.523	.510	.563	.493	.554	.310	.459	.431	.478	.521	.555	.584	.317	.214	.523	.510	.563	
6	.347	.466	.298	.345	.466	.393	.460	.486	.522	.207	.208	.368	.511	.409	.347	.466	.298	.345	.466	.393	.460	.486	.522	.207	.208	.368	.511	.409	
7	.449	.596	.404	.476	.509	.380	.458	.533	.594	.276	.181	.469	.507	.478	.449	.596	.404	.476	.509	.380	.458	.533	.594	.276	.181	.469	.507	.478	
8	.100	.222	.253	.314	.317	.338	.265	.198	.228	.457	.220	.310	.293	.229	.100	.222	.253	.314	.317	.338	.265	.198	.228	.457	.220	.310	.293	.229	
9	.484	.532	.351	.382	.461	.315	.435	.543	.545	.225	.151	.390	.533	.463	.484	.532	.351	.382	.461	.315	.435	.543	.545	.225	.151	.390	.533	.463	
10	.458	.577	.439	.520	.415	.429	.455	.538	.507	.385	.216	.514	.556	.485	.458	.577	.439	.520	.415	.429	.455	.538	.507	.385	.216	.514	.556	.485	
11	.468	.452	.538	.505	.397	.442	.464	.480	.372	.370	.237	.466	.456	.536	.468	.452	.538	.505	.397	.442	.464	.480	.372	.370	.237	.466	.456	.536	
12	.288	.356	.456	.426	.254	.551	.457	.396	.339	.361	.271	.493	.388	.395	.288	.356	.456	.426	.254	.551	.457	.396	.339	.361	.271	.493	.388	.395	
13	.399	.500	.445	.531	.518	.530	.507	.473	.454	.412	.259	.514	.543	.464	.399	.500	.445	.531	.518	.530	.507	.473	.454	.412	.259	.514	.543	.464	
14	.513	.593	.456	.574	.450	.497	.565	.585	.488	.371	.298	.568	.576	.593	.513	.593	.456	.574	.450	.497	.565	.585	.488	.371	.298	.568	.576	.593	
15	.421	.458	.357	.497	.416	.504	.475	.454	.443	.325	.245	.513	.446	.510	.421	.458	.357	.497	.416	.504	.475	.454	.443	.325	.245	.513	.446	.510	
16	.761	.648	.374	.520	.470	.381	.452	.632	.512	.310	.171	.492	.528	.566	.761	.648	.374	.520	.470	.381	.452	.632	.512	.310	.171	.492	.528	.566	
17	.437	.608	.352	.485	.453	.489	.520	.602	.554	.270	.210	.520	.499	.499	.437	.608	.352	.485	.453	.489	.520	.602	.554	.270	.210	.520	.499	.499	
18	.309	.481	.197	.295	.487	.309	.333	.455	.505	.165	.082	.361	.485	.304	.309	.481	.197	.295	.487	.309	.333	.455	.505	.165	.082	.361	.485	.304	
19	.453	.594	.346	.390	.463	.469	.416	.587	.639	.330	.248	.501	.632	.444	.453	.594	.346	.390	.463	.469	.416	.587	.639	.330	.248	.501	.632	.444	
20	.420	.586	.388	.373	.523	.411	.466	.556	.576	.301	.287	.510	.577	.466	.420	.586	.388	.373	.523	.411	.466	.556	.576	.301	.287	.510	.577	.466	
21	.478	.598	.416	.506	.524	.545	.560	.585	.607	.346	.246	.575	.649	.529	.478	.598	.416	.506	.524	.545	.560	.585	.607	.346	.246	.575	.649	.529	
22	.593	.612	.499	.602	.445	.464	.578	.553	.518	.343	.268	.616	.579	.646	.593	.612	.499	.602	.445	.464	.578	.553	.518	.343	.268	.616	.579	.646	
23	.402	.465	.391	.438	.540	.489	.518	.490	.500	.367	.264	.585	.582	.523	.402	.465	.391	.438	.540	.489	.518	.490	.500	.367	.264	.585	.582	.523	
24	.391	.482	.240	.334	.479	.457	.406	.464	.541	.257	.133	.463	.487	.430	.391	.482	.240	.334	.479	.457	.406	.464	.541	.257	.133	.463	.487	.430	
25	.594	.573	.444	.613	.487	.492	.616	.563	.493	.377	.283	.575	.509	.645	.594	.573	.444	.613	.487	.492	.616	.563	.493	.377	.283	.575	.509	.645	
26	.648	.705	.338	.461	.487	.384	.484	.642	.539	.340	.158	.492	.515	.520	.648	.705	.338	.461	.487	.384	.484	.642	.539	.340	.158	.492	.515	.520	
27	.599	.666	.453	.573	.489	.498	.594	.665	.557	.334	.199	.576	.601	.632	.599	.666	.453	.573	.489	.498	.594	.665	.557	.334	.199	.576	.601	.632	
28	.612	.640	.455	.591	.468	.503	.585	.617	.550	.420	.209	.591	.557	.631	.612	.640	.455	.591	.468	.503	.585	.617	.550	.420	.209	.591	.557	.631	
29	-	.673	.376	.480	.452	.422	.509	.609	.523	.319	.133	.482	.547	.593	-	.673	.376	.480	.452	.422	.509	.609	.523	.319	.133	.482	.547	.593	

(Table 4 continues)

(Table 4 continued)

LTLS Item	Learning-to-Learn Scales (LTLS) Item													
	29	30	31	32	33	34	35	36	37	38	39	40	41	42
30	.694	—	.388	.564	.540	.512	.617	.698	.670	.297	.192	.581	.619	.588
31	.418	.450	—	.579	.364	.443	.443	.435	.399	.436	.400	.528	.489	.529
32	.507	.614	.633	—	.464	.540	.641	.530	.471	.439	.310	.595	.539	.636
33	.510	.611	.440	.544	—	.468	.543	.538	.600	.348	.212	.504	.549	.460
34	.483	.591	.539	.637	.572	—	.621	.523	.488	.421	.322	.603	.561	.566
35	.565	.690	.530	.718	.657	.752	—	.592	.529	.370	.275	.598	.578	.575
36	.648	.735	.503	.584	.618	.613	.683	—	.644	.342	.221	.546	.629	.558
37	.587	.731	.483	.544	.692	.595	.641	.716	—	.343	.278	.526	.645	.504
38	.371	.358	.522	.510	.444	.530	.457	.414	.431	—	.287	.411	.363	.425
39	.158	.232	.490	.372	.280	.413	.348	.278	.362	.363	—	.428	.258	.329
40	.545	.673	.634	.683	.623	.738	.728	.640	.644	.514	.538	—	.606	.638
41	.597	.682	.582	.618	.644	.666	.693	.701	.737	.449	.327	.721	—	.607
42	.631	.648	.605	.695	.554	.670	.667	.628	.591	.513	.400	.744	.695	—
43	.685	.720	.446	.571	.647	.528	.576	.719	.653	.444	.289	.601	.585	.586
44	.656	.671	.517	.613	.571	.584	.648	.663	.563	.394	.254	.705	.674	.697
45	.687	.734	.582	.622	.576	.539	.647	.738	.636	.411	.283	.707	.684	.744
46	.667	.781	.577	.640	.576	.611	.709	.725	.636	.422	.274	.685	.699	.676
47	.364	.381	.566	.540	.387	.431	.468	.396	.426	.587	.415	.522	.428	.577
48	.578	.607	.591	.617	.600	.558	.670	.665	.577	.490	.317	.704	.650	.673
49	.505	.637	.494	.656	.675	.667	.764	.602	.612	.366	.392	.695	.694	.670
50	.235	.417	.510	.553	.333	.591	.540	.427	.423	.393	.479	.606	.481	.430
51	.575	.663	.510	.585	.592	.544	.599	.681	.688	.390	.350	.640	.645	.646
52	.321	.407	.476	.510	.417	.558	.461	.424	.428	.344	.595	.589	.477	.548
53	.424	.560	.456	.504	.570	.553	.553	.571	.605	.470	.305	.664	.692	.556
54	.195	.333	.374	.381	.413	.430	.451	.302	.343	.269	.239	.476	.475	.368
55	.622	.767	.546	.647	.647	.615	.702	.724	.726	.484	.329	.726	.721	.726
<i>M</i>	1.96	1.70	2.09	2.15	1.49	1.68	1.97	1.68	1.49	1.89	1.77	1.73	1.64	1.93
<i>SD</i>	.80	.73	.74	.73	.58	.72	.78	.68	.56	.75	.65	.66	.69	.75
<i>Sk</i>	.06	.55	-.14	-.24	.70	.55	.04	.50	.61	.18	.26	.35	.63	.12
<i>K</i>	-1.44	-.98	-1.18	-1.09	-.50	-.90	-1.33	-.79	-.68	-1.20	-.70	-.74	-.75	-1.21

(Table 4 continues)

(Table 4 continued)

LTLS Item	Learning-to-Learn Scales (LTLS) Item													
	43	44	45	46	47	48	49	50	51	52	53	54	55	
1	.415	.435	.494	.482	.228	.386	.455	.363	.465	.332	.337	.196	.483	
2	.420	.408	.459	.500	.286	.411	.418	.298	.415	.284	.356	.184	.464	
3	.499	.504	.572	.539	.368	.447	.441	.355	.511	.277	.418	.133	.535	
4	.503	.540	.626	.575	.241	.441	.419	.261	.549	.253	.404	.142	.517	
5	.423	.508	.473	.497	.397	.441	.495	.314	.551	.349	.435	.269	.549	
6	.374	.356	.403	.458	.301	.356	.481	.268	.421	.208	.380	.217	.447	
7	.454	.507	.520	.520	.359	.415	.480	.249	.557	.288	.421	.341	.578	
8	.194	.171	.134	.211	.341	.247	.268	.240	.193	.238	.312	.296	.284	
9	.459	.487	.503	.482	.253	.365	.453	.190	.471	.242	.383	.180	.549	
10	.494	.485	.528	.656	.367	.466	.448	.323	.493	.294	.461	.230	.527	
11	.381	.547	.541	.547	.375	.497	.420	.324	.419	.384	.340	.232	.498	
12	.295	.422	.351	.441	.314	.394	.388	.573	.362	.364	.362	.253	.377	
13	.397	.464	.519	.520	.357	.449	.471	.358	.417	.312	.444	.334	.471	
14	.477	.648	.581	.607	.386	.502	.517	.431	.560	.389	.446	.283	.605	
15	.403	.492	.437	.456	.264	.454	.497	.397	.487	.374	.445	.359	.534	
16	.697	.589	.652	.639	.285	.494	.421	.296	.523	.294	.393	.170	.590	
17	.558	.505	.503	.551	.322	.365	.520	.363	.565	.309	.493	.251	.543	
18	.415	.449	.377	.397	.159	.319	.377	.188	.458	.201	.348	.304	.458	
19	.482	.515	.491	.549	.268	.463	.471	.317	.581	.341	.473	.301	.562	
20	.497	.449	.481	.529	.306	.443	.501	.359	.538	.376	.441	.237	.536	
21	.472	.516	.558	.558	.291	.462	.513	.434	.514	.379	.470	.268	.601	
22	.520	.671	.647	.655	.406	.577	.562	.363	.592	.372	.428	.261	.604	
23	.380	.504	.494	.486	.397	.522	.547	.380	.446	.360	.461	.363	.522	
24	.365	.480	.439	.464	.303	.423	.493	.202	.484	.336	.427	.310	.517	
25	.524	.604	.616	.590	.403	.579	.530	.392	.537	.388	.375	.246	.593	
26	.701	.569	.619	.631	.309	.498	.495	.308	.580	.303	.452	.196	.557	
27	.598	.713	.725	.737	.347	.598	.543	.334	.558	.349	.434	.265	.701	
28	.537	.630	.662	.659	.442	.548	.541	.403	.517	.337	.397	.270	.618	
29	.622	.647	.665	.640	.317	.514	.460	.212	.533	.288	.361	.163	.561	

(Table 4 continues)



(Table 4 continued)

LTLS Item	Learning-to-Learn Scales (LTLS) Item														
	43	44	45	46	47	48	49	50	51	52	53	54	55		
30	.669	.640	.686	.744	.313	.522	.572	.377	.613	.352	.476	.281	.689		
31	.365	.471	.519	.508	.482	.502	.420	.441	.441	.409	.357	.299	.456		
32	.494	.583	.580	.595	.471	.542	.582	.495	.533	.455	.415	.312	.568		
33	.562	.507	.501	.496	.307	.486	.581	.273	.510	.343	.456	.326	.534		
34	.427	.508	.454	.520	.338	.439	.566	.523	.460	.460	.436	.339	.499		
35	.469	.584	.569	.624	.377	.552	.661	.466	.514	.386	.432	.348	.583		
36	.656	.625	.680	.676	.331	.573	.533	.379	.626	.363	.478	.249	.631		
37	.558	.498	.553	.549	.339	.466	.522	.363	.606	.352	.484	.273	.605		
38	.358	.338	.346	.355	.482	.391	.295	.329	.326	.283	.371	.214	.389		
39	.222	.215	.236	.226	.326	.248	.315	.402	.287	.496	.232	.187	.256		
40	.492	.627	.609	.594	.422	.580	.592	.524	.549	.489	.528	.377	.597		
41	.497	.614	.606	.624	.340	.535	.612	.429	.569	.396	.580	.389	.608		
42	.499	.653	.684	.610	.489	.571	.587	.374	.577	.475	.451	.301	.630		
43	—	.561	.594	.594	.318	.481	.421	.360	.515	.357	.401	.175	.532		
44	.628	—	.770	.674	.385	.630	.558	.394	.640	.462	.455	.336	.666		
45	.672	.779	—	.741	.381	.645	.530	.348	.613	.432	.433	.219	.640		
46	.674	.706	.785	—	.334	.637	.565	.385	.607	.392	.448	.277	.696		
47	.394	.441	.446	.398	—	.429	.405	.387	.322	.386	.364	.267	.372		
48	.585	.702	.736	.729	.534	—	.491	.379	.507	.431	.417	.312	.531		
49	.502	.610	.600	.639	.497	.596	—	.423	.567	.401	.507	.453	.605		
50	.423	.426	.389	.430	.456	.451	.477	—	.396	.438	.391	.268	.399		
51	.591	.679	.673	.658	.386	.597	.636	.437	—	.439	.490	.323	.619		
52	.433	.508	.493	.450	.461	.516	.474	.497	.505	—	.399	.321	.404		
53	.500	.529	.524	.541	.465	.536	.610	.462	.584	.495	—	.393	.489		
54	.232	.394	.267	.337	.336	.394	.544	.316	.388	.398	.498	—	.400		
55	.638	.736	.725	.784	.463	.644	.709	.462	.707	.485	.613	.501	—		
M	1.54	1.95	2.01	1.86	1.98	1.87	1.69	1.60	1.75	1.91	1.58	1.65	1.82		
SD	.66	.73	.77	.73	.77	.67	.69	.67	.69	.67	.66	.67	.71		
Sk	.82	.07	-.02	.22	.04	.16	.50	.68	.38	.10	.71	.54	.26		
K	-.42	-1.09	-1.31	-1.09	-1.29	-.80	-.83	-.63	-.88	-.75	-.55	-.72	-.97		

Note. Sk = Skewness, K = Kurtosis. Mardia's normalized multivariate kurtosis estimate = 37.73.

Table 5  
Sources of Variance in the Learning-to-Learn Scales for an Elementary and Secondary School Sample (N = 313) According to the Schmid-Leiman Bifactor Model (Orthogonalized Higher-Order Factor Model) with Five First-Order Factors

LTLS Item	General		F1		F2		F3		F4		F5		h <sup>2</sup>	u <sup>2</sup>
	b	S <sup>2</sup>	b	S <sup>2</sup>	b	S <sup>2</sup>	b	S <sup>2</sup>	b	S <sup>2</sup>	b	S <sup>2</sup>		
1	.621	.386	.052	.003	<b>.359</b>	<b>.129</b>	.241	.058	-.104	.011	-.082	.007	.593	.407
2	.636	.404	.032	.001	<b>.426</b>	<b>.181</b>	.122	.015	-.111	.012	.094	.009	.623	.377
3	.664	.441	.176	.031	<b>.308</b>	<b>.095</b>	.042	.002	-.147	.022	.122	.015	.605	.395
4	.672	.452	<b>.307</b>	<b>.094</b>	.295	.087	-.082	.007	-.089	.008	-.051	.003	.650	.350
5	.748	.560	<b>.194</b>	<b>.038</b>	.079	.006	-.029	.001	.202	.041	.040	.002	.647	.353
6	.612	.375	.028	.001	<b>.343</b>	<b>.118</b>	-.069	.005	.134	.018	.104	.011	.527	.473
7	.684	.468	.056	.003	<b>.295</b>	<b>.087</b>	-.098	.010	.231	.053	.079	.006	.627	.373
8	.469	.220	-.181	.033	.110	.012	-.013	.000	.141	.020	<b>.615</b>	<b>.378</b>	.663	.337
9	.639	.408	.141	.020	<b>.380</b>	<b>.144</b>	-.186	.035	.076	.006	.098	.010	.623	.377
10	.672	.452	.118	.014	<b>.314</b>	<b>.099</b>	.035	.001	-.086	.007	.175	.031	.603	.397
11	.702	.493	<b>.273</b>	<b>.075</b>	-.047	.002	.073	.005	-.030	.001	.158	.025	.601	.399
12	.609	.371	.067	.004	-.064	.004	<b>.391</b>	<b>.153</b>	.002	.000	.004	.000	.532	.468
13	.723	.523	.057	.003	.153	.023	-.010	.000	.096	.009	<b>.365</b>	<b>.133</b>	.692	.308
14	.773	.598	<b>.257</b>	<b>.066</b>	.056	.003	.095	.009	.023	.001	.031	.001	.677	.323
15	.686	.471	.085	.007	-.027	.001	.149	.022	<b>.248</b>	<b>.062</b>	.003	.000	.562	.438
16	.677	.458	<b>.389</b>	<b>.151</b>	.140	.020	-.092	.008	-.076	.006	-.044	.002	.645	.355
17	.672	.452	.126	.016	.185	.034	.043	.002	.163	.027	-.076	.006	.536	.464
18	.554	.307	-.015	.000	<b>.283</b>	<b>.080</b>	-.179	.032	.406	.165	-.033	.001	.585	.415
19	.699	.489	.025	.001	<b>.324</b>	<b>.105</b>	.046	.002	.202	.041	-.050	.003	.640	.360
20	.743	.552	-.026	.001	<b>.469</b>	<b>.220</b>	.150	.023	.059	.003	-.008	.000	.799	.201
21	.737	.543	.061	.004	<b>.304</b>	<b>.092</b>	.144	.021	.082	.007	-.036	.001	.668	.332
22	.743	.552	<b>.313</b>	<b>.098</b>	-.011	.000	.074	.005	.059	.003	-.070	.005	.664	.336
23	.732	.536	.039	.002	.086	.007	.089	.008	<b>.240</b>	<b>.058</b>	.126	.016	.626	.374
24	.617	.381	.069	.005	.052	.003	-.119	.014	<b>.424</b>	<b>.180</b>	.013	.000	.582	.418
25	.794	.630	<b>.349</b>	<b>.122</b>	-.069	.005	.032	.001	.072	.005	.025	.001	.764	.236
26	.696	.484	<b>.324</b>	<b>.105</b>	.196	.038	-.056	.003	-.041	.002	-.051	.003	.635	.365
27	.770	.593	<b>.336</b>	<b>.113</b>	.084	.007	-.019	.000	.030	.001	-.019	.000	.714	.286
28	.759	.576	<b>.350</b>	<b>.123</b>	-.036	.001	-.062	.004	.048	.002	.124	.015	.721	.279
29	.629	.396	<b>.442</b>	<b>.195</b>	.024	.001	-.144	.021	-.039	.002	-.048	.002	.616	.384
30	.761	.579	<b>.249</b>	<b>.062</b>	.244	.060	-.014	.000	.063	.004	-.091	.008	.713	.287

(Table 5 continues)

(Table 5 continued)

LTLS Item	General		F1		F2		F3		F4		F5		$h^2$	$u^2$
	$b$	$S^2$	$b$	$S^2$	$b$	$S^2$	$b$	$S^2$	$b$	$S^2$	$b$	$S^2$		
31	.655	.429	.101	.010	.057	.003	<b>.294</b>	<b>.086</b>	-.135	.018	.184	.034	.581	.419
32	.749	.561	<b>.208</b>	<b>.043</b>	-.033	.001	.188	.035	-.011	.000	.136	.018	.659	.341
33	.704	.496	.051	.003	.200	.040	-.043	.002	<b>.250</b>	<b>.063</b>	.118	.014	.616	.384
34	.751	.564	.022	.000	.019	.000	<b>.308</b>	<b>.095</b>	.160	.026	.052	.003	.688	.312
35	.791	.626	.165	.027	.024	.001	.163	.027	.135	.018	.026	.001	.699	.301
36	.758	.575	<b>.222</b>	<b>.049</b>	.254	.065	.038	.001	.030	.001	-.076	.006	.696	.304
37	.746	.557	.038	.001	<b>.389</b>	<b>.151</b>	.037	.001	.159	.025	-.027	.001	.737	.263
38	.570	.325	.077	.006	-.020	.000	.076	.006	-.047	.002	<b>.447</b>	<b>.200</b>	.539	.461
39	.430	.185	-.136	.018	.112	.013	<b>.477</b>	<b>.228</b>	-.084	.007	.043	.002	.452	.548
40	.832	.692	.111	.012	.023	.001	<b>.292</b>	<b>.085</b>	.126	.016	.013	.000	.806	.194
41	.792	.627	.062	.004	<b>.285</b>	<b>.081</b>	.118	.014	.123	.015	.026	.001	.742	.258
42	.794	.630	<b>.288</b>	<b>.083</b>	-.040	.002	.119	.014	.029	.001	.056	.003	.733	.267
43	.694	.482	<b>.276</b>	<b>.076</b>	.218	.048	.004	.000	-.057	.003	-.039	.002	.610	.390
44	.763	.582	<b>.344</b>	<b>.118</b>	-.079	.006	.046	.002	.131	.017	-.099	.010	.736	.264
45	.772	.596	<b>.390</b>	<b>.152</b>	.073	.005	.024	.001	-.055	.003	-.065	.004	.761	.239
46	.785	.616	<b>.311</b>	<b>.097</b>	.128	.016	.043	.002	-.015	.000	-.028	.001	.732	.268
47	.586	.343	.091	.008	-.080	.006	.122	.015	.009	.000	<b>.352</b>	<b>.124</b>	.497	.503
48	.757	.573	<b>.260</b>	<b>.068</b>	-.040	.002	.095	.009	.057	.003	.075	.006	.660	.340
49	.759	.576	.059	.003	.062	.004	.165	.027	<b>.265</b>	<b>.070</b>	-.017	.000	.681	.319
50	.568	.323	-.054	.003	.049	.002	<b>.525</b>	<b>.276</b>	-.039	.002	-.051	.003	.608	.392
51	.732	.536	.143	.020	.187	.035	.123	.015	.142	.020	-.142	.020	.647	.353
52	.582	.339	-.016	.000	-.013	.000	<b>.421</b>	<b>.177</b>	.084	.007	-.070	.005	.528	.472
53	.683	.466	-.027	.001	.177	.031	.138	.019	.212	.045	.077	.006	.568	.432
54	.483	.233	-.114	.013	-.103	.011	.126	.016	<b>.426</b>	<b>.181</b>	.092	.008	.463	.537
55	.823	.677	<b>.196</b>	<b>.038</b>	.130	.017	.031	.001	.179	.032	-.002	.000	.766	.234
Total $S^2$	.486		.041		.040		.029		.025		.021		.643	.357
Common $S^2$	.757		.064		.062		.046		.038		.033			
$\omega_H/\omega_{HS}$	.939		.136		.195		.245		.177		.303			

Note. LTLS = Learning-to-Learn Scales.  $b$  = loading of subtest on factor,  $S^2$  = variance explained,  $h^2$  = communality,  $u^2$  = uniqueness,  $\omega_H$  = Omega-hierarchical,  $\omega_{HS}$  = Omega-hierarchical subscale. Bold type indicates coefficients and variance estimates consistent with the exploratory factor analysis factor assignment.

Table 6  
*Learning-to-Learn Scales (LTLS) Item Exploratory Factor Analysis Promax Rotated (K = 4) Factor Pattern (Structure) Coefficients for an Elementary and Secondary School Sample (N = 313): Four Oblique Factor Solution*

Item number/Abbreviated item content	g	F1	F2	F3	F4	<i>h</i> <sup>2</sup>
3. Develops plan after considering possible consequences (SP)	72	46 (70)	19 (56)	-15 (54)	40 (65)	61
4. Screens out noise and distractions (~)	75	80 (80)	-19 (46)	-03 (59)	27 (62)	70
5. Shows basic understanding of cause and effect (SP)	79	41 (75)	06 (62)	39 (75)	01 (47)	65
11. Given a choice, takes new task rather than familiar one (AN)	72	51 (71)	40 (68)	-12 (55)	03 (39)	57
14. Changes strategies when one solution doesn't work (SP)	81	57 (80)	26 (70)	04 (66)	05 (47)	68
16. Stays focused in individual, self-selected activity > 20 min. (SF)	74	91 (81)	-14 (48)	-08 (56)	11 (51)	68
22. Self-corrects errors on projects or activities (SP)	78	70 (80)	13 (64)	08 (64)	-09 (39)	66
25. Compares new to old tasks as per what worked (SP)	83	71 (84)	20 (70)	07 (68)	-10 (40)	74
26. Stays focused on group activity > 10 min., w/out direction (SF)	77	80 (81)	-12 (51)	01 (61)	15 (55)	68
27. Actively perseveres difficult task with little teacher input (EM)	82	76 (85)	02 (62)	08 (68)	03 (50)	73
28. Develops plan for multi-stage activity (SP)	79	67 (81)	16 (65)	05 (65)	-02 (44)	67
29. Stays focused in individual, self-selected activity > 30 min. (SF)	72	100 (81)	-19 (46)	-07 (54)	-02 (42)	68
30. Works independently at assigned task, minimal supervision (EM)	83	67 (84)	-12 (56)	23 (73)	15 (59)	75
36. Remains attentive when teacher leads group activity (IR)	83	61 (82)	-02 (59)	17 (71)	18 (60)	72
42. Communicates problems have more than one solution (SP)	82	59 (81)	36 (75)	-01 (66)	-04 (42)	72
43. Stays focused in individual, self-selected activity > 10 min. (SF)	76	71 (78)	-03 (53)	-01 (60)	18 (56)	64
44. Keeps trying difficult task when solution not forthcoming (EM)	80	75 (83)	07 (65)	18 (68)	-20 (34)	72
45. Perseveres challenging task even with distractions (EM)	83	90 (88)	04 (62)	-09 (63)	03 (49)	78
46. Practices activity without teacher prompting (EM)	84	74 (86)	09 (65)	01 (67)	09 (54)	75
48. Voluntarily engages activity previously found challenging (EM)	78	52 (76)	34 (71)	05 (64)	-04 (39)	65
51. Learns by accepting constructive feedback (~)	78	44 (75)	04 (60)	34 (73)	05 (49)	63
55. Engages new activity without constant need for approval (EM)	87	47 (83)	09 (69)	38 (81)	04 (54)	78
8. Plays with at least one other child during free play (GL)	46	-54 (28)	63 (56)	27 (47)	31 (40)	45
12. Vocally demonstrates skills and knowledge (AN)	61	15 (54)	69 (72)	-08 (47)	-06 (24)	52
13. Initiates proper activity with another child without direction (GL)	75	03 (64)	42 (70)	22 (68)	28 (57)	62
31. Asks teacher for task to perform or activity to engage in (VE)	67	19 (60)	73 (74)	-28 (47)	19 (43)	61
32. Teaches another child a new task or skill (SP)	76	39 (72)	54 (77)	-09 (59)	02 (40)	66
34. Willingly asks questions and shares ideas (VE)	76	05 (65)	60 (80)	26 (70)	-01 (38)	68
38. Identifies alternative uses for an object (~)	57	-01 (47)	67 (65)	-13 (43)	19 (37)	45
39. Verbalizes frustration with task and asks teacher for help (VE)	42	-21 (31)	77 (59)	-14 (32)	17 (27)	38
40. Seeks answers by engaging materials, children, and adults (VE)	85	26 (77)	54 (85)	20 (75)	-02 (43)	79
47. Verbalizes possible consequences of act or event (SP)	58	03 (49)	67 (67)	-07 (46)	08 (32)	46
50. Verbalizes pride in accomplishments by showing to others (VE)	56	-02 (47)	76 (70)	-09 (43)	04 (27)	50
52. Verbalizes frustration on task but continues working (EM)	58	03 (49)	61 (67)	10 (50)	-07 (23)	46

(Table 6 continues)

(Table 6 continued)

Item number/Abbreviated item content	<i>g</i>	F1	F2	F3	F4	<i>h</i> <sup>2</sup>
6. Takes turns in small group without reminder (IR)	67	13 (59)	-04 (46)	<b>41 (66)</b>	F4 (62)	54
7. Shows acceptance of peer advice by following it (IR)	74	17 (67)	-09 (51)	<b>56 (76)</b>	25 (61)	65
15. Shows a sense of humor about his or her own errors (~)	70	17 (63)	31 (66)	<b>41 (69)</b>	-12 (31)	56
18. Refrains from acting out aggressively when frustrated (IR)	61	05 (53)	-37 (33)	<b>91 (75)</b>	12 (49)	64
19. Responds positively to suggestions for alternative approach (IR)	76	19 (68)	-03 (55)	<b>52 (77)</b>	22 (59)	65
23. Willingly participates in unfamiliar group activities (AN)	76	05 (65)	33 (69)	45 (75)	06 (46)	63
24. Responds to questions about ideas without becoming upset (IR)	65	12 (51)	-13 (47)	<b>80 (75)</b>	-09 (36)	58
33. Works cooperatively with another child or small group (GL)	75	12 (66)	07 (58)	<b>55 (76)</b>	16 (54)	62
37. Shows acceptance of teacher advice by following it (IR)	82	23 (74)	-03 (58)	<b>48 (80)</b>	31 (68)	74
49. Helps, shares, discusses with peers in a group (GL)	79	15 (70)	29 (71)	49 (78)	-04 (41)	67
53. Responds positively to assistance (IR)	71	-03 (60)	30 (65)	<b>45 (71)</b>	14 (41)	57
54. Willingly guesses, even when unsure if response is correct (VE)	47	-35 (33)	36 (53)	71 (59)	-20 (13)	47
2. Attempts a task after previous attempts unsuccessful (EM and AN)	70	21 (63)	23 (55)	-02 (56)	<b>50 (69)</b>	59
10. Self-selects activity without direction (~)	73	31 (67)	24 (59)	-03 (58)	41 (65)	60
20. Participates in lesson introduced by teacher (AN)	81	14 (72)	14 (62)	32 (75)	43 (73)	74
1. Perseveres difficult task with teacher encouragement (EM)	68	32 (63)	23 (55)	-03 (54)	31 (57)	50
9. Listens and waits for turn in group activity (IR)	72	39 (68)	-22 (42)	33 (67)	38 (68)	65
17. Attentive when spoken to directly by teacher (~)	72	37 (69)	-01 (54)	38 (69)	08 (48)	54
21. Acts positive and confident in new task or activity (AN)	79	27 (73)	16 (63)	28 (72)	25 (60)	65
35. Others depend on this child's directions during activity (~)	82	36 (76)	36 (75)	22 (73)	-02 (43)	70
41. Maintains positive attitude toward new/unfamiliar activities (AN)	85	23 (76)	20 (69)	34 (79)	25 (63)	74
Eigenvalue		30.26	2.77	1.95	1.34	
% Variance		55.03	5.03	3.55	2.44	
<i>r</i> <sub>α</sub>		.97	.89	.90	.76	

Note. SP = Strategic Planning, EM = Effectiveness Motivation, IR = Interpersonal Responsiveness in Learning, VE = Vocal Engagement, SF = Sustained Focus in Learning, AN = Acceptance of Novelty and Risk, GL = Group Learning, ~ = No original L.TLS assignment, *h*<sup>2</sup> = Communality. General structure coefficients are based on the first unrotated factor coefficients (*g* loadings). Salient factor pattern coefficients ( $\geq .40$ ) are presented in bold.