

*Minnesota Teacher License Examinations
Data Correlates: Basic Skills*

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Examinations Data Correlates:
Basic Skills***

Background

As candidates have tackled the new *Minnesota Teachers Licensure Examinations*, some concerns have been expressed about passing rates in the Education Unit at St. Cloud State. Members of several of the TPI working groups have requested correlational and predictive studies that might identify factors indicating success of candidates on the examinations. Primarily, members of the Recruitment and

Preparation work groups requested this information.

Method

Accordingly, we developed a data-base for the first 179 instances of MTLE *Basic Skills* results for students in SCSU's education unit. We entered MTLE scores along with other candidate variables available on most individuals having taken the examination. Table 1 represents a prospectus on the variables available in the data set. Please note that, as candidates in future semesters take the *Basic Skills* examinations, this data set can be adjusted for added scores.

Table 1. A prospective of available variables.

<u>Measure Name</u>	<u>Explanation</u>	<u>N</u>	<u>Mean</u>	<u>SD</u>
Reading	MTLE Reading score/ Note that passing score = 240	179	239.76	26.80
Writing	MTLE Writing score/ Note that passing score = 240	157	234.80	24.49
Math	MTLE Mathematics score/ Passing score = 240	149	246.13	31.05
HS_Rank	High school class rank expressed as a percentage (e.g. higher = closer to top of H.S. rankings),	150	59.52	20.85
ENGL_191	Grade points (0 = F to 4 = A) on English 191, a course taken by most students at SCSU as a university Liberal Education requirement	85	3.33	.65
CMST_192	Grade points on Communication Studies 192, a course taken as a Liberal Education requirement by most students at SCSU	112	3.11	.62
MATH_193	Grade points on Math 193, a course taken as a Liberal Education requirement by most students at SCSU	94	2.35	.75
PHIL_194	Grade points on Philosophy 194, a course taken as a Liberal Education requirement by most students at SCSU	144	2.72	.89
GPA	Total grade point average at SCSU at the time that the MTLE was taken	226	3.20	.44
Intro_ED	Grade points on one of the four Introduction to Education courses required at SCSU (ED 200, SPED 200, CFS 200, or ED 300)	181	3.63	.60
ACT_Comp	American College Test: Comprehensive Score	151	20.42	3.42
ACT_Engl	American College Test: English/ Written Language	143	19.34	4.43
ACT_Math	American College Test: Mathematics	143	20.58	4.11
ACT_Sci	American College Test: Science	143	20.99	3.20
ACT_Rdng	American College Test: Reading	143	20.62	4.52

We calculated Pearson-product-moment correlations between classes of variables, presented in tables (see below). These Pearsonian correlations reflect the degree to which pairs of variables (i.e., bivariate approach) linearly covary. The probability test reflects the degree to which the correlation observed is likely to occur, given a matrix wherein the actual correlation is zero. Lower alpha (probability) ratings suggest that the sample was less likely to be taken from one with a correlation wherein $r_{xy} = 0$, thus suggesting that r_{xy} does not = 0 [in the sample].

Next, adjusting for excessive colinearity, regression equations were run predicting each of the MTLE area scores. When correlations above .70 were noted, only one of the variables per set was included in the prediction equation.

Minnesota Teacher Licensure Examinations and High School Class Rank

Table 2 shows the correlations between each of the three *MTLE* subtests and class rank. We also tabled probability alphas.

Table 2. Pearson correlations between MTLE tests and class rankings.

MTLE sub test	r_{xy}	P
<i>MTLE Reading</i>	.33	<.001
<i>MTLE Writing</i>	.46	<.001
<i>MTLE Mathematics</i>	.47	<.001

Given the sample size, class rank correlates moderately and significantly with *MTLE Reading (MTLER)*, *MTLE Mathematics (MTLEM)*, and *MTLE Writing (MTLEW)*. The three *MTLE* tests are, themselves inter-correlated in the sample, *Reading X Writing* = .66, $p < .001$, *Reading X Mathematics* = .53, $p < .001$, and *Writing X Mathematics* = .59, $p < .001$. Clearly, scores on the three instruments also significantly covary. Later, we will discuss that this finding is suggestive of the existence of a *g* factor (intelligence and/or a test-taking construct).

MTLE Related to SCSU Coursework

Table 3 shows the degree of linear relationship between *MTLE Reading* and the four courses typically required at SCSU as university requirements, included as part of the Liberal Education sequence. Data for *MTLE Writing* is shown in Table 4, while correlations between required courses and GPA and *MTLE Mathematics* are shown in Table 5.

Table 3. Correlations between SCSU required courses and GPA with *MTLE Reading*.

SCSU Requirement	r_{xy}	p
English 191	.08	.56
Communication Studies 192	.37	<.001
Mathematics 193	.12	.19
Philosophy 194	.13	.19
Grade point average	.23	.003
Intro to Education	.10	.26

Clearly, the grades on SCSU courses could not be employed to select majors who would differentially pass the *MTLE* Basic Skills examinations. As can be seen from Table 1, the lack of predictive power probably stems largely from restrict range problems generated by ceiling effects for grades. Especially note that this is the case for the Intro to Education courses. Math 193 and

PHIL 194, on the other hand, shows more normal grade distributions, but still is not related (not a surprise) to the reading test. It could be argued that significant correlations suggest that the courses in question should be taken prior to the MTLE, though, of course, these correlations cannot be employed to explain causation.

Table 4. Correlations between SCSU required courses and GPA with *MTLE Writing*.

SCSU Requirement	r_{xy}	p
English 191	-.06	.68
Communication Studies 192	.27	.02
Mathematics 193	.17	.20
Philosophy 194	.22	.04
Grade Point Average	.31	< .001
Intro to Education	.36	< .001

Only weak correlations exist between any of the SCSU requirements and MTLE Writing outcomes. Once more, ceiling effects probably reduced the ability of any of these variables to predict *MTLEW* values (ceiling effects artificially reduce variability and thus the ability of one variable to relate to another). Only CMST 192, PHIL 194,

overall GPA, and grades in the intro to education course appear related to the basic skills writing metric. Some critics might argue that the lack of relationship between ENG 191 and *MTLE Writing* sets off alarm bells. Certainly, no support exists in these data for the hypothesis that ENG 191 helps prepare candidates for *MTLE Writing*.

Table 5. Correlations between SCSU required courses and GPA with *MTLE Mathematics*.

SCSU Requirement	r_{xy}	p
English 191	.01	.95
Communication Studies 192	.30	.014
Mathematics 193	.53	< .001
Philosophy 194	.51	< .001
Grade Point Average	.28	.001
Intro to Education	.34	< .001

Mathematics 193 and PHIL 194 both correlated strongly with *MTLE Mathematics*. While the correlation between the two mathematics indicators is not surprising, the philosophy course also appears to tap analytical skills (probably

related to logic) that cross over into the quantitative domain (see course description below, emphasis added):

Reasoning about human values, human knowledge

and our place in the scheme of things. Conceptual analysis, identifying and *analyzing arguments*, and recognizing fallacious reasoning.

Despite a significant correlation, due to the large sample, the covariance between CMST 192 and *MTLEM* only explains 25% of reliable variance. To a degree the MATH

193-*MTEL* and PHIL 194-*MTLE* correlations may also result from a more normal grade distribution in these two courses (see Table 1).

MTLE Related to ACT Scores

Tables 6-8 include MTLE-ACT correlations. As one can see, they are all significant.

Table 6. Pearson correlations between *MTLE Reading* and ACT subtests and composite scores.

MTLE sub test	r_{xy}	p
ACT Composite	.66	< .001
ACT English	.67	< .001
ACT Mathematics	.52	< .001
ACT_Science	.53	< .001
ACT Reading	.63	< .001

Table 7. Pearson correlations between *MTLE Writing* and ACT subtests and composite scores.

MTLE sub test	r_{xy}	p
ACT Composite	.63	< .001
ACT English	.67	< .001
ACT Mathematics	.49	< .001
ACT_Science	.44	< .001
ACT Reading	.54	< .001

Table 8. Pearson correlations between *MTLE Mathematics* and ACT subtests and scores.

MTLE sub test	r_{xy}	p
ACT Composite	.68	< .001
ACT English	.57	< .001
ACT Mathematics	.79	<.001
ACT_Science	.57	< .001
ACT Reading	.36	.001

The ACT scores correlate significantly, in the expected direction, with the *MTLE* indicators. Unfortunately, the ACT scores are also highly intercorrelated, averaging Pearsonian coefficients of about .6 (in the

present sample). Thus, colinearity probably suggests that the ACT Composite would be the best indicator to employ in constructing prediction equations, with perhaps the

exception of ACT Math as a predictor of *MTELM*.

Correlations between MTLE Scores and Course Status

On the chance that *MTLE* scores differ by course selection, biserial correlations were calculated between *MTLE* values and a dummy-coded status value for the introductory courses. The dummy variable was calculated by defining any grade value as “1” and lack of a grade value as “0.” This

process resulted in the creation of four variables, reflecting attendance (vs. non-enrollment) in SPED 200, ED 200, (i.e., elementary majors), CFS 200 and ED 300 (indicating secondary and K-12 majors).

Mathematically, this process is similar to calculating one-Way ANOVAs, wherein we could treat COURSE as an IV and *MTLE* values as DVs (or a multivariate DV could be calculated via MANOVA methods). Results are shown in Table 9.

Table 9. Biserial correlations between “majors” and *MTLE* scores.

MTLE Basic Skills Subtest	Elementary	Special Education	Early Childhood	Secondary
Reading	-.12	-.08	-.06	.14
Writing	-.12	-.08	.03	.09
Mathematics	.16	-.10	.04	.05

None of the biserial correlations proved either significant or likely to serve usefully as predictors. No differences in *MTLE* scores existed as a function of the field in which the candidate expressed interest (via enrolling in, completing, and receiving a grade in an introductory course). A slight tendency exists for secondary education majors to score higher on basic skills tests than do their special education and elementary (K-6, *MTELR* and *MTLEW* only) counterparts, though the effects are quite small.

Predicting MTLE Values

MTLE Reading. Based on the preliminary analyses shown above, we initially entered four variables into a regression equation for predicting *MTLE Reading* values. We discovered that the strongest prediction model included only **GPA**, **CMST 192** grade points, and the **ACT Composite**. The ACT Composite was selected over any of the subtests due to multi-collinearity with the other ACT values, though it is understood

that it primarily functions as a stand-in for the Reading and English subtests.

Together, ACT Composite, GPA, and CMST 192 significantly predicted *MTLE Reading* ($F_{2df} = 25.42, p < .001, R^2 = .53$ (.51 adjusted). This means that with the three variables in question about half of the *MTLR* variance can be predicted, though ACT composite performs the majority of the predictive work. Not enough data exists to set a stable cutoff score for admission, but, as further data cumulate, the current results suggest that it will be possible to select a defensible criterion.

MTLE Writing. The **ACT Composite**, **GPA**, High School **Class Rank**, and **MATH 193** grade points appeared to be the best variables for predicting *MTLEW*. The model proved significant, though minimally weaker than that for *MTELR*. ($F_{2df} = 28.44, p < .001$), with a model R^2 of .50 (.48 adjusted). Once more, ACT Composite proved to be the strongest predictor.

MTLE Mathematics. Initially, we included four variables in the model, ACT Mathematics, Class Rank, MATH 193 and PHIL 194; together, these variables produced only a modest solution. The strongest prediction equation was produced by combining **MATH 193, ACT Composite,** and **PHIL 194** ($F_{2df} = 11.36, p < .001$). The model was quite strong, with an R^2 of .69 (.63 adjusted). MATH 193, the ACT Composite, and PHIL 194 each added significant variability to the equation. Due to the magnitude of the effect, it may be possible to set entry standards that predict *MTLEM*.

Executive Summary

1. Our current entry requirements (e.g., GPA and GPA in certain courses) do not optimally predict candidates' ability to pass the *MTLE* Basic Skills series examinations, though the university requirements proved significant; unfortunately, these effect sizes proved small.
2. The best bet for selecting students that can and will pass examinations, unless we adopt other, predictive, universal entrance requirements, is the ACT Composite, with the assistance of Scores on MATH 193 (and in future probably MATH 201) and possibly PHIL 194.
3. Based on these data, a weighted combination of variables could be developed that would predict (within a range of measurement and sampling error) passing scores on the *MTLE* Basic Skill Tests. Students that fell below a certain confidence level on the indicators could either be counseled out from the education sequence or referred to a remedial basic skills program.
4. We could elect to set passage of *MTLE* Basic Skills as a criterion for entry into the professional education sequence. This would certainly obviate the need to select teacher candidates on the basis that they would likely pass the tests. This remains a difficult decision because of SCSU's access mission.
5. The strong inter-correlation of *MTLE* basic skills tests with the ACT Composite suggests that what we are most likely observing in this study is Spearman's ubiquitous *g* factor—typically thought of as being made up of general cognitive ability (or the vector generated by the correlation of all measures of information processing--especially those made up of combinatorial elements and higher-order thinking skills); on the one hand, and strategic test-taking performance on the other. This seems a trivial and likely unfair model for selection of educators as it does not account for the nexus between content knowledge, pedagogy; and the ability to connect with children, adolescents, parents, and colleagues. At best it oversimplifies the process of selecting teachers, at worst it discriminates unfairly against potential candidates who attended weaker schools or who experienced other challenging life circumstances before attending SCSU.

6. The best approach to candidate selection would probably be multifaceted, including some testing (and/or use of existing data), samples of writing behavior, and performance-based measures collected during early field experiences.
7. While significant problems may well exist for *MTLEM* (students often cite the online calculator), its extremely high correlation with ACT Mathematics (near .80, $R^2 = .62$) suggests that it is a valid indicator of quantitative skills to the extent that ACT Mathematics taps these constructs.
8. We must remain aware that the relationship between scores on written tests, especially basic skills, and ultimate measures of teaching skill remain highly

equivocal (see Gitomer, Brown, & Bonett, 2011 for an excellent current review), though the relationship between basic skills and acquisition of pedagogical knowledge (as measured by tests) is better established (Gitomer, et al., 2011).

References

- Gitomer, D. H., Brown, T. L., & Bonett, J. (2011). Useful signal or unnecessary obstacle? The role of basic skills tests in teacher preparation. *Journal of Teacher Education*, 62, 431-445.
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