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ABSTRACT

This study investigated the construct validity and population generalizability of the NTE Core Battery using two different data bases and several analytical designs. Part I of the study used data from the November 1982 administration of the Core Battery at the subscore level for 5,183 examinees. Part II used data from the October 1985 administration of a revised version of the battery at the item level for 13,059 examinees. Both parts of the study used confirmatory factor analysis to model the structure of the test scores in relation to the knowledge and ability (constructs) they purport to measure. In Part I a nine-factor model, one for each subtest, was tested, but factors correlated too highly to be different constructs. The simplest model found to fit the data was a three-factor model of general academic skills, mathematics, and essay factors. This model fit the data well and almost equally well for white males and females and black females. The black male population was small, and results were somewhat unstable. Additional exploration of models in Part II resulted in the conclusion that the Core Battery measures general academic skills, mathematics, and essay writing. Eighteen tables present analysis findings. Three appendixes present information on correlations and six additional tables. (SLD)

RR-92-3

RESEARCH REPORT

CONSTRUCT VALIDITY STUDY OF THE NTE CORE BATTERY USING CONFIRMATORY FACTOR ANALYSIS

Jerilee Grandy

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Educational Testing Service
Princeton, New Jersey
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Construct Validity Study of the NTE Core Battery Using Confirmatory Factor Analysis

Jerilee Grandy

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EXECUTIVE SUMMARY

This study investigated the construct validity and population generalizability of the NTE Core Battery using two different data bases and several different analytical designs. This report has two purposes: (1) to explain the logic of construct validation in general, using a specific construct validation methodology, and (2) to explore the construct validity of the NTE Core Battery in particular.

Part I of the study used data from the November 1982 administration of the Core Battery and worked with subscores. Part II used data from the October 1985 administration of a revised version of the Battery and worked with data at the item level.

Both parts of the study used confirmatory factor analysis to model the structure of the test scores in relationship to the knowledge and abilities (i.e., the constructs) they purport to measure. According to its specifications, the Core Battery measures achievement in three broad areas: Communication Skills, General Knowledge, and Professional Knowledge. Communication Skills and General Knowledge each consist of four subtests that should be somewhat related in content but still be different from one another. Statistically, each of the four sets of subtests should be moderately correlated but not so highly correlated that their scores are redundant.

In Part I, we tested a nine-factor model (one factor for each subtest) with data from the November 1982 administration. Results indicated that the factors correlated too highly to be different constructs. Furthermore, the subtest scores did not group into the three factors defined by test specifications.

We then compared the nine-factor model with various other models. The simplest model to fit the data was a three-factor model consisting of general academic skills, mathematics, and essay factors. The simpler model fit the data very well, accounting for nearly all of the variance explained by the nine-factor one. The general academic skills factor consisted of seven subtests: Listening, Reading, Writing (multiple choice), Literature and Fine Arts, Science, Social Studies, and Professional Knowledge. The mathematics factor consisted of only the mathematics test, and the essay consisted of the two essay ratings.

Implications for construct validity were that the Battery was only construct valid in the sense that three factors -- general academic skills, mathematics, and essay -- were distinctly different from one another, but there was no discriminant validity between the seven individual subtests within the general academic skills factor. Furthermore, mathematics was different from the other General Knowledge subtests, contrary to design.

To investigate population generalizability we tested the same model simultaneously across four populations: White males, White females, Black males and Black females. While the model was somewhat unstable for the small sample of Black males, we found no evidence that the test was biased in the assessment of any of these groups.

Based on the outcome of Part I, we conducted a second construct validity study using individual item data from a more recent, revised version of the Core Battery. In Part II, we computed tetrachoric correlations among a sample of 119 multiple-choice items and used these correlations for later analyses. A three-factor exploratory factor analysis produced a general factor, a mathematics factor, and a factor with a few items from the Social Studies test.

An eight-factor confirmatory factor analysis produced estimates that suggested that mathematics was different from all other subtests, the essay ratings were also different, and the remaining subtests correlated rather highly. Social studies showed slightly more uniqueness than the other subtests of General Knowledge. Literature/Fine Arts, Science, and Professional Knowledge each correlated highly with the three Communication Skills factors.

We hypothesized a three-factor model consisting of the a priori constructs of Communication Skills, General Knowledge, and Professional Knowledge. When we tested this model and compared it with a two-factor model consisting of only a general academic skills factor and a mathematics factor, we found that the two-factor model fit better and showed greater discriminant validity than the three-factor model.

Several attempts to "control" for the effects of reading ability on test performance were unsuccessful. First, the division of the population into high-ability and low-ability groups failed because the high-ability readers had such a restricted range of scores that tetrachoric correlations were not computable. Second, attempts to modify the models to remove or isolate reading ability were unsuccessful because the models could not obtain solutions. Results suggested there was not enough unique variance in most items to compute unique factors for their respective subtests.

The conclusion from Part II was that the Core Battery measures three different constructs: general academic skills, mathematics, and essay writing. Aside from the fact that the Mathematics test and a few Social Studies items are different from Communication Skills, there is no other construct validity evident.

INTRODUCTION

Description of the NTE Core Battery

The NTE Core Battery, first administered in the fall of 1982, consists of three components entitled (1) Communication Skills, (2) General Knowledge, and (3) Professional Knowledge. Each of these components consists of three or more separately timed half-hour subtests.

Communication Skills contains three multiple-choice subtests and one essay. The multiple choice parts are Listening, Reading, and Writing. Listening has 40 items, each with four choices; Reading has 30 five-choice items; and Writing has 45 five-choice items. The raw score for each subtest consists of the sum of the number of items answered correctly. Two raters grade the essay holistically and assign a score from 1 to 6. The final rating is the sum of the two scores unless they differ by more than two points, a third rater reads essay, and the final score is the sum of the two closest ra tings.

The Test of General Knowledge contains four subtests, each with five- choice items. The subtests are Literature and Fine Arts (35 items), Mathe matics (25 items), Science (30 items), and Social Studies (30 items).

The Test of Professional Knowledge is designed to measure the knowledge obtained in a teacher education program. It focuses on the processes and the context of teaching. The test contains four separately timed multiple-choice subtests, the first three of which are designed to be parallel and the fourth of which is experimental. Each subtest consists of 35 five-choice items.

The scores of each multiple-choice subtest consists of the number of items answered correctly. In addition, scaled scores are obtained by weighting the raw scores of each subtest to produce a composite which is then converted arithmetically to a scale having a predefined range of 600 to 690. The actual weights assigned to each subtest score were decided *a priori* on the basis of an agreed upon view of the relative importance of the content components.

Test results reported to the examinee consist of the three scaled scores plus raw score information on each of the subtests, namely, the numbers right, wrong, and omitted.

The NTE test analysis report contains further information about the tests themselves and their psychometric characteristics (Educational Testing Service, 1984).

Purpose of the Studies

In the development and production of any test battery, fundamental questions of validity and possible test score bias naturally arise. We study these issues not only because the public demands proof of test validity, but also because we have to know how to report test scores and to advise users in their interpretation.

Construct validation is a process by which many types of evidence of validity form a single logically consistent network. It tells us not only what abilities a test measures, but what abilties it does not measure. Establishing evidence for what a test measures supports its convergent validity, a term coined by Campbell and Fiske (1959). Showing what it does not measure supports its discriminant validity. Together, convergent and discriminant validity provide construct validity. As Cronbach (1971) and many others have pointed out, construct validity is fundamental to the proper interpretation of a test score.

Implicit in any construct validation is an a priori theory or model specifying the construct that a test measures and the relationships of that construct with other constructs. By a construct we mean an ability, skill, knowledge, or other characteristic that we cannot observe directly but must infer from observations. Examples are intelligence, teaching ability, socioeconomic status, introversion, and physical fitness. Essentially, a construct is a concept. It is an abstraction. We have a concept of intelligence, and our concept goes beyond the ability to read passages or solve puzzles. All measures of intelligence are limited and fallible. Because a construct is an abstraction and must be inferred from observations, it is essential that we determine whether we are drawing those inferences correctly. That determination is the essence of a construct validation study.

The NTE Core Battery was designed to test three broad areas of knowledge: communication skills, general knowledge, and professional knowledge. Each of these is a very general, multifaceted construct. Within each of these areas, the NTE further refined the meaning of the construct with more specific constructs such as listening, reading, and writing. Designing test specifications is essentially the task of defining constructs as explicitly as possible. It is then the challenge to item writers to create instruments that will measure those constructs as accurately and precisely as possible.

A construct validation of the Core Battery, therefore, requires our demonstrating that the tests measure what they claim they measure and not something different. This means, for example, that the test labeled "Reading" must measure reading skills, and that the test labeled "Social Studies" must measure knowledge of social studies. Further, because these tests have different labels, construct validation requires that these constructs be different from one another.

While a test battery may be construct valid for a specific population, it may not be equally valid for all populations using it. A test may measure one construct for one group and a different construct for another. It may measure the same construct for two groups, but with different reliabilities. In each of these instances, the test would be psychometrically biased if it were interpreted and used uniformly across all groups. We therefore have to test the construct validation model to determine whether it fits equally well for all intended populations.

PART I: Study of Construct Validity and Psychometric Bias

Population and Variables Studied

Data for Part I came from the first administration of the Core Battery in November 1982. Only the data from examinees who took all subtests of the Battery were usable. To study population generalizability we had to divide the test-taking population into groups according to major population characteristics. The most important groupings were by race and gender. In addition, we had planned to examine other population breakdowns if the groups were large enough to enable us to generate stable statistical estimates.

While it was essential to analyze the population separately by race and gender, it would have been desirable to compare geographic regions as well. We attempted to group examinees by region but found that those in the south, regardless of how we defined the regions, far outnumbered those in other parts of the country. For example, when we defined the northeast as those states above the Mason-Dixon line, there were only two Black males in the northeast. After many redefinitions of regions, we concluded that the only meaningful geographic units might be three states -- Virginia, North Carolina, and Louisiana. Even if we had analyzed the data from these states individually, excluding examinees from all other states, the numbers of Black males would have been to small to include. We decided that, for this study, we would not attempt an analysis by geographic region.

Another population division that we planned to make was according to highest level of education completed. Over half, however, were seniors, and most of the rest had bachelor's degrees. Since they were taking the test in November, it was most unlikely there would be any difference between the two groups. Examinees with more than a bachelor's degree and those who were less than seniors were far to small in number to treat as separate groups for analysis.

One further variable that we considered as a possible population grouping was undergraduate major field. Unfortunately, many examinees omitted this item. Fewer than half of the Black males answered it, and only a slightly higher proportion of Black females responded. Of those who did respond, the largest proportion of White males had majored in general education, while the largest proportion of White females had majored in elementary education. Among the Black males who responded, the largest proportion had majored in general education and in humanities. The largest proportion of Black females who answered the question had majored in elementary education.

We conducted all analyses by gender and by the two largest racial groups, Black and White. The other background questions, because they failed to prove useful for defining subpopulations, did not enter further analyses. We included in the study only those who took all parts of all three tests and who indicated their race, gender, and grade-point average (GPA). The total number of examinees who took all subtests of the Battery was 6,003. Of these, 9% either omitted the gender or race question, or they were neither Black nor White. An additional 5 percent omitted GPA. The usable sample consisted of 86.5% of those who took the entire Battery. This totalled 5,183 examinees

The breakdown of these examinees by race and gender was quite uneven. They distributed in the following way:

White males	791
White females	3,797
Black males	97
Black females	498

There were so very few examinees in the other ethnic categories that we excluded their data from the study. In fact, the number of Black males was so small that statistics obtained for that group may prove to be very unstable.

Test Performance of Population Subgroups

The four subpopulations of examinees each performed quite differently on the average; the largest differences in means were between Whites and Blacks. Table 1 shows the means and standard deviations of each subtest for each group. Scores were usually highest for White females and lowest for Black males. For White males, there was a ceiling effect on every subtest except Writing, Essay, and Professional Knowledge. By "ceiling effect" we mean that the mean score lay within two standard deviations of a perfect score. The average score of Blacks, on the other hand, was less than two standard deviations higher than the chance score on all but two subtests for males and all but three subtests for females.

It is important to emphasize that although two or more groups obtain very different means on a test, this does not imply that the test is biased for or against any group. If a test is biased, one or more groups may or may not score exceedingly low.

Construct Validation Models -- Use of Confirmatory Factor Analysis

The NTE Core Battery specifies nine possibly different constructs: Listening, Reading, Writing (multiple-choice format), Writing (essay format), Literature and Fine Arts, Mathematics, Science, Social Studies, and Professional Knowledge. In addition to the nine specific constructs, the Battery purports to measure three higher-order constructs: (1) Communication Skills, consisting of Listening, Reading, Writing (multiple-choice), and Writing (Essay); (2) General Knowledge, consisting of Literature/Fine Arts, Science, Social Studies, and Mathematics; and (3) Professional Knowledge.

The primary goal of this study was to first test whether there are nine different constructs and then to test whether the nine subtests group into three general constructs corresponding to the areas of Communication Skills, General Knowledge, and Professional Knowledge. In most test batteries measuring general academic abilities, aptitudes, or levels of achievement, we find only two constructs -- general academic and quantitative skills. It is normally only in the more advanced subject areas requiring specialized knowledge that we find distinct differences in performance on individual content areas. The study had to answer two construct validity questions: Does the Core Battery successfully distinguish between nine specific skills? Does it distinguish between three general skills, in accordance with its design?

To test whether the Core Battery fit the intended structural models, we used a confirmatory factor analysis which, because it does corrections for attenuation, is an improvement over the multitrait-multimethod matrix using zero-order correlations as developed by Campbell and Fiske. (For an explanation of this methodology, see Werts and Linn, 1970). For this analysis, we specify a mathematical model (a factor-analytic one) to represent constructs and their relationships with test scores and with each other. This is a highly appropriate mathematical model because it closely parallels true- score theory -- factors model true scores, or constructs, such as listening, reading, and professional knowledge. A factor loading, because it is the cor relation between the actual test scores and the factor, models a correlation between observed scores and true scores. This number squared is an estimate of the reliability of the test scores. Correlations between factors correspond to the correlations between constructs, or true scores, and therefore correspond to correlations corrected for attenuation.

The computer program we used for the confirmatory factor analysis was LISREL VI (Jöreskog and Sörbom, 1981 and 1983). We begin with an *a priori* model that we specify according to our concept of what skills the tests measure. From that model, LISREL produces a maximum likelihood (MLH) solution simultaneously for all subpopulations. By solving the equations for all groups simultaneously, we can compare factor structure, reliabilities, and other estimates across populations. For an explanation of the advantages of simultaneous confirmatory factor analysis across populations, see Werts, Rock, and Grandy (1979).

Along with a MLH solution, LISREL produces several assessments of the fit of the model. One is a chi-square goodness-of-fit statistic which is somewhat limited because it is sensitive to sample size and very sensitive to departures from multivariate normality of the observed variables. Large samples and departures from normality tend to increase chi-square over what we might expect from specification error in the model. When this occurs, the chi-square may be "significant" and mislead us into rejecting a model when, in fact, it fits quite well. In other words, small differences between the model and the observed data are statistically significant when the sample sizes are sufficiently large or the distribution of variables is skewed. A practical use of the chi-square measure is to compare it to the number of degrees of freedom; if it is not much larger than the number of degrees of freedom -- no more than perhaps twice as large -- we can usually conclude that the fit is quite good.

The LISREL program produces two other measures of overall fit: the goodness-of-fit index (GFI) and the root mean square residual (RMR). GFI ranges from zero to one -- the higher the number, the better the fit. GFI is a measure of the relative amount of variances and covariances jointly accounted for by the model. Unlike chi-square, it is independent of the sample size and relatively robust against departures from normality. The RMR is a measure of the average of the residual variances and covariances. When the normalized RMR is less than 0.05, we usually conclude that the overall model fits quite well. We can use both statistics, the GFI and the RMR, to compare the relative fit of two or more models to the same data.

The decision of whether to accept or reject a model depends not only on its overall fit but also on an inspection of other parameters within the model. There may be a good overall fit, for example, but with one of the relationships within the model very poorly determined.

Furthermore, when the overall goodness-of-fit is poor, we can often discover what is wrong with the model by examining the normalized residuals and/or the modification indices. Where these are large we can often infer correlated measurement errors where we have assumed, under true-score theory, that errors of measurement are random. This information provides us with some direction for modifying or redesigning our model to better fit the data.

Because the distributions of scores on the Core Battery subtests were often slightly skewed, we compared the maximum likelihood solutions with two- stage least squares solutions also generated by the LISREL program. In all instances, the estimates were virtually identical.

For this study, we first tested a nine-factor model because the Core Battery presumably has nine content areas. We then tested the three-factor model consisting of Communication Skills, General Knowledge, and Professional Knowledge. Finally, we constructed and tested several simpler models. Only one model fit the data well and showed clear discriminant validity among constructs. We will discuss each model below.

The Nine-Factor Model

In the nine-factor model we hypothesized that each subtest measured a different factor. In order for the model to be identified (i.e., solvable), we had to have at least two measures of each factor. We therefore computed two half-scores for each subtest -- one consisting of the number of odd- numbered items answered correctly, and the other consisting of the number of correct even-numbered items. The use of odd-even scoring to produce part scores can inflate the correlations between part scores if a test is highly speeded. The Core Battery, however, is not a highly speeded test. The most speeded section is Reading, where 90% of the sample complete the entire test within the allowable time limit (Educational Testing Service, 1984). For most other sections, more than 95% complete the test on time.

The Professional Knowledge test already had three parts. It was therefore not necessary to produce half-scores for this subtest. Nor was it necessary to rescore the essay in any way. The two measures that we allowed to load on the essay factor were the two ratings. Although some essays required a third reading, we did not include this third rating in the analyses. The Appendix includes the correlations among the half-scores of the subtests, essay ratings, and GPA.

Not surprisingly, the nine-factor model fit the data exceedingly well. The short table below shows the three measures of goodness of fit discussed earlier, namely, chi-square, GFI, and RMR.

Nine-factor Model: Measures of Fit

Chi-square = 669.84 with 504 degrees of freedom

Group	Goodness-of-fit index (GFI)	Root mean square residual (RMR)
White Males	0.979	0.013
White Females	0.994	0.008
Black Males	0.878	0.042
Black Females	0.975	0.018

We expect this model to fit well because it contains nearly half as many factors as variables. The only way it could misfit would be if, for example, the odd-numbered Reading items measured Writing better than they measure what the even-numbered Reading items measure. What the goodness-of-fit indicators do not tell us is whether the Reading items measure something distinctly different from the Writing items. To answer this question, we begin by examining the correlations among the nine factors, i.e., the estimated true- score correlations.

The NTE Test Analysis (ETS, 1984, p. 72) reports estimated true-score correlations among all of the subtests. These figures use KR-20 as the reliability estimate upon which the true-score estimates are based. We generated true-score estimates from the factor model. Table 2 shows the results from both methods of estimation. For purposes we will discuss below, we changed the order of presentation, putting Essay and Mathematics last. No single estimate of the reliability of the essay exists. Therefore, we have omitted it from the table.

The correlations based on KR-20 are very slightly, but consistently, higher than the factor-analytic estimates. The conclusions, nevertheless, are the same -- except for the essay and mathematics factors, there is a very high correlation between the other constructs. It is difficult to justify a statement that Reading is different from Professional Knowledge, for example, when their underlying constructs correlate better than 0.9. Likewise, we do not expect people's true knowledge of literature and fine arts to correlate nearly 0.9 with their true knowledge of science.

Our next step was to check whether the three-factor model consisting of Communication Skills, General Knowledge, and Professional Knowledge would fit the data according to the test design.

The Three-Factor Model: Communication Skills, General Knowledge, and Professional Knowledge

In accordance with test specifications and with methods of score reporting, the nine subtests are expected to fall into three general skill groups:

Communication Skills:	Listening Reading Writing (multiple choice) Writing (essay)
General Knowledge:	Literature/Fine Arts Mathematics Science Social Studies
Professional Knowledge:	Prof. Knowledge I Prof. Knowledge II Prof. Knowledge III

We therefore tested a three-factor model with this structure. This model fit so poorly that no solution was computable. The reasons that the model did not fit are clear from Table 2. The essay portion of Writing appears to measure something quite different from the other Writing subtest and, indeed, different from any other subtest. Likewise, Mathematics does not belong with the other subtests called "General Knowledge." We also see from Table 2 that the Professional Knowledge factor correlateds very highly with Reading and other subtests. Thus the test of this model showed quite emphatically that the subtests do not group into these three *a priori* constructs.

Because this model did not fit the data, we constructed and tested several other models which were reasonable based upon *a priori* considerations.

Five-Factor and Four-Factor Models

When we saw that the Essay did not fit with the other subtests designated as Communication Skills, we created a fourth factor entitled Essay. Furthermore, because Mathematics was clearly different from the other areas of General Knowledge, we specified yet a fifth factor for Mathematics. We then tested this five-factor model:

Communication Skills:	Listening Reading Writing (multiple choice)
General Knowledge:	Literature/Fine Arts Science Social Studies
Mathematics:	Mathematics
Essay:	Essay (2 ratings)
Prof. Knowledge:	Professional Knowledge (3 parts)

While the data fit the model quite well, three factors correlated highly with each other, and we could not justifiably regard those factors as different constructs. For the entire sample combined, the intercorrelations of these three factors were as follows:

	Comm. Skills	Gen. Knowl	Prof. Knowl
Comm. Skills	1.000	0.943	0.915
Gen. Knowl.	0.943	1.000	0.908
Prof. Knowl.	0.915	0.908	1.000

Our next step was to simplify the model further and combine Communication Skills with General Knowledge in the hope that the correlation with Professional Knowledge might drop slightly. We labeled the newly formed factor Verbal Skills. The resulting model had the following structure:

Verbal:	Listening Reading Writing (multiple choice) Literature/Fine Arts Science Social Studies
Mathematics:	Mathematics
Essay:	Essay (2 ratings)
Prof. Know.:	Professional Knowledge (3 parts)

This model was tested on all four subpopulations simultaneously and found to fit the data quite well as we see below:

Four-factor Model: Measures of Fit

Chi-square = 3177.37 with 644 degrees of freedom

Group	Goodness-of-fit index (GFI)	Root mean square residual (RMR)
White Males	0.918	0.030
White Females	0.945	0.026
Black Males	0.833	0.055
Black Females	0.942	0.029

If we look at the solution, however, we find the correlation between the Professional Knowledge and Verbal factors still to be quite high. For each of the subpopulations, the correlations are as follows:

Group	r
White males	0.914
White females	0.908
Black males	0.911
Black females	0.921

Based on this finding, we concluded that we could not justifiably accept a model consisting of more than three factors.

Exploration of Models with Correlated Errors and Multiple Loadings

Before testing a simple three-factor model consisting of general academic skills, quantitative, and essay writing skills, we tested more complex models. In addition to these three factors, we hypothesized that certain pairs of subscores also loaded on unique factors that were different from the basic three.

We allowed the multiple-choice writing scores and the essay ratings, for example, to load on a factor called Writing. We set Mathematics and Science scores to load on yet another factor. Using LISREL, we test everal variations on these designs and found either the model was unidentified (not solvable because there were too many unknowns) or the standardized factor loadings on the unique factors were very small -- usually less than 0.10.

Failure to find any model that could justify separating the seven subtests labeled as Verbal skills led us to test a simple three-factor model. If that model fit the data, we would compare it to the original nine-factor one to see whether the nine-factor model provided an improvement over the sim pler one. If so, we would accept the nine-factor model; if not, we would have shown that the subtests failed to exhibit discriminant validity and therefore that the nine-factor model was not construct valid.

The Three-Factor Model: Verbal, Essay, and Mathematical Skills

Because the test scores appeared to cluster into three distinct factors, we next tested a three-factor model, naming those factors Verbal, Essay, and Mathematics. Indices of fit are shown in the following table:

Three-factor Model: Measures of Fit

Chi-square = 4333.69 with 660 degrees of freedom

Group	Goodness-of-fit index (GFI)	Root mean square residual (RMR)
White Males	0.888	0.034
White Females	0.922	0.030
Black Males	0.812	0.060
Black Females	0.926	0.031

Comparing these estimates with those generated by the nine-factor model, we see that the value of chi-square has risen considerably, but that the other two measures of fit are excellent. As we mentioned earlier, chi-square is very sensitive to non-normality and to large sample sizes, while the GFI and RMR are not. The GFI and RMR both indicate that the model fits the data exceedingly well.

When a simpler model fits the data as well as the three-factor model fits these data, we prefer the simpler model over the more complex model because the simpler one is more parsimonious. High correlations among factors indicate redundancy among those factors, and consequently, lack of parsimony. The three-factor model in this analysis is more parsimonious because the correlations among factors are smaller than they are in the models having more factors. Table 7 shows the correlations among factors for each population group.

The three-factor model tells us is that the Essay and the Mathematics subtests measure something different from what the other subtests measure. The other subtests -- Reading, Listening, Writing (multiple choice), Literature and Fine Arts, Science, Social Studies, and Professional Knowledge -- all appear to measure the same construct, presumably general academic skills.

The next step is to examine the solution generated by the three-factor model and then to see to what extent each subtest included in the common academic skills factor still measures something uniquely different from the other subtests included in that factor. Based on the goodness-of-fit estimates, we expect there will be very little uniqueness, otherwise the model would not fit so well. It is still worthwhile to obtain estimates of that uniqueness to have a better understanding of what the subtests measure.

Table 3 shows the reliability estimates of each subtest based on the three-factor model. We compute these estimates from the factor loadings ac cording to a formula derived by Werts, Linn, and Joreskog (1974). These reliabilities range between 0.569 and 0.867. The highest ones are for Professional Knowledge which, because it totals over 100 items among its three parts, we would expect to have the highest reliability. Remember that when we interpret these reliabilities, they are in relationship with the general academic skills factor. For example, the Writing and Science subtests are equally reliable measures of a general academic skills factor. For White males, a general academic skills factor can explain 87% of the observed score variance in the Professional Knowledge subtests.

We can now compare these reliability estimates to those reported in the NTE Test Analysis (ETS, 1984) and to those generated by the nine-factor model. Table 4 shows the reported reliabilities for the entire examinee population. These estimates are values of KR-20, a formula based on the internal consistency of responses to items within a subtest. They are usually higher than those generated from the factor-analytic model. Comparing KR-20 with the factor-analytic estimates, we find approximately the same rank ordering. Professional Knowledge has the highest reliability; Science has the lowest. More informative, however, is the comparison of the reliability estimates from the three-factor model with those from the nine-factor model.

Table 5 shows the reliability estimates generated by the nine-factor solution. Because the scores used to identify each factor consisted of the sum of the odd and even numbered items, the reliability estimates generated in the factor-analytic solution are nearly identical to the split-half reliabilities (with Spearman-Brown correction) of each subtest. The difference between each of these values and unity is an estimate of the percentage of variance due to measurement error.

We can now estimate the uniqueness of each subtest. The uniqueness is equivalent to the amount of reliable variance not explained by the general academic skills factor. It is the difference between the two reliability estimates. Tables 6a - 6d show, for each group, the breakdown of total variance into three components: the amount explained by general academic skills, the amount attributed to random error, and the unique variance explained by whatever that subtest measures other than general academic skills.

We see that for White males, something unique to the Reading subtest explains less than 3% of the variance in Reading test scores. This is not surprising because a general academic skills factor probably consists primarily of reading skills. Secondarily, reasoning abilities, general knowledge, and various other skills are necessary to take any test. We do expect the other subtests, however, to exhibit greater uniqueness. For Black females, something other than general academic skills accounts for less than 4% of the variance in the Professional Knowledge subtests.

Looking at the tables overall, we see that the subtest showing the most uniqueness is the multiple-choice Writing test. Here the unique variance is about 10%. The higher figure for Black males (18.5%) may be valid, but we must question it because of the very small number of Black males (only 97). The Listening subtest also contains between 7% and 11% unique variance, but these amounts are very small compared to the common variance. If we were to find that a math test measured reading more than it measured math, we would certainly be reluctant to call it a math test. In actuality, we find that for White males, the variance in scores for the Listening subtest breaks down in the following way: 71.2% is general academic skills, 17.9% is random measurement error, and the remaining 10.9% is the unique content measured by the Listening test. It is therefore difficult to justify calling the test a test of listening skills. This same argument holds for the other six subtests shown to be primarily tests of general academic skills.

Implications for Construct Validity

We have focused our analyses so far on the seven subtests showing a large general skills component. The other two subtests -- the Essay and the Mathematics test -- clearly measure something different from all other subtests. Table 7 shows the correlations of the Essay, Mathematics, and Verbal factors and undergraduate grade-point average (GPA). For all groups, the Verbal and Mathematics factors correlate the most highly. The Essay factor correlates only moderately with the other two. It too measures something quite different.

What these correlations show is that the Essay and Mathematics tests have good discriminant validity -- they do not measure the same skills as the other subtests. All of the subtests included in the Verbal factor have poor discriminant validity because they do not measure something very different from one another. The seven general academic skills subtests combined, however, do measure something different from the other two subtests.

Discriminant validity is one side of the construct validity coin. The other side is convergent validity. We have shown that some tests do <u>not</u> measure what the other tests measure, but we have not shown what any of them <u>are</u> measuring. A more thorough construct validity study would contain data on specific course grades, student characteristics, and other measures of achievement in reading, science, etc. Ideally, it would contain criterion data such as success in teaching.

For this study, the only external data we had was self-reported undergraduate GPA. We might expect students' test scores to correlate highly with GPA, especially their scores on Professional Knowledge, if that test measures the content of the education curriculum. What we found, however, was that Professional Knowledge was behaving as a general academic skills test. In fact, its statistics behave as if it were an alternate form of the Reading test.

What we expect, based on what we know of the education curriculum, is that the Verbal factor will correlate most highly with GPA. This is usually the case. The correlations between self-reported GPA and the Verbal factor are relatively low, however, especially for females of both races. GPA, therefore, has provided us with some small degree of evidence for convergent validity, but the evidence is not strong.

It is not difficult to understand why the correlation with GPA is lower than expected. One reason is that the grades are self-reported, and self- reported grades are usually not completely accurate. As a result, they correlate less well with other measures of ability. Not only is self-reported GPA less reliable than transcript GPA, but GPA may not be a reliable measure of how much a student knows. In fact, grades often correlate only moderately with test scores. So our findings are not unusual. The only conclusion we can draw is that we have not established strong evidence of convergent validity from this study, but future studies containing more external measures may do so.

Generalizability across Populations

A test is unbiased across populations if it measures the same knowledge, skill, or ability for all populations and does so equally well for each. In the language of confirmatory factor analysis, we say that the tests are congeneric -- that each test measures the same factor for all populations. Furthermore, the tests measuring the same factors also have equal loadings for all populations. Congeneric tests have perfectly correlated true-scores, hence measure the same factor. Multifactor congeneric tests measure the same composite of multiple factors (possibly with different weights), hence their true scores may not correlate perfectly.

We saw that under the three-factor model consisting of a general academic ability factor, a mathematics factor, and an essay factor, the model was congeneric across populations. If we had found that scores on the Science test, for example, had loaded heavily on the Mathematics factor for White males and not for Black females, the Science test would have failed to exhibit population generalizability because it would have been measuring a different ability for one group than for another. This did not occur. The same three- factor structure fit for all four groups. Each subtest measured the same corresponding construct for all groups. We can conclude that the Core Battery is unbiased with respect to congenerity.

Whether each subtest measures what it measures equally well for each group is not obvious from inspection alone. From the reliability table we see that the Core Battery may be most reliable for White males and least reliable for Black males. To test whether this is the case we constrained the factor loadings to be equal for all groups and tested whether this constrained model still provided a good fit of the data.

We would not expect this model to fit quite so well as the unconstrained model because the four groups are certainly not identical, but the solution still produced a good fit to the data. Indices of fit are shown below:

Constrained Model: Measures of Fit

Group	Goodness-of-fit index (GFI)	Root mean square residual (RMR)
White Males	0.887	0.061
White Females	0.922	0.031
Black Males	0.805	0.092
Black Females	0.920	0.059

The only group whose data did not fit reasonably well was Black males, and as we discussed earlier, the size of this group was only 97. These data alone cannot give us the reason for the slightly lower reliability of the test battery for Black males. One condition that can yield a low reliability estimate for a group is homogeneity or restriction in range of scores. We saw earlier that the Black males had the lowest means on four of the subtests. They also had the smallest standard deviations on four subtests. What probably occurred was that the reliability estimates were low because only 97 Black males took the exam, they had relatively low scores, and they had little variation among those scores. What we have to examine in addition to reliabilities are the standard errors of measurement (SEM) of their scores. Table 8 shows that the SEMs were not especially high for Black males. If the SEMs had been high, we would have to conclude that the test did not measure as well for Black males as for the other groups. The SEMs were about the same for Black males as for the other groups. It is fair to conclude, based on the small number of Black males, that the test may measure the three constructs as well for Black males as for the other groups.

Referring back to Table 3, we see that the reliabilities of subscores on the Science, Social Studies, and Mathematics subtests were somewhat lower for Black females than for other groups. On all three of these subtests, Black females had lower than average observed score variances and very slightly higher SEMs (Table 8). If there is any lack of population generalizability here, it may be that these subtests have a slightly higher SEM. The lower variance in scores among Black females may be the cause of the slightly lower reliability in those scores.

White females obtained scores with the lowest reliability on the Essay. Their Essay ratings also have small variance, probably because their average ratings were high. What is likely to be occurring here is a ceiling effect. The White women score so high that the Essay ratings fail to discriminate very well among them. Of course, it may be that it is unnecessary to do so.

The reliability estimates were all quite high for White males. It is interesting to note, however, that on the multiple-choice writing subtest and on Professional Knowledge, the scores of White males had the highest SEMs. It was only because they had large score variances on these two subtests that the SEMs were high as well as the reliabilities.

What we have seen from this analysis is very little, if any, psychometric bias across population groups. No group exhibited consistently larger than average SEMs, nor did any particular subtest have a large SEM for a specific population. Overall, the data suggest there is no significant bias in the Core Battery in generalizing score meaning and precision across population groups.

Conclusions from Part I

The first purpose of the study was to examine convergent and discriminant evidence of construct validity in the NTE Core Battery. The second purpose was to investigate the generalizability of score meaning and precision across populations.

We accomplished the first purpose of the study using confirmatory factor analysis to model the structure of the test scores in relationship to the constructs they purportedly measure. According to test specifications, the Core Battery measures nine different skills or knowledge areas, some of which cluster into broader areas, such as "general knowledge." Testing this nine- factor model, we found that many factors correlated too highly to be justi fiably regarded as different constructs.

We found instead that a three-factor model fit the data exceedingly well. Seven of the subtests -- Listening, Reading, Writing (multiple-choice format), Literature and Fine Arts, Science, Social Studies, and Professional Knowledge -- all formed a single factor which we labeled general academic skills. None of these subtests, with the possible marginal exception of Listening and Social Studies, showed sufficient uniqueness to suggest that it measures something different from the others.

The essay form of the Writing test apparently measures something quite different from what the multiple-choice form of Writing measures. Whatever the multiple-choice Writing test measures correlates better with what the other multiple-choice subtests measure than it does with what the essay measures. This important finding suggests that whether the test is in a multiple-choice format or not may be an important factor in performance. While we cannot verify this suggestion from the data at hand, we should consider differences in test format when attempting to explain the factor structure of the tests. It is possible that the ability to take a multiple- choice test, or alternatively, the particular kind of multiple-choice strategy required to take the Core Battery is affecting performance on all of the multiple-choice subtests.

What we found from the three-factor solution was that the essay and the Mathematics subtests have good discriminant validity -- they both measure skills that are uniquely different, but related, to the skills required by the other subtests. The other seven subtests forming a single factor have poor discriminant validity vis-a-vis each other. They all appear to measure a common set of skills, probably a combination of reading and reasoning. This is also an important finding because, although these subtests are measuring this factor well (with good reliabilities), we cannot justify the claim that they measure different skills or knowledge areas. For example, uniqueness explains only about 5% of the variance in the Professional Knowledge subtests.

The analysis for population generalizability showed that for the four populations -- white males, white females, black males, and black females -- the factor structure was the same. This means that the subtests measure the same constructs for all four groups. The general academic skills factor consisting of seven subtests is the same for all groups. The factor loadings of the subtests on their respective factors were also not greatly different across populations. While some of the subtests obtained lower reliabilities for black males, these findings are likely to be attributable to the small number ($n = 97$) of black males taking the test. We can confidentally conclude that while the four groups had different means on the various subtests, the tests showed evidence of common meaning and equal precision across groups.

PART II: Analysis of Construct Validity at the Item Level Using 1985 Data

Population and Variables Studied

This analysis used data from the files of all test candidates who took the Core Battery in October 1985 (Form 3HNT) and attempted all nine operational sections of the Battery. The population size was 13,059. Because we found no evidence of differential score properties across populations in the previous study (Part I), we did not analyze the data separately by race, gender, or other demographic division.

We did, however, form two subgroups defined in terms of reading scores. The results of Part I had suggested that reading ability may work as a limiting factor in student performance in other content areas. If reading skill could be "held constant," perhaps we could detect differences in performance on other subtests, particularly among examinees who were the best readers. We therefore selected the top and bottom quartiles on the Reading score with the intention of conducting the same analyses on those groups as we conducted on the entire population.

The range in Reading scores for the top quartile was from 26 to 30 items answered correctly; for the bottom quartile the range was from 1 to 18. Because the distribution of scores was so highly skewed, the range was extremely restricted among the top-scoring examinees. This restriction in range presented a problem in the analysis, as we shall see later in this report.

In contrast to the analysis in Part I, the analysis in Part II used individual items instead of subscores. Because items are either right or wrong, item scores are binary variables. The usual product-moment correlations are appropriate for computing correlations among continuous variables (subscores) but are inappropriate for binary variables. An appropriate measure of association between binary scores for underlying continuous variables is the tetrachoric correlation. TESTFACT is a factor analysis program designed to produce tetrachoric correlations and to use those correlations to compute a factor analysis for binary data. We used TESTFACT for the first factor analyses and then used the tetrachoric matrix produced by TESTFACT as input data for LISREL.

The entire Core Battery contained 340 items plus two essay ratings (excluding the rating used to resolve a large difference between the first two ratings). This was too many variables to use in TESTFACT. Furthermore, the distribution of items was such that the three sections of Professional Knowledge together contained 105 items--far more than any other section. Mathematics, on the other hand, contained only 25 items. This very unequal item-content distribution had the potential of affecting the outcome of a factor analysis.

To equalize the distribution of items across content areas, we sampled every nth item from each subtest in such a way as to include approximately equal numbers of items from each. The exact items selected were as follows:

Subtest	Sampling fraction	Items selected	No. of items
General Knowledge			
Social studies	1/2	1,3,5,7, . . .	15
Mathematics	3/5	1,3,5,6,8,10,11,13, . .	15
Lit/Fine Arts	2/5	1,3,6,8,11,13,16, . . .	14
Science	1/2	1,3,5,7, . . .	15
Professional Knowledge			
Prof. Know. I	2/5	1,3,6,8,11,13,16, . . .	14
Communication Skills			
Listening	2/5	1,3,6,8,11,13,16, . . .	16
Reading	1/2	1,3,5,7, . . .	15
Writing (mc)	1/3	1,4,7,10,13,16,19, . . .	15
Essay	Rating 1, Rating 2		

This selection resulted in 119 test items and 2 essay ratings, or a total of 121 variables.

Correlation Matrices

The computer program TESTFACT produced tetrachoric correlation matrices for the population as a whole and for each of the two subgroups defined in terms of Reading score. Appendix B shows that matrix for the population. The matrix was very similar for the low Reading-score group, with each correlation being slightly lower for the group than for the whole population. The lower correlation would be expected because the distribution of scores covers a narrower range.

The restriction in range of scores for the high Reading group was sufficiently severe to prevent the computation of correlations. Recalling that the correlation between subscores is quite high (from Part I), by restricting the range on Reading scores we have also restricted the range on scores for other subtests. For example, consider the following. Among high Readers, on the Social Studies subtest, only 1.6 percent got item 5 incorrect. On Listening Skills, only 0.6 percent got item 6 incorrect. On multiple- choice writing, only 1.0 percent got item 34 incorrect. On the Professional Knowledge test, only 3.0 percent missed the first item. Basically, the test battery was too easy for top-scoring Readers, and the ceiling effect prevented a correlational analysis among those examinees.

Exploratory Factor Analysis Using TESTFACT

In order to test whether items would factor into the three a priori categories of General Knowledge (GK), Professional Knowledge (PK), and Communication Skills (CS), we set up the TESTFACT program to produce a three- factor solution. From that solution we computed varimax and promax rotations. Table 9 shows the rotated principal factor loadings.

The large number of positive non-zero loadings on the first factor suggest that the first factor is a general ability factor. Some General Knowledge items along with a few items from various tests load on the second factor. The only salient loadings on the third factor are Mathematics items. No other items -- not even the Science items -- load on the third factor.

Because the tetrachoric correlations could not be computed for the high reading group, the factor analysis could not be computed either. For the low reading group, results were nearly the same as they were for the population as a whole. The only difference was that each factor loading was somewhat lower.

The implication of these analysis is that the Battery as a whole seems to measure two factors: mathematics and another general ability factor, mostly defined by verbal items. To understand the factor structure more clearly, we conducted confirmatory factor analyses using LISREL to test the fit of several a priori models.

Inclusion of the Essay Ratings

The 119 multiple-choice items in the test battery were all binary, and therefore it was appropriate to compute a tetrachoric correlation matrix. The essay ratings, on the other hand, were on a continuous scale. While we did not know what effect it might have in subsequent analyses, we decided to compute biserial correlations between the essay ratings and each of the other variables and to insert those values in the larger matrix. The essay ratings were labeled as variables 120 and 121 in the matrix and in the list of variables that appear in the LISREL analyses. Appendix C shows these correlations between the multiple-choice items and the essay ratings.

The Eight-Factor Model

In the eight-factor model we hypothesized that each subtest measured a different factor. This model was nearly identical with the nine-factor model in Part I, except that it allowed the essay ratings to load on all of the other eight factors as extension variables instead of defining the Essay as its own factor. We did this in case there was an incompatibility between the biserial and tetrachoric correlations, anticipating that the incompatibilty might have a less severe effect on extension variables than on a unique factor.

We instructed the LISREL program to produce a two-stage least square (TSLS) solution, instead of a maximum likelihood (ML) solution because the ML solution would have been unreasonably costly. Previous studies have indicated that the TSLS estimates are sufficiently close to the ML estimates, and that the additional cost of an ML analysis is generally not warranted.

Table 10 gives the estimated true-score correlations between subtests. According to the test design, the subtest would be construct valid if all subtests within CS were highly correlated with one another, and those subtests within GK were also highly intercorrelated. PK should not be highly correlated with any of the others, and GK factors should not correlate highly with CS factors. Correlations within the dotted lines in the table should be higher than the correlations outside of the dotted lines.

First, looking at Mathematics, we see that its correlation with Science was higher than its correlation with any other subtest. It did not correlate highly, however, with other factors regarded as GK or with PK or CS factors.

The Social Studies factor correlated better with the Literature and Fine Arts factor and with the Science factor than it did with PK or the three areas of CS. It did not correlate highly with Mathematics.

Literature and Fine Arts, on the other hand, correlated about the same with the CS factors as it did with the other GK factors and rather poorly with Mathematics; it also correlated highly with PK.

Science, while it correlated moderately well with Mathematics, correlated no better with other GK factors than it did with CS factors.

This analysis of the GK factors suggests that Mathematics does not belong in GK but is probably a totally different factor from any of the others measured. Literature and Fine Arts as well as Science had as high a verbal load as the CS factors do. Statistically, they are indistinguishable. There is some evidence that Social Studies is somewhat different from either PK or CS and therefore has some discriminant validity.

PK is very highly correlated with the CS factors and with Literature and Fine Arts and Science. In fact, PK is more highly correlated with the Reading factor than Reading is with Writing.

The two essay ratings loaded better on the multiple-choice Writing subtest than on the other subtests, though Rating 1 loaded higher on Reading than on Writing. All of the essay factor loadings were low; the largest was 0.16, and that was the one loading on Reading.

The only measure of fit of the model produced by the TSLS solution was a coefficient of determination. This number can range from 0 to 1 and may be regarded as the fraction of variance explained by the model. For this model it was 0.263. We would expect the fit to be good because there are a large number of factors. One condition that would reduce the degree to which the model fit the data would be if certain items loaded more highly on a different factor than on the one specified, for example, if a Fine Arts item actually loaded better on

Reading than it did on the factor containing the other Fine Arts items. It is likely that this was true of some items, considering the high correlations between certain factors, such and Reading and PK.

In summary, the pattern of correlations in the eight-factor model suggests that Mathematics is something different from all other constructs, and that Literature and Fine Arts, Science, and Professional Knowledge are all indistinguishable from the three CS factors. These three subtests, in other words, do not show discriminant validity. Social studies, however, does seem to be more similar to Literature and Fine Arts and to Science than it is to the CS or PK factors.

Table 11 shows the factor loadings for the eight-factor solution.

The Three-Factor Model

The solution to the eight-factor model did not suggest that subtests grouped into Communication Skills, General Knowledge, and Professional Knowledge as per test design. To estimate more exactly just how well items may load onto these three a priori factors, we set up that model for LISREL to test explicitly.

The coefficient of determination was 0.147. Table 12a shows the estimated true-score correlations among those three factors. The correlations were quite high, especially between CS and PK, suggesting that the factors do not have high discriminant validity.

Table 13 presents the factor loadings for this model. The essay ratings were allowed to load on the CS factor alone because, according to test design, the essay is part of CS. The loadings were only .16 and .14 for these ratings. This suggests that the essay ratings are either measuring something very different from CS, or they have low reliability, or both.

The three-factor model solution alone is not very informative. It fits less well than the eight-factor model, but larger numbers of factors nearly always fit better than smaller models. What is more informative is the comparison of this model with a competing one.

The Two-Factor Model

Results of the eight-factor model suggested that there may be only two factors: mathematics and everything else. A comparison of the two-factor model with the three-factor model reported above would provide a test of two competing models: one in accordance with the a priori test design and one consistent with empirical correlations.

For the two-factor model, we named the non-mathematics items "Verbal". Table 12b shows the results of the LISREL test of the two-factor model.

Verbal and Mathematics factors were correlated 0.78, a value that shows considerably more discriminant validity than the correlations between CS, GK, and PK in the three-factor model. The coefficient of determination was 0.219, a figure that was actually higher for the two-factor model than for the three- factor model. All other things being equal, we would expect a two-factor model to provide a poorer fit to the data than a three-factor model. The fact that the two-factor model fit better is evidence in its favor that would be difficult to dispute.

Table 14 gives the factor loadings for the two-factor model. The essay ratings loaded very little on either factor: 0.12 and 0.09 on Verbal; 0.10 and 0.04 on Mathematics. These values were consistent with the earlier models showing the essay ratings to be measuring something different from the rest of the Battery.

An examination of the other factor loadings showed that some items had near-zero loadings on the "Verbal" factor. Those with loadings less than 0.2 were Science item number 23, Reading item number 1, and Listening items 3 and 28. An examination of the tetrachoric correlations showed that Science item 23 and Reading item 1 were uncorrelated with any other item and therefore may be measuring something quite different from the rest of the Battery, or they may be ambiguous or incorrectly keyed.

Similarly, some items loaded quite heavily on the "Verbal" factor, the highest being 0.834 for Social Studies item 17. Three other items loaded higher than 0.6. These were two Social Studies items and one from Science.

In general, there seemed to be no pattern of Verbal factor loadings that we could relate to specific subtests. Reading, for example, did not load any higher on that factor than did Social Studies.

Analysis Designs Attempting to Control for the Effects of Reading Skill

It was clear from the outcomes of the analyses conducted thus far that performance on the non-mathematical items in the Battery was highly related to a single factor, probably reading ability or general verbal skills. We therefore designed two types of analyses attempting to control for reading ability. The first was to divide the population into high-scoring and low-scoring readers with the intention of testing all models on those two groups separately. If reading ability limits performance on other subtests, those other subtests should be more construct valid for high readers than for low readers.

What we found, and discussed earlier, was that the restriction in range of Reading scores among high-scoring readers prevented a tetrachoric correlation from being computable. The correlation was computable on the low readers, however, so that group's data were analyzed.

The eight-factor LISREL model resulted in findings similar to those obtained for the population as a whole, except that the Reading factor, probably because of the restricted range on reading scores, correlated near zero with other factors. Table 15 shows the estimated true-score correlations for this model.

The three-factor and two-factor models for low readers produced results almost identical with those for the total population, except that all of the correlations were lower.

It is difficult to interpret the findings from these low-reader models because the Communication Skills factor essentially excludes Reading. In other words, while we may have successfully removed Reading effects from the other factors, we also removed them from Communication Skills, which is uninterpretable.

The LISREL program was not able to produce a coefficient of determination for any of the models using data from low readers. This problem may be reflecting the artificiality of restricting the range on one of the variables included in the analysis.

In response to this possibility, we tried leaving reading scores out of the analysis altogether and testing the resulting seven-factor model on low readers. The LISREL program found this model to be unsolvable (the phi matrix was not positive definite).

Our attempts to "remove" reading from our analyses were unsuccessful, either to remove it empirically or statistically. We then developed a totally different strategy to understand whether some items more than others were responsible for the high verbal load present in each subtest.

The Common Reading Factor Model

The persistent finding that reading or other verbal skills seemed to affect performance on Professional Knowledge and the General Knowledge subtests with the exception of Mathematics led us to the development of a model in which each item (with the exception of mathematics) was hypothesized to measure reading ability plus some other ability identified by its subtest. In other words, the Science subtest should measure reading ability as well as knowledge of science. The model allowed each item on the "Verbal" factor to load on two factors, with the exception of Reading, which was set to load only on the Reading factor. In addition, we required that the Reading factor be uncorrelated with each of the other factors, though the remaining factors could be correlated with one another.

This design seemed to reflect the real world most accurately. Performance on a Science item should be influenced by two things: reading ability and science knowledge. Similarly, performanence on a Professional Knowledge item should be influenced by reading ability and knowledge of the profession of education. We might expect some correlation, however, between knowledge of science and professional knowledge, or at least we would not deny its possibility.

The solution to such a model would allow us to look at each item individually and determine the extent to which performance on that item is affected by reading ability and the extent to which it is affected by the knowledge it was designed to measure. Those items with higher loadings on the Reading factor than on the subtest factor would be designated poor items because they reduce the construct validity of the test. Those items with higher loadings on the specific subtest factor than on Reading would be working he way they were designed to work. A followup content analysis could possibly uncover the differences between these two types of items. Knowing the differences, we could design the next version of the Battery to contain more construct valid items.

After a great many attempts to "fine tune" the model, the LISREL program was unable to produce any solution. The model variations included removal of the essay ratings from the model, specification of the essay as a factor of its own, and instructions to produce an unweighted least squares solution instead of a two-stage least squares solution. When the LISREL program did produce initial estimates, the phi matrix was not positive definite and the estimates of phi were out of range (correlations much greater than 1.0). The estimated factor loadings on Reading, Mathematics, and Social Studies were reasonable, however, while on the other factors the loadings were near zero.

What these results may suggest is that there was virtually no reliable variance, beyond reading ability, in the scores of items designed to measure other skills. Consequently, a model designed to estimate the amount of that unique reliable variance could not have a solution.

Conclusions of Part II

The exploratory factor analysis (using TESTFACT) as well as the confirmatory factor analyses (using LISREL) pointed to the conclusion that the multiple-choice items in the Core Battery were measuring a large general factor, probably verbal or reading skill, plus a mathematics factor. Social Studies showed some unique variance, but since General Knowledge was not defined by the other factors (they were indistinguishable from Communication Skills), it is difficult to argue that Social Studies was part of General Knowledge. The essay ratings were measuring something quite different from either the verbal or the mathematics factors, though they were more highly correlated with verbal than mathematics.

Attempts to extract reading ability from the items designed to measure other skills, namely, Science, Social Studies, Literature/Fine Arts, and Professional Knowledge, resulted in models that were unsolvable, apparently because there was too little unique variance in the scores on those items.

In summary, the eight-factor model showed the intercorrelations of factors within a content area (CS or GK) to be generally no higher than correlations between content areas that were designed to measure different constructs. The solution to that model implies that the Battery is not construct valid if the constructs are defined to be CS, GK, and PK. The test of the two-factor (V and M) model versus the three-factor (GK, PK, and CS) model showed the two-factor model to fit better than the three-factor model, again supporting a different pattern of constructs than was intended by the test design.

DISCUSSION

Lack of discriminant validity has important practical implications. When we report test performance to an examinee, regardless of whether it is a scaled score or number right or whatever, implicit in that report is a claim that the score represents the level of the examinee's knowledge in that subject area. If we call it Professional Knowledge, then we are implying that it is not Reading or Science. More importantly, it is misleading to the examinee to be given one score in what claims to be Professional Knowledge and another score in what claims to be Science if the difference between those scores can be attributed entirely (or almost entirely) to random measurement error. This is unfortunately what is occurring with the seven subtests we have called "verbal skills."

There are a number of directions that the NTE Program might take to address their problems with construct validity, and we will discuss some of them here. They are all fairly straigtforward technically but will require some commitment to making changes, not only in the method of score reporting, but in the test itself. Because the test will be revised in the near future, none of the suggestions outlined here would incur great expense or cause a complete upheaval of the Program.

The first suggestion is quite simple, namely, that the Mathematics subtest be removed conceptually from General Knowledge. It makes no sense from the viewpoint of education or cognitive psychology to group mathematics with literature and then to expect the two of them to be different from reading. In no other testing program is mathematics regarded as a knowledge area along side of fine arts, literature, science, and social studies--all forming one factor (higher order or otherwise). By calling the Mathematics subtest "mathematical ability," or better yet, "quantitative skills," and reporting quantitative scores separately from all other scores, one major problem in construct validity is solved without making any changes to the test or conducting any studies.

The second suggestion is directed toward understanding why the items on seven subtests, supposedly measuring different constructs, all seem to measure only one. This will involve a statistical analysis followed by a content analysis. In the standard development of a test, an "item analysis" is performed to identify those items that do not correlate well with the total test score or subscore. Biserial correlations are computed between each item score and the total scale score.

A modification of that procedure in which each item on all seven "verbal" subtests is correlated with the total Reading score would identify items that are primarily reading items. The remaining items could then be grouped and given subtest scores which should correlate less highly with Reading. This procedure would be especially profitable for Professional Knowledge which has such a high correlation with Reading. If there is still a high correlation between other subtests, such as Science and Social Studies, then results of these tests should be reported together, as General Knowledge, without trying to break them down into more specific subjects.

After identifying the items correlating highly with reading, content experts could examine the "high reading" items and compare them with the items correlating less well with reading to see what the differences are. This information could be applied in future revisions of the Core Battery.

Mislevy has suggested a third approach to dealing with lack of discriminant validity by modifying the reporting system so as to provide candidates with empirical Bayes confidence bands that they can use to make decisions about retesting. This information would tell them whether their subscores are significantly different (thus enabling them to understand their relative strengths and weaknesses), or whether the observed differences in their subscores are simply random fluctuations. This information could affect candidate decisions regarding retest preparation.

One final suggestion is that the Core Battery be tested on samples of students or professionals who have never taken an education course in order to see if some evidence of construct validity can be obtained for the Professional Knowledge subtest. This technique is often used to provide construct validity for occupational tests. An appropriate design would be to select three samples, perhaps seniors in engineering, law students, and practicing writers or journalists. Each group would be strong in some area that is supposedly measured by the Core Battery, and none would be expected to score well on Professional Knowledge. If the profiles of these three groups (or any number of groups) could be distinguished by their scores on the Core Battery, there would be good evidence both of convergent and discriminant validity.

We have focused most of our attention in this report on discriminant validity because it could be analyzed very thoroughly. Evidence for convergent validity is more difficult because, in Part I, we had only one variable other than test scores with which to link those scores, and in Part II we had no external variables.

We found in the analyses in Part I that undergraduate GPA correlated moderately with each of the three test factors. If we had had grades in specific subjects corresponding with the test content areas, we might have been able to establish more definite convergent validity. We do not know, for example, what our large verbal factor is really measuring. It may be reading, reasoning, test-taking skill, or some combination of these. We do not know what the essay is measuring -- only that it is not measuring what the other subtests measure. If we had a grade in English Composition to correlate with it, for example, we might find some evidence for what it <u>does</u> measure.

Likewise, we <u>assume</u> that the Mathematics subtest measures mathematical skills, but we have no evidence in the form of other mathematics tests or grades in mathematics to support that claim. Therefore, we have not established convergent validity because we did not have the measures we needed to do so. The only evidence of convergent validity we did find was that performance on all of the subtests is positively correlated with undergraduate grades. We can conclude, therefore, that the Core Battery as a whole measures some of the same things reflected in students' grades, but we do not know whether it is connected with specific course content or whether it is an indicator of general intelligence and academic performance.

A fifth recommendation, therefore, is to obtain external measures of each construct so that a stronger and more complete construct validity model can be tested.

One final comment addresses a contradiction inherent in the intent of the Core Battery, a contradiction that has arisen because of the mixed criticisms that have been directed agains the test since its beginning and the attempts on the part of the NTE Program to satisfy all of the critics. On the one hand, many "experts" want a test that measures general academic skills without requiring a knowledge of subject content. After all, they claim, that is why the NTE has Area tests. A second faction of "experts" wants the Core Battery to be structured according to subject content, with detailed diagnostic feedback to the candidates. But to satisfy the first group of experts, the items were designed so that subject knowledge was not required in order to answer the items. To satisfy the second group, diagnostic information is being reported to the candidate. But to provide diagnostic information requires that the subtests be measuring different content and that construct validity studies be done to demonstrate that they measure different content.

These two very different views on the part of "experts" place contradictory demands on the NTE Program. Perhaps the Program should take its own stand, based on resident expertise in teaching and in psychometrics, and construct a test based on that commitment. The NTE Program does not have to serve many masters. Neither the exam nor its purpose needs to be complicated. It simply has to be a competently constructed, reasonably validated examination, designed to accomplish a clear and consistent mission.

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Table 1

Means and Standard Deviations of Subtest Raw Scores and GPA

Subtest	Maximum Possible Score	Means: White Males (n=791)	Means: White Females (n=3,797)	Means: Black Males (n=97)	Means: Black Females (n=498)
Listening	40	29.71	30.39	22.42	22.16
Reading	30	20.24	20.67	13.24	13.12
Writing (multi. choice)	45	27.18	29.33	18.72	20.55
Essay	12	6.98	7.76	5.04	5.94
Lit./Arts	35	24.15	24.65	15.94	16.59
Mathematics	25	17.25	15.68	10.55	8.93
Science	30	20.75	19.50	12.87	12.19
Social Studies	30	20.68	19.34	13.63	13.11
Prof. Knowledge (sum of 3 parts)	105	64.46	69.46	44.42	48.42
GPA to Date*	3.75	2.94	3.15	2.82	2.93

Subtest	Standard Deviations: White Males	Standard Deviations: White Females	Standard Deviations: Black Males	Standard Deviations: Black Females
Listening	5.74	5.15	5.40	5.95
Reading	5.30	4.71	4.57	4.89
Writing (multi. choice)	7.38	6.48	5.65	6.03
Essay	1.88	1.64	1.82	1.94
Lit./Arts	5.88	5.21	5.11	5.43
Mathematics	4.48	4.39	4.31	3.77
Science	5.00	4.44	4.20	4.14
Social Studies	5.16	4.65	4.42	4.39
Prof. Knowledge (sum of 3 parts)	15.39	12.64	12.45	13.39
GPA to Date*	0.45	0.45	0.40	0.43

*GPA is estimated by using the mid-point of the intervals designated as response alternative

Table 2

Estimated True-Score Correlations*
(N = 5,392)

Subtest	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Listening	1.000	0.940	0.841	0.869	0.847	0.865	0.860	-	0.801
(2) Reading	0.924	1.000	0.879	0.916	0.898	0.911	0.919	-	0.828
(3) Writing (multi. choice)	0.822	0.867	1.000	0.883	0.820	0.827	0.843	-	0.763
(4) Lit./Art	0.851	0.899	0.866	1.000	0.902	0.921	0.882	-	0.774
(5) Science	0.835	0.892	0.812	0.891	1.000	0.937	0.874	-	0.883
(6) Social Studies	0.843	0.895	0.810	0.902	0.926	1.000	0.883	-	0.825
(7) Prof. Knowledge (all parts)	0.848	0.912	0.834	0.873	0.875	0.871	1.000	-	0.748
(8) Essay**	0.592	0.628	0.674	0.627	0.546	0.551	0.614	1.000	-
(9) Math	0.779	0.812	0.745	0.755	0.871	0.806	0.734	0.490	1.000

*Correlations above the diagonal are based on reported estimates from the Test Analysis of the NTE Core Battery, Form 3ENT, SR-84-19. Correlations below the diagonal are based on the nine-factor model for all subgroups combined.

**Estimate is based on corrections for attenuation using interrater reliabilities, not score reliabilities which would require at least two essays to estimate. True correlations with the essay factor may be higher.

Table 3

Reliability Estimates from the Three-Factor Model

Factor	Subtest	Reliability: White Males	White Females	Black Males	Black Females
VERBAL	Listening	0.712	0.686	0.662	0.715
	Reading	0.790	0.744	0.665	0.749
	Writing (multi. choice)	0.730	0.713	0.588	0.681
	Lit./Art	0.784	0.731	0.686	0.706
	Science	0.735	0.668	0.604	0.569
	Social Studies	0.774	0.705	0.706	0.672
	Prof. Knowledge (all parts)	0.867	0.831	0.808	0.842
ESSAY *	Essay	0.732	0.660	0.775	0.744
MATH	Math	0.814	0.791	0.804	0.646

*Reliability estimates are based solely on interrater reliabilities, not score reliabilities which would require at least two essays.

Table 4

Reliability Estimates Based on Reported Values of KR-20*

Subtest	Reliability
Listening	0.840
Reading	0.840
Writing (multi. choice)	0.857
Lit./Art	0.840
Science	0.798
Social Studies	0.801
Prof. Knowledge	0.919
Essay	-
Math	0.831

*Reported in the Test Analysis of the NTE Core Battery, Form 3ENT, February, 1984, SR-84-19.

Table 5

Reliability Estimates Based upon the Nine-Factor Model or upon Split Halves

Subtest	Reliability			
	White Males	White Females	Black Males	Black Females
Listening	0.821	0.791	0.732	0.808
Reading	0.819	0.787	0.719	0.754
Writing (multi. choice)	0.844	0.834	0.773	0.781
Lit./Art	0.847	0.800	0.788	0.768
Science	0.801	0.731	0.652	0.646
Social Studies	0.831	0.769	0.746	0.725
Prof. Knowledge (all parts)	0.911	0.880	0.855	0.879
Essay*	0.732	0.660	0.784	0.744
Math	0.813	0.790	0.807	0.646

*Based solely on interrator reliability.

Table 6a

Components of Variance of Scores on Selected Subtests

White Males Only

Subtest	Percent of total variance explained by: general verbal ability	random measurement error	uniqueness of subtest
Listening	71.2	17.9	10.9
Reading	79.0	18.1	2.9
Writing (multi. choice)	73.0	15.6	11.4
Lit./Art	78.4	15.3	6.3
Science	73.5	19.9	6.6
Social Studies	77.4	16.9	5.7
Prof. Knowledge (sum of 3 parts)	86.7	8.9	4.4

Table 6b

Components of Variance of Scores on Selected Subtests

White Females Only

Subtest	Percent of total variance explained by: general verbal ability	random measurement error	uniqueness of subtest
Listening	68.6	20.9	10.5
Reading	74.4	21.3	4.3
Writing (multi. choice)	71.3	16.6	12.1
Lit./Art	73.1	19.9	7.0
Science	66.8	26.9	6.4
Social Studies	70.5	23.1	6.4
Prof. Knowledge (sum of 3 parts)	83.1	12.0	4.9

Table 6c

Components of Variance of Scores on Selected Subtests

Black Males Only

Subtest	Percent of total variance explained by: general verbal ability	random measurement error	uniqueness of subtest
Listening	66.2	26.8	7.0
Reading	66.5	28.1	5.4
Writing (multi. choice)	58.8	22.7	18.5
Lit./Art	68.6	21.2	10.2
Science	60.4	34.8	4.8
Social Studies	70.6	25.4	4.0
Prof. Knowledge (sum of 3 parts)	80.8	14.5	4.7

Table 6d

Components of Variance of Scores on Selected Subtests

Black Females Only

	Percent of total variance explained by:		
Subtest	general verbal ability	random measurement error	uniqueness of subtest
Listening	71.5	19.2	9.3
Reading	74.9	24.6	0.5
Writing (multi. choice)	68.1	21.7	10.2
Lit./Art	70.6	23.2	6.2
Science	56.9	35.4	7.7
Social Studies	67.2	27.5	5.3
Prof. Knowledge (sum of 3 parts)	84.2	12.1	3.7

Table 7

Estimated True-Score Correlations between Three NTE Core Battery Factors and GPA*

Group		Verbal	Essay	Math	GPA
White Males	Verbal	1.000			
	Essay	0.660	1.000		
	Math	0.790	0.479	1.000	
	GPA	0.408	0.300	0.265	1.000
White Females	Verbal	1.000			
	Essay	0.438	1.000		
	Math	0.707	0.361	1.000	
	GPA	0.280	0.217	0.213	1.000
Black Males	Verbal	1.000			
	Essay	0.529	1.000		
	Math	0.795	0.401	1.000	
	GPA	0.439	0.236	0.348	1.000
Black Females	Verbal	1.000			
	Essay	0.667	1.000		
	Math	0.770	0.512	1.000	
	GPA	0.285	0.222	0.183	1.000

*Corrections for attenuation for the essay are based solely upon interrater reliabilities, not score reliabilities.

Table 8

Standard Errors of Measurement Based on Three-Factor Model

Subtest	White Males	White Females	Black Males	Black Females
Listening	3.09	2.89	3.14	3.18
Reading	2.43	2.39	2.64	2.45
Writing (multi. choice)	3.83	3.47	3.64	3.41
Lit./Art	2.75	2.73	2.86	2.77
Science	2.58	2.58	2.65	2.72
Social Studies	2.44	2.53	2.42	2.52
Prof. Knowledge (sum of 3 parts)	5.61	5.18	5.48	5.32
Essay	0.96	0.96	0.84	0.98
Math	1.94	2.01	1.88	2.24

Table 9

PROMAX PRIMARY FACTOR LOADINGS

	1	2	3
GKSS 1	0.2737	-0.1811	0.0927
GKSS 3	0.3366	-0.0902	0.0901
GKSS 5	0.6693	-0.0674	0.1642
GKSS 7	0.1262	-0.1372	-0.1582
GKSS 9	0.2719	-0.3833	0.1683
GKSS 11	0.3120	-0.2302	0.0267
GKSS 13	0.3157	-0.3044	0.1293
GKSS 15	0.4955	-0.1038	0.0792
GKSS 17	0.4517	-0.5548	0.1212
GKSS 19	0.3764	-0.1886	0.1364
GKSS 21	0.4199	-0.3566	0.1021
GKSS 24	0.4592	-0.2635	-0.0036
GKSS 25	0.3724	-0.1531	-0.0160
GKSS 27	0.2622	-0.3134	-0.0103
GKSS 29	0.4100	0.0870	0.0154
GKM 1	0.2763	-0.1464	-0.3096
GKM 3	0.5658	0.0718	-0.2953
GKM 5	0.1406	-0.1638	-0.2595
GKM 6	0.3529	-0.0094	-0.3074
GKM 8	0.0457	-0.1764	-0.1969
GKM 10	0.4310	-0.0451	-0.3803
GKM 11	0.3161	0.0504	-0.2543
GKM 13	0.3440	-0.2606	-0.3775
GKM 15	0.2849	-0.1782	-0.3442
GKM 16	0.3760	0.0382	-0.2230
GKM 18	0.3759	-0.0880	-0.3048
GKM 20	0.2700	-0.0829	-0.2992
GKM 21	0.3493	-0.1347	-0.3950
GKM 23	0.3578	-0.2157	-0.3718
GKM 25	0.2561	0.0733	-0.2796
GKLA 1	0.3302	-0.0346	-0.0018
GKLA 3	0.3929	-0.0253	0.0656
GKLA 7	0.4247	0.0424	0.0245
GKLA 8	0.2719	-0.1886	-0.0295
GKLA 11	0.3134	-0.1249	0.0553
GKLA 13	0.5006	-0.0632	0.0648
GKLA 16	0.4319	-0.0274	0.0319
GKLA 18	0.4717	-0.1215	0.0684
GKLA 21	0.3201	-0.0062	-0.0078
GKLA 23	0.1519	-0.0703	-0.0265
GKLA 26	0.3618	-0.0373	0.0017
GKLA 28	0.4200	0.0394	0.0622
GKLA 31	0.2653	-0.0439	0.0581
GKLA 33	0.3151	0.0693	-0.0669
GKS 1	0.3296	-0.0168	0.0149
GKS 3	0.2534	-0.0602	-0.0543
GKS 5	0.5243	-0.1863	-0.0686
GKS 7	0.1312	-0.1440	-0.1019
GKS 9	0.6412	-0.1183	0.0302
GKS 11	0.3721	-0.2189	-0.0473
GKS 13	0.3132	0.0413	-0.0022
GKS 15	0.3526	-0.2519	-0.0085
GKS 17	0.3358	-0.1476	-0.0765
GKS 19	0.3677	-0.2262	0.0012
GKS 21	0.1161	-0.1499	-0.1670
GKS 23	0.0195	0.1066	0.0041
GKS 25	0.5046	-0.0737	0.0101
GKS 27	0.2870	-0.1101	-0.0286
GKS 29	0.3854	-0.0389	-0.0992

	1	2	3
PK#2 1	0.5100	0.1241	0.0155
PK#2 3	0.3884	0.1714	0.0516
PK#2 6	0.5116	-0.1067	0.0397
PK#2 8	0.3558	0.0621	-0.0396
PK#2 11	0.3620	0.0629	0.1021
PK#2 13	0.4099	0.0615	0.0121
PK#2 16	0.4917	0.0467	0.0340
PK#2 18	0.6409	0.0256	0.0846
PK#2 21	0.2658	0.1056	0.0629
PK#2 23	0.1787	-0.0945	-0.0316
PK#2 26	0.4162	-0.0322	-0.0151
PK#2 28	0.4036	-0.0166	-0.0073
PK#2 31	0.4060	0.0067	-0.0497
PK#2 33	0.3240	0.1513	0.0065
CSL 1	0.3198	0.0742	-0.0854
CSL 3	0.1896	-0.0269	0.0035
CSL 6	0.5508	0.2117	0.0014
CSL 8	0.4368	0.1685	-0.0356
CSL 11	0.5515	-0.0063	0.0415
CSL 13	0.5090	-0.0174	-0.0141
CSL 16	0.4210	0.0320	-0.0538
CSL 18	0.3407	0.1058	0.0406
CSL 21	0.2625	-0.0576	0.1064
CSL 23	0.4510	0.0821	0.0042
CSL 26	0.5641	0.2182	-0.0090
CSL 28	0.0975	-0.0130	-0.0220
CSL 31	0.5418	0.2227	-0.0613
CSL 33	0.5494	0.1116	0.1251
CSL 36	0.4315	-0.0568	0.0268
CSL 38	0.4635	-0.0209	0.0360
CSR 1	0.0835	0.0323	-0.0016
CSR 3	0.5983	0.0767	0.0376
CSR 5	0.4387	-0.0729	-0.0270
CSR 7	0.2231	-0.0056	0.0037
CSR 9	0.5657	0.0582	-0.0063
CSR 11	0.6454	0.0240	0.0598
CSR 13	0.4843	0.0134	0.0940
CSR 15	0.2790	-0.1113	-0.0587
CSR 17	0.3760	0.0195	-0.0064
CSR 19	0.5316	0.1208	-0.0150
CSR 21	0.7115	0.1603	0.0301
CSR 23	0.5263	0.1944	0.0328
CSR 25	0.5287	0.1632	-0.0580
CSR 27	0.5284	0.0659	-0.1295
CSR 29	0.3981	0.1697	-0.0210
CSW 1	0.5482	0.1531	-0.0359
CSW 4	0.3346	0.0555	-0.0770
CSW 7	0.2287	-0.1152	-0.0010
CSW 10	0.2333	-0.0912	-0.0329
CSW 13	0.3093	-0.0525	-0.0402
CSW 16	0.3164	0.0915	-0.0264
CSW 19	0.2540	-0.0385	-0.0537
CSW 22	0.2789	0.0391	-0.1326
CSW 25	0.2653	-0.0926	-0.0323
CSW 28	0.5500	0.0781	-0.0154
CSW 31	0.4286	0.0007	0.0149
CSW 34	0.5973	0.1734	-0.0192
CSW 37	0.4087	-0.0531	0.0186
CSW 40	0.4455	0.0994	-0.0440
CSW 43	0.4384	0.1250	-0.0274

Table 10

Estimated True-Score Correlations*
(N = 13,059)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Social Studies	1.000							
(2) Mathematics	.655	1.000						
(3) Lit/Fine Arts	.850	.717	1.000					
(4) Science	.879	.799	.869	1.000				
(5) Prof Knowledge	.748	.715	.864	.860	1.000			
(6) Listening	.714	.717	.879	.817	.899	1.000		
(7) Reading	.733	.738	.881	.830	.920	.939	1.000	
(8) Writing (m/c)	.701	.735	.883	.786	.858	.866	.888	1.000

General Knowledge: (1)–(4); Communication Skills: (6)–(8)

*Dotted lines enclose correlations that should be high compared with correlations outside of the dotted lines in order for the test to be valid as a measure of three constructs: Communication Skills, General Knowledge, and Professional Knowledge. High correlations inside the lines would indicate convergent validity; low correlations outside the lines would indicate discriminant validity.

Table 11

Standardized Factor Loadings for Eight-Factor Model*
(N = 13,059)

	SOC-STUD	MATH	LIT-ART	SCIENCE	PROF-KN	LISTEN	READING	WRITE-MC
VAR 1	0.482	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 2	0.332	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 3	0.549	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 4	0.206	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 5	0.481	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 6	0.378	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 7	0.473	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 8	0.434	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 9	0.755	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 10	0.455	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 11	0.560	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 12	0.532	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 13	0.397	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 14	0.401	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 15	0.303	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VAR 16	0.0	0.602	0.0	0.0	0.0	0.0	0.0	0.0
VAR 17	0.0	0.609	0.0	0.0	0.0	0.0	0.0	0.0
VAR 18	0.0	0.372	0.0	0.0	0.0	0.0	0.0	0.0
VAR 19	0.0	0.499	0.0	0.0	0.0	0.0	0.0	0.0
VAR 20	0.0	0.248	0.0	0.0	0.0	0.0	0.0	0.0
VAR 21	0.0	0.633	0.0	0.0	0.0	0.0	0.0	0.0
VAR 22	0.0	0.392	0.0	0.0	0.0	0.0	0.0	0.0
VAR 23	0.0	0.691	0.0	0.0	0.0	0.0	0.0	0.0
VAR 24	0.0	0.546	0.0	0.0	0.0	0.0	0.0	0.0
VAR 25	0.0	0.397	0.0	0.0	0.0	0.0	0.0	0.0
VAR 26	0.0	0.532	0.0	0.0	0.0	0.0	0.0	0.0
VAR 27	0.0	0.452	0.0	0.0	0.0	0.0	0.0	0.0
VAR 28	0.0	0.585	0.0	0.0	0.0	0.0	0.0	0.0
VAR 29	0.0	0.595	0.0	0.0	0.0	0.0	0.0	0.0
VAR 30	0.0	0.333	0.0	0.0	0.0	0.0	0.0	0.0
VAR 31	0.0	0.0	0.529	0.0	0.0	0.0	0.0	0.0
VAR 32	0.0	0.0	0.371	0.0	0.0	0.0	0.0	0.0
VAR 33	0.0	0.0	0.399	0.0	0.0	0.0	0.0	0.0
VAR 34	0.0	0.0	0.319	0.0	0.0	0.0	0.0	0.0
VAR 35	0.0	0.0	0.347	0.0	0.0	0.0	0.0	0.0
VAR 36	0.0	0.0	0.494	0.0	0.0	0.0	0.0	0.0
VAR 37	0.0	0.0	0.406	0.0	0.0	0.0	0.0	0.0
VAR 38	0.0	0.0	0.478	0.0	0.0	0.0	0.0	0.0
VAR 39	0.0	0.0	0.327	0.0	0.0	0.0	0.0	0.0
VAR 40	0.0	0.0	0.130	0.0	0.0	0.0	0.0	0.0
VAR 41	0.0	0.0	0.383	0.0	0.0	0.0	0.0	0.0
VAR 42	0.0	0.0	0.407	0.0	0.0	0.0	0.0	0.0
VAR 43	0.0	0.0	0.274	0.0	0.0	0.0	0.0	0.0
VAR 44	0.0	0.0	0.359	0.0	0.0	0.0	0.0	0.0
VAR 45	0.0	0.0	0.0	0.474	0.0	0.0	0.0	0.0
VAR 46	0.0	0.0	0.0	0.303	0.0	0.0	0.0	0.0
VAR 47	0.0	0.0	0.0	0.569	0.0	0.0	0.0	0.0
VAR 48	0.0	0.0	0.0	0.173	0.0	0.0	0.0	0.0
VAR 49	0.0	0.0	0.0	0.679	0.0	0.0	0.0	0.0
VAR 50	0.0	0.0	0.0	0.447	0.0	0.0	0.0	0.0
VAR 51	0.0	0.0	0.0	0.334	0.0	0.0	0.0	0.0
VAR 52	0.0	0.0	0.0	0.405	0.0	0.0	0.0	0.0
VAR 53	0.0	0.0	0.0	0.433	0.0	0.0	0.0	0.0
VAR 54	0.0	0.0	0.0	0.430	0.0	0.0	0.0	0.0
VAR 55	0.0	0.0	0.0	0.207	0.0	0.0	0.0	0.0
VAR 56	0.0	0.0	0.0	-0.008	0.0	0.0	0.0	0.0
VAR 57	0.0	0.0	0.0	0.540	0.0	0.0	0.0	0.0
VAR 58	0.0	0.0	0.0	0.335	0.0	0.0	0.0	0.0
VAR 59	0.0	0.0	0.0	0.421	0.0	0.0	0.0	0.0
VAR 60	0.0	0.0	0.0	0.0	0.642	0.0	0.0	0.0

*See Table 9 for translation of variable numbers to Core Battery items.

Table 11 (Continued)

	SOC-STUD	MATH	LIT-ART	SCIENCE	PROF-KN	LISTEN	READING	WRITE-MC
VAR 61	0.0	0.0	0.0	0.0	0.396	0.0	0.0	0.0
VAR 62	0.0	0.0	0.0	0.0	0.501	0.0	0.0	0.0
VAR 63	0.0	0.0	0.0	0.0	0.352	0.0	0.0	0.0
VAR 64	0.0	0.0	0.0	0.0	0.361	0.0	0.0	0.0
VAR 65	0.0	0.0	0.0	0.0	0.405	0.0	0.0	0.0
VAR 66	0.0	0.0	0.0	0.0	0.496	0.0	0.0	0.0
VAR 67	0.0	0.0	0.0	0.0	0.620	0.0	0.0	0.0
VAR 68	0.0	0.0	0.0	0.0	0.287	0.0	0.0	0.0
VAR 69	0.0	0.0	0.0	0.0	0.182	0.0	0.0	0.0
VAR 70	0.0	0.0	0.0	0.0	0.405	0.0	0.0	0.0
VAR 71	0.0	0.0	0.0	0.0	0.396	0.0	0.0	0.0
VAR 72	0.0	0.0	0.0	0.0	0.412	0.0	0.0	0.0
VAR 73	0.0	0.0	0.0	0.0	0.340	0.0	0.0	0.0
VAR 74	0.0	0.0	0.0	0.0	0.0	0.551	0.0	0.0
VAR 75	0.0	0.0	0.0	0.0	0.0	0.164	0.0	0.0
VAR 76	0.0	0.0	0.0	0.0	0.0	0.565	0.0	0.0
VAR 77	0.0	0.0	0.0	0.0	0.0	0.449	0.0	0.0
VAR 78	0.0	0.0	0.0	0.0	0.0	0.544	0.0	0.0
VAR 79	0.0	0.0	0.0	0.0	0.0	0.513	0.0	0.0
VAR 80	0.0	0.0	0.0	0.0	0.0	0.410	0.0	0.0
VAR 81	0.0	0.0	0.0	0.0	0.0	0.281	0.0	0.0
VAR 82	0.0	0.0	0.0	0.0	0.0	0.234	0.0	0.0
VAR 83	0.0	0.0	0.0	0.0	0.0	0.440	0.0	0.0
VAR 84	0.0	0.0	0.0	0.0	0.0	0.580	0.0	0.0
VAR 85	0.0	0.0	0.0	0.0	0.0	0.117	0.0	0.0
VAR 86	0.0	0.0	0.0	0.0	0.0	0.520	0.0	0.0
VAR 87	0.0	0.0	0.0	0.0	0.0	0.489	0.0	0.0
VAR 88	0.0	0.0	0.0	0.0	0.0	0.408	0.0	0.0
VAR 89	0.0	0.0	0.0	0.0	0.0	0.442	0.0	0.0
VAR 90	0.0	0.0	0.0	0.0	0.0	0.0	0.602	0.0
VAR 91	0.0	0.0	0.0	0.0	0.0	0.0	0.440	0.0
VAR 92	0.0	0.0	0.0	0.0	0.0	0.0	0.472	0.0
VAR 93	0.0	0.0	0.0	0.0	0.0	0.0	0.305	0.0
VAR 94	0.0	0.0	0.0	0.0	0.0	0.0	0.522	0.0
VAR 95	0.0	0.0	0.0	0.0	0.0	0.0	0.612	0.0
VAR 96	0.0	0.0	0.0	0.0	0.0	0.0	0.349	0.0
VAR 97	0.0	0.0	0.0	0.0	0.0	0.0	0.220	0.0
VAR 98	0.0	0.0	0.0	0.0	0.0	0.0	0.357	0.0
VAR 99	0.0	0.0	0.0	0.0	0.0	0.0	0.465	0.0
VAR 100	0.0	0.0	0.0	0.0	0.0	0.0	0.644	0.0
VAR 101	0.0	0.0	0.0	0.0	0.0	0.0	0.462	0.0
VAR 102	0.0	0.0	0.0	0.0	0.0	0.0	0.439	0.0
VAR 103	0.0	0.0	0.0	0.0	0.0	0.0	0.529	0.0
VAR 104	0.0	0.0	0.0	0.0	0.0	0.0	0.372	0.0
VAR 105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.663
VAR 106	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.374
VAR 107	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.220
VAR 108	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.254
VAR 109	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.327
VAR 110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.366
VAR 111	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.293
VAR 112	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.319
VAR 113	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.273
VAR 114	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.569
VAR 115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.437
VAR 116	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.632
VAR 117	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.334
VAR 118	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.456
VAR 119	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.442
VAR 120	0.048	0.025	-0.034	0.061	-0.064	0.050	0.165	0.122
VAR 121	0.006	-0.045	0.020	0.045	-0.030	0.041	0.037	0.129

Table 12

Test of Two Competing Models

a. Estimated True-Score Correlations between Three a Priori Constructs in Accordance with Test Design

(Coefficient of determination = 0.147)

	Communication Skills	General Knowledge	Professional Knowledge
Communication Skills	1.000		
General Knowledge	.871	1.000	
Prof Knowledge	.927	.855	1.000

b. Estimated True-Score Correlations between Two Empirically Inferred Constructs

(Coefficient of determination = 0.219)

	Verbal	Math
Verbal	1.000	
Mathematics	.780	1.000

Table 13

Standardized Factor Loadings for Three-Factor Model as per Test Design*
(N = 13,059)

	COMM-SKL	GEN-KNOW	PROF-KN
VAR 1	0.0	0.533	0.0
VAR 2	0.0	0.361	0.0
VAR 3	0.0	0.606	0.0
VAR 4	0.0	0.223	0.0
VAR 5	0.0	0.515	0.0
VAR 6	0.0	0.402	0.0
VAR 7	0.0	0.509	0.0
VAR 8	0.0	0.467	0.0
VAR 9	0.0	0.312	0.0
VAR 10	0.0	0.487	0.0
VAR 11	0.0	0.603	0.0
VAR 12	0.0	0.572	0.0
VAR 13	0.0	0.427	0.0
VAR 14	0.0	0.434	0.0
VAR 15	0.0	0.326	0.0
VAR 16	0.0	0.350	0.0
VAR 17	0.0	0.402	0.0
VAR 18	0.0	0.261	0.0
VAR 19	0.0	0.312	0.0
VAR 20	0.0	0.175	0.0
VAR 21	0.0	0.420	0.0
VAR 22	0.0	0.246	0.0
VAR 23	0.0	0.462	0.0
VAR 24	0.0	0.338	0.0
VAR 25	0.0	0.282	0.0
VAR 26	0.0	0.382	0.0
VAR 27	0.0	0.294	0.0
VAR 28	0.0	0.401	0.0
VAR 29	0.0	0.451	0.0
VAR 30	0.0	0.200	0.0
VAR 31	0.0	0.318	0.0
VAR 32	0.0	0.375	0.0
VAR 33	0.0	0.390	0.0
VAR 34	0.0	0.399	0.0
VAR 35	0.0	0.391	0.0
VAR 36	0.0	0.520	0.0
VAR 37	0.0	0.421	0.0
VAR 38	0.0	0.486	0.0
VAR 39	0.0	0.327	0.0
VAR 40	0.0	0.209	0.0
VAR 41	0.0	0.377	0.0
VAR 42	0.0	0.412	0.0
VAR 43	0.0	0.340	0.0
VAR 44	0.0	0.251	0.0
VAR 45	0.0	0.316	0.0
VAR 46	0.0	0.258	0.0
VAR 47	0.0	0.550	0.0
VAR 48	0.0	0.213	0.0
VAR 49	0.0	0.606	0.0
VAR 50	0.0	0.449	0.0
VAR 51	0.0	0.246	0.0
VAR 52	0.0	0.428	0.0
VAR 53	0.0	0.385	0.0
VAR 54	0.0	0.459	0.0
VAR 55	0.0	0.209	0.0
VAR 56	0.0	-0.069	0.0
VAR 57	0.0	0.463	0.0
VAR 58	0.0	0.335	0.0
VAR 59	0.0	0.342	0.0

	COMM-SKL	GEN-KNOW	PROF. KNOW
VAR 60	0.0	0.0	0.642
VAR 61	0.0	0.0	0.394
VAR 62	0.0	0.0	0.499
VAR 63	0.0	0.0	0.353
VAR 64	0.0	0.0	0.357
VAR 65	0.0	0.0	0.404
VAR 66	0.0	0.0	0.494
VAR 67	0.0	0.0	0.614
VAR 68	0.0	0.0	0.285
VAR 69	0.0	0.0	0.181
VAR 70	0.0	0.0	0.403
VAR 71	0.0	0.0	0.391
VAR 72	0.0	0.0	0.410
VAR 73	0.0	0.0	0.339
VAR 74	0.580	0.0	0.0
VAR 75	0.170	0.0	0.0
VAR 76	0.584	0.0	0.0
VAR 77	0.462	0.0	0.0
VAR 78	0.561	0.0	0.0
VAR 79	0.527	0.0	0.0
VAR 80	0.432	0.0	0.0
VAR 81	0.297	0.0	0.0
VAR 82	0.239	0.0	0.0
VAR 83	0.459	0.0	0.0
VAR 84	0.595	0.0	0.0
VAR 85	0.122	0.0	0.0
VAR 86	0.602	0.0	0.0
VAR 87	0.508	0.0	0.0
VAR 88	0.415	0.0	0.0
VAR 89	0.453	0.0	0.0
VAR 90	0.055	0.0	0.0
VAR 91	0.535	0.0	0.0
VAR 92	0.452	0.0	0.0
VAR 93	0.222	0.0	0.0
VAR 94	0.585	0.0	0.0
VAR 95	0.571	0.0	0.0
VAR 96	0.450	0.0	0.0
VAR 97	0.311	0.0	0.0
VAR 98	0.351	0.0	0.0
VAR 99	0.495	0.0	0.0
VAR 100	0.650	0.0	0.0
VAR 101	0.490	0.0	0.0
VAR 102	0.536	0.0	0.0
VAR 103	0.560	0.0	0.0
VAR 104	0.415	0.0	0.0
VAR 105	0.502	0.0	0.0
VAR 106	0.340	0.0	0.0
VAR 107	0.247	0.0	0.0
VAR 108	0.241	0.0	0.0
VAR 109	0.289	0.0	0.0
VAR 110	0.281	0.0	0.0
VAR 111	0.230	0.0	0.0
VAR 112	0.316	0.0	0.0
VAR 113	0.286	0.0	0.0
VAR 114	0.565	0.0	0.0
VAR 115	0.384	0.0	0.0
VAR 116	0.565	0.0	0.0
VAR 117	0.419	0.0	0.0
VAR 118	0.440	0.0	0.0
VAR 119	0.444	0.0	0.0
VAR 120	0.162	0.0	0.0
VAR 121	0.136	0.0	0.0

*See Table 9 for translation of variable numbers to items in Core Battery.

Table 14

Standardized Factor Loadings for Two-Factor Model*
(N = 13,059)

	VERBAL	MATH
VAR 1	0.549	0.0
VAR 2	0.376	0.0
VAR 3	0.625	0.0
VAR 4	0.229	0.0
VAR 5	0.529	0.0
VAR 6	0.413	0.0
VAR 7	0.523	0.0
VAR 8	0.479	0.0
VAR 9	0.834	0.0
VAR 10	0.501	0.0
VAR 11	0.621	0.0
VAR 12	0.586	0.0
VAR 13	0.438	0.0
VAR 14	0.445	0.0
VAR 15	0.335	0.0
VAR 16	0.0	0.603
VAR 17	0.0	0.608
VAR 18	0.0	0.370
VAR 19	0.0	0.497
VAR 20	0.0	0.246
VAR 21	0.0	0.632
VAR 22	0.0	0.391
VAR 23	0.0	0.691
VAR 24	0.0	0.544
VAR 25	0.0	0.397
VAR 26	0.0	0.533
VAR 27	0.0	0.451
VAR 28	0.0	0.584
VAR 29	0.0	0.596
VAR 30	0.0	0.331
VAR 31	0.327	0.0
VAR 32	0.387	0.0
VAR 33	0.402	0.0
VAR 34	0.407	0.0
VAR 35	0.402	0.0
VAR 36	0.536	0.0
VAR 37	0.432	0.0
VAR 38	0.500	0.0
VAR 39	0.333	0.0
VAR 40	0.217	0.0
VAR 41	0.387	0.0
VAR 42	0.424	0.0
VAR 43	0.347	0.0
VAR 44	0.255	0.0
VAR 45	0.326	0.0
VAR 46	0.266	0.0
VAR 47	0.561	0.0
VAR 48	0.221	0.0
VAR 49	0.625	0.0
VAR 50	0.463	0.0
VAR 51	0.253	0.0
VAR 52	0.442	0.0
VAR 53	0.398	0.0
VAR 54	0.471	0.0
VAR 55	0.207	0.0
VAR 56	-0.068	0.0
VAR 57	0.475	0.0
VAR 58	0.345	0.0
VAR 59	0.350	0.0
VAR 60	0.394	0.0
VAR 61	0.239	0.0
VAR 62	0.514	0.0
VAR 63	0.310	0.0
VAR 64	0.294	0.0
VAR 65	0.354	0.0
VAR 66	0.407	0.0
VAR 67	0.555	0.0
VAR 68	0.201	0.0
VAR 69	0.211	0.0
VAR 70	0.416	0.0
VAR 71	0.350	0.0
VAR 72	0.403	0.0
VAR 73	0.230	0.0
VAR 74	0.318	0.0
VAR 75	0.193	0.0
VAR 76	0.349	0.0
VAR 77	0.273	0.0
VAR 78	0.506	0.0
VAR 79	0.502	0.0
VAR 80	0.391	0.0
VAR 81	0.279	0.0
VAR 82	0.284	0.0
VAR 83	0.392	0.0
VAR 84	0.381	0.0
VAR 85	0.110	0.0
VAR 86	0.380	0.0
VAR 87	0.430	0.0
VAR 88	0.400	0.0
VAR 89	0.422	0.0
VAR 90	0.074	0.0
VAR 91	0.470	0.0
VAR 92	0.459	0.0
VAR 93	0.235	0.0
VAR 94	0.472	0.0
VAR 95	0.522	0.0
VAR 96	0.450	0.0
VAR 97	0.352	0.0
VAR 98	0.355	0.0
VAR 99	0.425	0.0
VAR 100	0.512	0.0
VAR 101	0.369	0.0
VAR 102	0.422	0.0
VAR 103	0.446	0.0
VAR 104	0.278	0.0
VAR 105	0.428	0.0
VAR 106	0.301	0.0
VAR 107	0.294	0.0
VAR 108	0.343	0.0
VAR 109	0.355	0.0
VAR 110	0.327	0.0
VAR 111	0.309	0.0
VAR 112	0.266	0.0
VAR 113	0.345	0.0
VAR 114	0.471	0.0
VAR 115	0.431	0.0
VAR 116	0.451	0.0
VAR 117	0.441	0.0
VAR 118	0.371	0.0
VAR 119	0.407	0.0
VAR 120	0.121	0.096
VAR 121	0.090	0.045

*See Table 9 for translation of variable numbers to items in Core Battery.

Table 15

Estimated True-Score Correlations for Low Readers*
(N = 3,265)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Social Studies	1.000							
(2) Mathematics	.463	1.000						
(3) Lit/Fine Arts	.570	.530	1.000					
(4) Science	.738	.674	.677	1.000				
(5) Prof Knowledge	.549	.593	.678	.735	1.000			
(6) Listening	.518	.589	.673	.688	.809	1.000		
(7) Reading	-.069	.112	.163	-.094	.063	.285	1.000	
(8) Writing (m/c)	.439	.643	.695	.642	.765	.784	.158	1.000

General Knowledge: (1)–(4). Communication Skills: (6)–(8).

*Dotted lines enclose correlations that should be high compared with correlations outside of the dotted lines in order for the test to be valid as a measure of three constructs: Communication Skills, General Knowledge, and Professional Knowledge. High correlations inside the lines would indicate convergent validity; low correlations outside the lines would indicate discriminant validity.

Appendix A

Intercorrelations of Variables Analyzed, by Subgroup

Definitions of Variables in Matrices

READ-1	Number of even-numbered items answered right in Reading test
READ-2	Number of odd-numbered items answered right in Reading test
LIST-1	Number of even-numbered items answered right in Listening test
LIST-2	Number of odd-numbered items answered right in Listening test
WRITE-1	Number of even-numbered items answered right in multiple-choice writing test
WRITE-2	Number of odd-numbered items answered right in multiple-choice writing test
LITART-1	Number of even-numbered items answered right in Literature and Fine Arts test
LITART-2	Number of odd-numbered items answered right in Literature and Fine Arts test
SCI-1	Number of even-numbered items answered right in Science test
SCI-2	Number of odd-numbered items answered right in Science test
SOCSTD-1	Number of even-numbered items answered right in Social Studies test
SOCSTD-2	Number of odd-numbered items answered right in Social Studies test
PROFKN-1	Number of items answered right in first Professional Knowledge test
PROFKN-2	Number of items answered right in second Professional Knowledge test
PROFKN-3	Number of items answered right in third Professional Knowledge test
ESSAY-1	Essay score assigned by first rater
ESSAY-2	Essay score assigned by second rater
MATH-1	Number of even-numbered items answered right in Mathematics test
MATH-2	Number of odd-numbered items answered right in Mathematics test
GPA	Self-reported grade-point average

Correlation Matrix for White Males

N = 791

CORRELATION MATRIX TO BE ANALYZED

	READ-1	READ-2	LIST-1	LIST-2	WRITE-1	WRITE-2	LITART-1	LITART-2	SCI-1	SCI-2
READ-1	1.000									
READ-2	0.693	1.000								
LIST-1	0.637	0.617	1.000							
LIST-2	0.637	0.591	0.696	1.000						
WRITE-1	0.634	0.596	0.549	0.562	1.000					
WRITE-2	0.647	0.630	0.549	0.564	0.730	1.000				
LITART-1	0.639	0.649	0.598	0.603	0.617	0.625	1.000			
LITART-2	0.624	0.616	0.569	0.587	0.608	0.618	0.734	1.000		
SCI-1	0.599	0.567	0.524	0.521	0.493	0.519	0.574	0.541	1.000	
SCI-2	0.641	0.628	0.554	0.580	0.575	0.591	0.672	0.617	0.665	1.000
SOCSTD-1	0.610	0.611	0.563	0.597	0.543	0.567	0.672	0.629	0.586	0.667
SOCSTD-2	0.664	0.641	0.590	0.605	0.578	0.600	0.661	0.615	0.570	0.639
PROFKN-1	0.661	0.667	0.606	0.623	0.604	0.630	0.693	0.634	0.582	0.666
PROFKN-2	0.675	0.657	0.583	0.589	0.587	0.606	0.673	0.613	0.554	0.680
PROFKN-3	0.651	0.639	0.554	0.568	0.577	0.601	0.635	0.605	0.572	0.662
ESSAY-1	0.426	0.379	0.368	0.370	0.479	0.445	0.410	0.399	0.316	0.352
ESSAY-2	0.418	0.391	0.386	0.357	0.472	0.445	0.436	0.430	0.297	0.355
MATH-1	0.531	0.514	0.513	0.505	0.506	0.493	0.530	0.513	0.601	0.608
MATH-2	0.551	0.535	0.503	0.484	0.501	0.501	0.485	0.505	0.553	0.564
GPA	0.304	0.299	0.304	0.262	0.314	0.326	0.323	0.317	0.308	0.309

CORRELATION MATRIX TO BE ANALYZED

	SOCSTD-1	SOCSTD-2	PROFKN-1	PROFKN-2	PROFKN-3	ESSAY-1	ESSAY-2	MATH-1	MATH-2	GPA
SOCSTD-1	1.000									
SOCSTD-2	0.711	1.000								
PROFKN-1	0.648	0.659	1.000							
PROFKN-2	0.651	0.656	0.762	1.000						
PROFKN-3	0.641	0.629	0.778	0.782	1.000					
ESSAY-1	0.359	0.389	0.407	0.420	0.402	1.000				
ESSAY-2	0.353	0.410	0.406	0.411	0.405	0.578	1.000			
MATH-1	0.538	0.533	0.529	0.477	0.510	0.317	0.290	1.000		
MATH-2	0.531	0.523	0.485	0.468	0.491	0.299	0.301	0.685	1.000	
GPA	0.312	0.334	0.358	0.369	0.369	0.238	0.218	0.237	0.199	1.000

A-3

Correlation Matrix for White Females

N = 3,797

CORRELATION MATRIX TO BE ANALYZED

	READ-1	READ-2	LIST-1	LIST-2	WRITE-1	WRITE-2	LITART-1	LITART-2	SCI-1	SCI-2
READ-1	1.000									
READ-2	0.648	1.000								
LIST-1	0.613	0.559	1.000							
LIST-2	0.609	0.569	0.654	1.000						
WRITE-1	0.576	0.541	0.534	0.525	1.000					
WRITE-2	0.581	0.546	0.541	0.538	0.715	1.000				
LITART-1	0.601	0.584	0.564	0.550	0.588	0.611	1.000			
LITART-2	0.550	0.530	0.502	0.491	0.548	0.567	0.666	1.000		
SCI-1	0.496	0.463	0.441	0.438	0.444	0.470	0.516	0.477	1.000	
SCI-2	0.580	0.548	0.518	0.521	0.533	0.557	0.603	0.538	0.571	1.000
SOCSTD-1	0.556	0.533	0.520	0.506	0.506	0.528	0.590	0.525	0.503	0.579
SOCSTD-2	0.568	0.538	0.518	0.521	0.529	0.545	0.608	0.549	0.493	0.577
PROFKN-1	0.617	0.603	0.565	0.553	0.551	0.576	0.618	0.561	0.498	0.589
PROFKN-2	0.602	0.580	0.528	0.529	0.531	0.556	0.590	0.541	0.503	0.592
PROFKN-3	0.607	0.593	0.550	0.550	0.543	0.565	0.598	0.525	0.520	0.602
ESSAY-1	0.295	0.282	0.261	0.274	0.324	0.349	0.314	0.289	0.211	0.257
ESSAY-2	0.288	0.262	0.263	0.265	0.334	0.330	0.302	0.292	0.230	0.259
MATH-1	0.541	0.476	0.489	0.499	0.480	0.502	0.490	0.458	0.475	0.554
MATH-2	0.531	0.454	0.466	0.469	0.486	0.503	0.457	0.428	0.458	0.511
GPA	0.353	0.314	0.298	0.289	0.314	0.324	0.325	0.304	0.287	0.331

CORRELATION MATRIX TO BE ANALYZED

	SOCSTD-1	SOCSTD-2	PROFKN-1	PROFKN-2	PROFKN-3	ESSAY-1	ESSAY-2	MATH-1	MATH-2	GPA
SOCSTD-1	1.000									
SOCSTD-2	0.624	1.000								
PROFKN-1	0.568	0.588	1.000							
PROFKN-2	0.557	0.573	0.703	1.000						
PROFKN-3	0.579	0.588	0.709	0.715	1.000					
ESSAY-1	0.246	0.267	0.281	0.262	0.255	1.000				
ESSAY-2	0.261	0.257	0.295	0.269	0.274	0.492	1.000			
MATH-1	0.497	0.484	0.482	0.482	0.497	0.226	0.203	1.000		
MATH-2	0.473	0.467	0.465	0.455	0.472	0.252	0.236	0.652	1.000	
GPA	0.311	0.322	0.371	0.369	0.393	0.186	0.145	0.289	0.272	1.000

Correlation Matrix for Black Males

N = 97

CORRELATION MATRIX TO BE ANALYZED

	READ-1	READ-2	LIST-1	LIST-2	WRITE-1	WRITE-2	LITART-1	LITART-2	SCI-1	SCI-2
READ-1	1.000									
READ-2	0.561	1.000								
LIST-1	0.561	0.607	1.000							
LIST-2	0.516	0.489	0.575	1.000						
WRITE-1	0.523	0.399	0.454	0.416	1.000					
WRITE-2	0.355	0.357	0.492	0.466	0.625	1.000				
LITART-1	0.439	0.497	0.428	0.461	0.445	0.383	1.000			
LITART-2	0.516	0.570	0.539	0.497	0.572	0.470	0.642	1.000		
SCI-1	0.512	0.497	0.497	0.497	0.352	0.282	0.400	0.473	1.000	
SCI-2	0.419	0.337	0.527	0.459	0.487	0.406	0.504	0.491	0.480	1.000
SOCSTO-1	0.431	0.523	0.510	0.541	0.442	0.409	0.530	0.467	0.512	0.375
SOCSTO-2	0.655	0.521	0.535	0.501	0.510	0.392	0.536	0.551	0.561	0.439
PROFKN-1	0.524	0.476	0.488	0.434	0.511	0.484	0.486	0.632	0.507	0.368
PROFKN-2	0.449	0.582	0.531	0.427	0.531	0.390	0.460	0.608	0.609	0.450
PROFKN-3	0.543	0.466	0.567	0.429	0.550	0.415	0.562	0.582	0.529	0.492
ESSAY-1	0.307	0.222	0.188	0.123	0.293	0.245	0.112	0.200	0.259	0.125
ESSAY-2	0.337	0.232	0.247	0.172	0.357	0.412	0.248	0.240	0.186	0.223
MATH-1	0.399	0.432	0.517	0.437	0.408	0.264	0.315	0.429	0.454	0.457
MATH-2	0.463	0.423	0.533	0.436	0.548	0.402	0.326	0.474	0.511	0.469
GPA	0.239	0.200	0.193	0.305	0.278	0.313	0.197	0.224	0.128	0.264

CORRELATION MATRIX TO BE ANALYZED

	SOCSTO-1	SOCSTO-2	PROFKN-1	PROFKN-2	PROFKN-3	ESSAY-1	ESSAY-2	MATH-1	MATH-2	GPA
SOCSTO-1	1.000									
SOCSTO-2	0.591	1.000								
PROFKN-1	0.551	0.627	1.000							
PROFKN-2	0.588	0.586	0.641	1.000						
PROFKN-3	0.480	0.591	0.685	0.661	1.000					
ESSAY-1	0.280	0.172	0.270	0.346	0.232	1.000				
ESSAY-2	0.217	0.205	0.279	0.361	0.346	0.640	1.000			
MATH-1	0.401	0.397	0.251	0.401	0.323	0.291	0.157	1.000		
MATH-2	0.434	0.440	0.347	0.469	0.382	0.276	0.258	0.674	1.000	
GPA	0.179	0.162	0.160	0.145	0.145	0.153	0.190	0.134	0.202	1.000

A-5

Correlation Matrix for Black Females

N = 498

CORRELATION MATRIX TO BE ANALYZED

	READ-1	READ-2	LIST-1	LIST-2	WRITE-1	WRITE-2	LITART-1	LITART-2	SCI-1	SCI-2
READ-1	1.000									
READ-2	0.604	1.000								
LIST-1	0.606	0.564	1.000							
LIST-2	0.582	0.564	0.677	1.000						
WRITE-1	0.602	0.530	0.520	0.548	1.000					
WRITE-2	0.570	0.509	0.504	0.493	0.641	1.000				
LITART-1	0.613	0.559	0.536	0.600	0.560	0.502	1.000			
LITART-2	0.584	0.528	0.487	0.532	0.535	0.535	0.623	1.000		
SCI-1	0.462	0.456	0.460	0.481	0.474	0.406	0.502	0.458	1.000	
SCI-2	0.507	0.455	0.457	0.474	0.466	0.410	0.508	0.446	0.476	1.000
SOCSTD-1	0.552	0.524	0.508	0.510	0.504	0.434	0.529	0.513	0.468	0.511
SOCSTD-2	0.583	0.573	0.514	0.528	0.525	0.495	0.587	0.528	0.493	0.498
PROFKN-1	0.621	0.606	0.589	0.603	0.586	0.558	0.590	0.589	0.483	0.516
PROFKN-2	0.645	0.610	0.583	0.625	0.601	0.554	0.591	0.571	0.443	0.507
PROFKN-3	0.606	0.586	0.563	0.556	0.552	0.508	0.534	0.501	0.418	0.523
ESSAY-1	0.482	0.474	0.391	0.396	0.446	0.393	0.367	0.386	0.305	0.273
ESSAY-2	0.436	0.385	0.304	0.349	0.368	0.356	0.345	0.385	0.261	0.272
MATH-1	0.450	0.348	0.398	0.412	0.406	0.326	0.371	0.385	0.364	0.377
MATH-2	0.428	0.366	0.407	0.435	0.445	0.372	0.438	0.425	0.346	0.411
GPA	0.202	0.220	0.155	0.179	0.249	0.239	0.194	0.229	0.117	0.181

CORRELATION MATRIX TO BE ANALYZED

	SOCSTD-1	SOCSTD-2	PROFKN-1	PROFKN-2	PROFKN-3	ESSAY-1	ESSAY-2	MATH-1	MATH-2	GPA
SOCSTD-1	1.000									
SOCSTD-2	0.568	1.000								
PROFKN-1	0.536	0.566	1.000							
PROFKN-2	0.531	0.586	0.718	1.000						
PROFKN-3	0.517	0.559	0.711	0.694	1.000					
ESSAY-1	0.320	0.416	0.465	0.456	0.433	1.000				
ESSAY-2	0.271	0.318	0.364	0.391	0.378	0.587	1.000			
MATH-1	0.367	0.341	0.423	0.404	0.355	0.279	0.201	1.000		
MATH-2	0.398	0.393	0.446	0.404	0.363	0.307	0.290	0.476	1.000	
GPA	0.160	0.177	0.254	0.243	0.298	0.189	0.148	0.087	0.161	1.000

Appendix B: Tetrachoric Correlations Among Items (N = 13,059)

		1 GKSS 1	2 GKSS 3	3 GKSS 5	4 GKSS 7	5 GKSS 9	6 GKSS 11	7 GKSS 13	8 GKSS 15	9 GKSS 17	10 GKSS 19	11 GKSS 21	12 GKSS 23
1	GKSS 1	1.000											
2	GKSS 3	0.104	1.000										
3	GKSS 5	0.186	0.228	1.000									
4	GKSS 7	0.030	0.086	0.098	1.000								
5	GKSS 9	0.178	0.172	0.227	0.096	1.000							
6	GKSS 11	0.123	0.152	0.274	0.098	0.175	1.000						
7	GKSS 13	0.193	0.180	0.258	0.066	0.261	0.201	1.000					
8	GKSS 15	0.144	0.181	0.390	0.092	0.192	0.189	0.232	1.000				
9	GKSS 17	0.306	0.224	0.345	0.168	0.396	0.286	0.373	0.284	1.000			
10	GKSS 19	0.133	0.163	0.276	0.063	0.202	0.147	0.226	0.180	0.330	1.000		
11	GKSS 21	0.175	0.192	0.319	0.125	0.311	0.250	0.276	0.316	0.445	0.234	1.000	
12	GKSS 23	0.191	0.194	0.376	0.122	0.235	0.247	0.266	0.262	0.386	0.250	0.[illegible]20	1.000
13	GKSS 25	0.125	0.152	0.240	0.094	0.164	0.183	0.169	0.182	0.290	0.177	0.265	0.239
14	GKSS 27	0.152	0.134	0.221	0.105	0.181	0.204	0.240	0.218	0.336	0.158	0.258	0.265
15	GKSS 29	0.099	0.168	0.266	0.091	0.073	0.131	0.133	0.195	0.130	0.134	0.159	0.186
16	GKM 1	0.101	0.107	0.174	0.128	0.117	0.130	0.124	0.149	0.216	0.123	0.184	0.219
17	GKM 3	0.132	0.184	0.383	0.137	0.055	0.219	0.196	0.310	0.202	0.147	0.230	0.329
18	GKM 5	0.072	0.071	0.124	0.111	0.078	0.109	0.069	0.057	0.188	0.061	0.094	0.133
19	GKM 6	0.081	0.142	0.241	0.136	0.068	0.142	0.136	0.174	0.186	0.151	0.159	0.245
20	GKM 8	0.052	0.025	0.030	0.076	0.052	0.053	0.079	0.062	0.133	0.039	0.103	0.072
21	GKM 10	0.114	0.141	0.272	0.122	0.099	0.163	0.138	0.248	0.236	0.176	0.248	0.295
22	GKM 11	0.038	0.102	0.198	0.078	0.057	0.121	0.098	0.189	0.119	0.104	0.139	0.169
23	GKM 13	0.158	0.121	0.232	0.179	0.211	0.208	0.167	0.199	0.307	0.169	0.254	0.269
24	GKM 15	0.118	0.123	0.209	0.142	0.143	0.133	0.133	0.197	0.227	0.143	0.175	0.224
25	GKM 16	0.075	0.155	0.262	0.100	0.057	0.144	0.109	0.232	0.147	0.095	0.142	0.215
26	GKM 18	0.120	0.118	0.260	0.159	0.125	0.148	0.129	0.199	0.222	0.160	0.204	0.247
27	GKM 20	0.091	0.097	0.194	0.123	0.088	0.113	0.101	0.168	0.195	0.112	0.151	0.212
28	GKM 21	0.100	0.161	0.228	0.161	0.112	0.206	0.141	0.216	0.263	0.134	0.216	0.263
29	GKM 23	0.128	0.141	0.253	0.165	0.132	0.199	0.178	0.218	0.309	0.155	0.234	0.296
30	GKM 25	0.067	0.081	0.164	0.080	0.031	0.087	0.074	0.167	0.097	0.035	0.083	0.149
31	GKL 1	0.146	0.124	0.250	0.066	0.111	0.100	0.123	0.161	0.180	0.117	0.174	0.165
32	GKL 3	0.096	0.139	0.248	0.050	0.121	0.123	0.159	0.204	0.233	0.178	0.169	0.187
33	GKL 7	0.094	0.137	0.253	0.052	0.094	0.148	0.150	0.212	0.166	0.171	0.189	0.179
34	GKL 8	0.107	0.131	0.178	0.073	0.163	0.146	0.157	0.159	0.268	0.133	0.205	0.187
35	GKL 11	0.125	0.115	0.223	0.059	0.160	0.123	0.138	0.163	0.260	0.174	0.184	0.184
36	GKL 13	0.170	0.190	0.311	0.091	0.182	0.161	0.179	0.229	0.324	0.204	0.245	0.267
37	GKL 16	0.120	0.128	0.282	0.069	0.143	0.150	0.125	0.252	0.216	0.128	0.190	0.231
38	GKL 18	0.153	0.173	0.340	0.084	0.198	0.209	0.173	0.263	0.284	0.206	0.251	0.278
39	GKL 21	0.098	0.118	0.192	0.084	0.086	0.069	0.128	0.123	0.185	0.133	0.141	0.137
40	GKL 23	0.085	0.033	0.077	0.060	0.077	0.071	0.065	0.095	0.142	0.108	0.073	0.089
41	GKL 26	0.122	0.119	0.236	0.056	0.157	0.125	0.125	0.188	0.209	0.131	0.156	0.185
42	GKL 28	0.144	0.136	0.212	0.040	0.102	0.127	0.130	0.193	0.211	0.154	0.152	0.175
43	GKL 31	0.102	0.091	0.170	0.052	0.124	0.113	0.162	0.120	0.198	0.138	0.146	0.145
44	GKL 33	0.102	0.071	0.170	0.053	0.072	0.083	0.064	0.120	0.110	0.090	0.126	0.132
45	GKS 1	0.090	0.112	0.209	0.066	0.107	0.099	0.105	0.155	0.168	0.122	0.154	0.153
46	GKS 3	0.091	0.090	0.189	0.089	0.100	0.104	0.076	0.171	0.164	0.108	0.126	0.142
47	GKS 5	0.145	0.174	0.380	0.120	0.211	0.248	0.198	0.308	0.343	0.239	0.318	0.317
48	GKS 7	0.076	0.053	0.079	0.068	0.091	0.088	0.047	0.049	0.160	0.088	0.129	0.116
49	GKS 9	0.188	0.225	0.456	0.104	0.228	0.251	0.245	0.353	0.354	0.261	0.352	0.365
50	GKS 11	0.154	0.127	0.288	0.100	0.205	0.167	0.196	0.207	0.298	0.179	0.262	0.266
51	GKS 13	0.109	0.125	0.218	0.080	0.093	0.090	0.075	0.146	0.137	0.098	0.118	0.124
52	GKS 15	0.143	0.148	0.285	0.091	0.182	0.240	0.193	0.270	0.323	0.163	0.248	0.291
53	GKS 17	0.077	0.111	0.264	0.075	0.136	0.170	0.139	0.259	0.227	0.153	0.242	0.225
54	GKS 19	0.136	0.173	0.301	0.102	0.173	0.207	0.174	0.233	0.311	0.179	0.246	0.240
55	GKS 21	0.068	0.019	0.078	0.092	0.062	0.088	0.071	0.051	0.139	0.074	0.093	0.106
56	GKS 23	-0.008	-0.007	-0.043	-0.004	-0.015	-0.055	-0.022	-0.067	-0.061	-0.015	-0.014	-0.061
57	GKS 25	0.132	0.159	0.324	0.091	0.174	0.194	0.202	0.304	0.259	0.184	0.270	0.240
58	GKS 27	0.105	0.100	0.218	0.093	0.137	0.121	0.115	0.145	0.206	0.151	0.150	0.193
59	GKS 29	0.117	0.095	0.263	0.098	0.133	0.141	0.091	0.178	0.198	0.142	0.186	0.180
60	PK 1	0.125	0.179	0.300	0.084	0.086	0.135	0.114	0.242	0.165	0.153	0.190	0.204
61	PK 3	0.037	0.124	0.254	0.041	0.042	0.064	0.050	0.148	0.030	0.080	0.085	0.128
62	PK 6	0.152	0.166	0.403	0.106	0.210	0.183	0.210	0.286	0.270	0.240	0.268	0.312
63	PK 8	0.087	0.081	0.208	0.067	0.080	0.092	0.115	0.170	0.150	0.132	0.136	0.139

B-2

			1 SS1	2 SS3	3 SS5	4 SS7	5 SS9	6 SS11	7 SS13	8 SS15	9 SS17	10 SS19	11 SS21	12 SS23
64	PK	11	0.100	0.160	0.231	0.023	0.110	0.111	0.107	0.161	0.171	0.105	0.120	0.158
65	PK	13	0.103	0.172	0.256	0.051	0.071	0.099	0.114	0.172	0.181	0.136	0.137	0.180
66	PK	16	0.120	0.157	0.336	0.091	0.098	0.162	0.128	0.222	0.223	0.188	0.184	0.238
67	PK	18	0.153	0.210	0.407	0.091	0.181	0.232	0.182	0.330	0.313	0.226	0.261	0.289
68	PK	21	0.056	0.078	0.159	0.005	0.060	0.076	0.085	0.063	0.078	0.080	0.069	0.092
69	PK	23	0.074	0.097	0.104	0.068	0.061	0.091	0.103	0.088	0.169	0.122	0.156	0.122
70	PK	26	0.108	0.135	0.242	0.078	0.113	0.138	0.147	0.178	0.226	0.150	0.178	0.218
71	PK	28	0.123	0.099	0.270	0.117	0.112	0.137	0.109	0.165	0.201	0.120	0.169	0.201
72	PK	31	0.120	0.127	0.260	0.093	0.147	0.100	0.116	0.180	0.209	0.150	0.178	0.208
73	PK	33	0.089	0.092	0.177	0.013	0.068	0.064	0.063	0.129	0.077	0.099	0.098	0.095
74	CSL	1	0.078	0.056	0.198	0.081	0.074	0.113	0.094	0.196	0.157	0.103	0.138	0.185
73	CSL	3	0.029	0.064	0.159	0.036	0.067	0.050	0.071	0.107	0.125	0.083	0.102	0.077
76	CSL	6	0.113	0.143	0.319	0.132	0.049	0.131	0.159	0.265	0.103	0.184	0.152	0.201
77	CSL	8	0.079	0.107	0.256	0.052	0.061	0.096	0.086	0.196	0.116	0.104	0.144	0.168
78	CSL	11	0.173	0.188	0.366	0.092	0.162	0.190	0.177	0.277	0.272	0.193	0.227	0.247
79	CSL	13	0.128	0.150	0.340	0.092	0.134	0.177	0.153	0.235	0.267	0.203	0.220	0.285
80	CSL	16	0.124	0.126	0.229	0.078	0.111	0.133	0.086	0.180	0.216	0.188	0.160	0.166
81	CSL	18	0.064	0.121	0.220	0.076	0.080	0.109	0.088	0.178	0.076	0.118	0.139	0.116
82	CSL	21	0.094	0.102	0.171	0.026	0.091	0.100	0.084	0.123	0.191	0.120	0.141	0.123
83	CSL	23	0.110	0.149	0.264	0.084	0.109	0.136	0.126	0.210	0.193	0.126	0.173	0.225
84	CSL	26	0.129	0.166	0.328	0.066	0.047	0.154	0.138	0.243	0.163	0.141	0.174	0.198
85	CSL	28	0.054	0.032	0.052	0.044	0.028	0.034	0.046	0.050	0.071	0.023	0.045	0.046
86	CSL	31	0.094	0.181	0.300	0.098	0.055	0.165	0.114	0.226	0.163	0.147	0.139	0.216
87	CSL	33	0.145	0.155	0.342	0.043	0.132	0.159	0.163	0.267	0.192	0.166	0.196	0.225
88	CSL	36	0.100	0.142	0.318	0.092	0.125	0.171	0.173	0.217	0.245	0.165	0.216	0.233
89	CSL	38	0.106	0.145	0.335	0.088	0.150	0.194	0.156	0.239	0.249	0.147	0.216	0.257
90	CSR	1	0.038	0.052	0.038	-0.006	-0.015	0.015	0.042	0.057	0.045	0.009	0.028	0.030
91	CSR	3	0.158	0.186	0.381	0.078	0.161	0.202	0.156	0.278	0.238	0.220	0.273	0.264
92	CSR	5	0.120	0.149	0.309	0.100	0.165	0.124	0.162	0.237	0.295	0.173	0.225	0.244
93	CSR	7	0.101	0.080	0.108	0.033	0.085	0.072	0.090	0.102	0.136	0.081	0.091	0.129
94	CSR	9	0.118	0.174	0.369	0.106	0.160	0.165	0.160	0.295	0.262	0.213	0.236	0.254
95	CSR	11	0.164	0.228	0.417	0.092	0.169	0.206	0.175	0.317	0.269	0.270	0.304	0.320
96	CSR	13	0.117	0.124	0.304	0.056	0.134	0.139	0.148	0.219	0.248	0.187	0.231	0.226
97	CSR	15	0.108	0.104	0.160	0.064	0.141	0.101	0.150	0.115	0.231	0.131	0.145	0.160
98	CSR	17	0.110	0.102	0.205	0.058	0.120	0.099	0.098	0.170	0.210	0.151	0.148	0.166
99	CSR	19	0.103	0.138	0.311	0.053	0.097	0.170	0.129	0.203	0.191	0.136	0.198	0.235
100	CSR	21	0.169	0.207	0.406	0.111	0.135	0.203	0.175	0.333	0.221	0.229	0.296	0.325
101	CSR	23	0.111	0.106	0.285	0.066	0.083	0.109	0.103	0.200	0.154	0.149	0.156	0.214
102	CSR	25	0.097	0.124	0.340	0.060	0.093	0.133	0.111	0.218	0.180	0.169	0.188	0.208
103	CSR	27	0.139	0.149	0.317	0.120	0.101	0.165	0.143	0.212	0.233	0.185	0.224	0.262
104	CSR	29	0.090	0.105	0.211	0.066	0.075	0.055	0.085	0.174	0.102	0.095	0.088	0.162
105	CSW	1	0.139	0.147	0.358	0.078	0.071	0.142	0.085	0.239	0.211	0.163	0.155	0.200
106	CSW	4	0.093	0.083	0.214	0.075	0.075	0.107	0.070	0.182	0.148	0.098	0.123	0.146
107	CSW	7	0.072	0.091	0.176	0.030	0.108	0.116	0.110	0.114	0.215	0.102	0.144	0.130
108	CSW	10	0.117	0.111	0.137	0.056	0.097	0.082	0.126	0.090	0.198	0.108	0.117	0.142
109	CSW	13	0.106	0.092	0.201	0.070	0.120	0.115	0.139	0.161	0.214	0.129	0.140	0.169
110	CSW	16	0.088	0.101	0.168	0.018	0.090	0.077	0.084	0.115	0.155	0.115	0.082	0.109
111	CSW	19	0.091	0.072	0.166	0.060	0.070	0.073	0.103	0.149	0.163	0.122	0.135	0.095
112	CSW	22	0.097	0.080	0.149	0.077	0.033	0.092	0.069	0.117	0.136	0.094	0.129	0.126
113	CSW	25	0.124	0.110	0.154	0.070	0.105	0.110	0.112	0.166	0.213	0.133	0.143	0.145
114	CSW	28	0.131	0.197	0.314	0.089	0.114	0.165	0.170	0.266	0.243	0.190	[illegible]	0.227
115	CSW	31	0.114	0.163	0.293	0.072	0.130	0.135	0.136	0.203	0.239	0.172	0.170	0.187
116	CSW	34	0.160	0.176	0.364	0.048	0.117	0.156	0.128	0.256	0.170	0.203	0.195	0.226
117	CSW	37	0.140	0.131	0.272	0.079	0.137	0.134	0.156	0.189	0.256	0.168	0.210	0.210
118	CSW	40	0.113	0.154	0.221	0.039	0.071	0.117	0.124	0.169	0.197	0.166	0.132	0.192
119	CSW	43	0.089	0.147	0.226	0.060	0.073	0.079	0.124	0.184	0.182	0.162	0.126	0.174

		13 GKSS 25	14 GKSS 27	15 GKSS 29	16 GKM 1	17 GKM 3	18 GKM 5	19 GKM 6	20 GKM 8	21 GKM 10	22 GKM 11	23 GKM 13	24 GKM 15
13	GKSS 25	1.000											
14	GKSS 27	0.166	1.000										
15	GKSS 29	0.145	[illegible]	1.000									
16	GKM 1	0.163	0.136	0.128	1.000								
17	GKM 3	0.240	0.177	0.252	0.278	1.000							
18	GKM 5	0.132	0.118	0.058	0.210	0.173	1.000						
19	GKM 6	0.178	0.128	0.158	0.246	0.386	0.165	1.000					
20	GKM 8	0.084	0.085	0.029	0.093	0.067	0.119	0.095	1.000				
21	GKM 10	0.207	0.201	0.200	0.330	0.475	0.199	0.387	0.105	1.000			
22	GKM 11	0.125	0.119	0.190	0.180	0.370	0.122	0.227	0.060	0.316	1.000		
23	GKM 13	0.215	0.196	0.152	0.397	0.334	0.276	0.317	0.191	0.395	0.236	1.000	
24	GKM 15	0.179	0.159	0.112	0.291	0.278	0.204	0.238	0.169	0.324	0.185	0.391	1.000
25	GKM 16	0.168	0.120	0.181	0.153	0.417	0.107	0.235	0.103	0.316	0.235	0.178	0.209
26	GKM 18	0.189	0.161	0.179	0.268	0.336	0.193	0.269	0.149	0.342	0.237	0.351	0.307
27	GKM 20	0.121	0.118	0.090	0.253	0.307	0.144	0.230	0.103	0.281	0.198	0.291	0.256
28	GKM 21	0.233	0.190	0.143	0.287	0.423	0.214	0.318	0.145	0.380	0.245	0.343	0.317
29	GKM 23	0.242	0.216	0.160	0.269	0.362	0.243	0.272	0.159	0.343	0.257	0.405	0.359
30	GKM 25	0.119	0.120	0.159	0.167	0.298	0.089	0.224	0.082	0.258	0.180	0.175	0.169
31	GKL 1	0.121	0.121	0.131	0.117	0.196	0.103	0.113	0.093	0.166	0.128	0.170	0.127
32	GKL 3	0.136	0.128	0.148	0.171	0.216	0.069	0.159	0.043	0.177	0.101	0.162	0.131
33	GKL 7	0.188	0.158	0.222	0.140	0.293	0.060	0.162	0.033	0.197	0.187	0.184	0.129
34	GKL 8	0.142	0.158	0.148	0.146	0.190	0.123	0.123	0.095	0.145	0.118	0.210	0.153
35	GKL 11	0.118	0.114	0.110	0.132	0.171	0.090	0.090	0.042	0.142	0.075	0.168	0.127
36	GKL 13	0.193	0.158	0.175	0.188	0.283	0.103	0.181	0.060	0.246	0.148	0.232	0.164
37	GKL 16	0.172	0.143	0.167	0.139	0.282	0.098	0.183	0.044	0.178	0.133	0.210	0.165
38	GKL 18	0.192	0.170	0.169	0.179	0.254	0.124	0.163	0.054	0.215	0.147	0.242	0.192
39	GKL 21	0.137	0.104	0.120	0.145	0.193	0.081	0.109	0.068	0.158	0.086	0.129	0.137
40	GKL 23	0.054	0.064	0.051	0.091	0.111	0.070	0.069	0.036	0.092	0.047	0.087	0.077
41	GKL 26	0.156	0.146	0.142	0.132	0.218	0.080	0.124	0.036	0.168	0.124	0.177	0.143
42	GKL 28	0.141	0.105	0.220	0.118	0.228	0.067	0.142	0.044	0.165	0.102	0.164	0.137
43	GKL 31	0.100	0.125	0.110	0.075	0.122	0.020	0.080	0.034	0.140	0.041	0.096	0.076
44	GKL 33	0.111	0.095	0.197	0.117	0.213	0.052	0.107	0.058	0.202	0.125	0.176	0.112
45	GKS 1	0.150	0.085	0.132	0.132	0.194	0.076	0.090	0.055	0.157	0.091	0.152	0.113
46	GKS 3	0.127	0.110	0.131	0.126	0.230	0.112	0.127	0.027	0.152	0.105	0.172	0.135
47	GKS 5	0.232	0.227	0.194	0.227	0.369	0.143	0.270	0.095	0.337	0.227	0.351	0.280
48	GKS 7	0.073	0.091	0.057	0.116	0.105	0.081	0.137	0.071	0.137	0.061	0.132	0.116
49	GKS 9	0.291	0.246	0.274	0.253	0.404	0.141	0.252	0.093	0.354	0.245	0.320	0.259
50	GKS 11	0.231	0.212	0.160	0.189	0.250	0.116	0.179	0.123	0.263	0.154	0.273	0.205
51	GKS 13	0.110	0.074	0.145	0.112	0.199	0.062	0.146	0.024	0.153	0.112	0.176	0.128
52	GKS 15	0.197	0.222	0.168	0.127	0.274	0.100	0.160	0.092	0.226	0.163	0.231	0.169
53	GKS 17	0.153	0.169	0.142	0.163	0.324	0.092	0.160	0.058	0.253	0.154	0.210	0.179
54	GKS 19	0.201	0.196	0.130	0.168	0.263	0.158	0.173	0.075	0.197	0.141	0.229	0.169
55	GKS 21	0.097	0.098	0.067	0.145	0.093	0.103	0.111	0.111	0.140	0.071	0.197	0.155
56	GKS 23	-0.011	-0.054	0.030	-0.028	0.020	-0.021	-0.002	0.022	-0.014	-0.004	-0.045	-0.035
57	GKS 25	0.220	0.191	0.203	0.167	0.330	0.107	0.242	0.078	0.282	0.196	0.235	0.198
58	GKS 27	0.160	0.124	0.113	0.143	0.167	0.097	0.132	0.049	0.181	0.102	0.184	0.157
59	GKS 29	0.170	0.119	0.140	0.181	0.191	0.131	0.196	0.082	0.216	0.180	0.259	0.201
60	PK 1	0.179	0.122	0.218	0.144	0.354	0.085	0.196	0.067	0.243	0.194	0.187	0.167
61	PK 3	0.081	0.045	0.123	0.121	0.226	0.065	0.131	0.011	0.173	0.123	0.129	0.102
62	PK 6	0.212	0.177	0.165	0.191	0.347	0.094	0.205	0.063	0.261	0.198	0.241	0.222
63	PK 8	0.155	0.063	0.167	0.129	0.229	0.069	0.159	0.050	0.212	0.155	0.168	0.145
64	PK 11	0.142	0.083	0.162	0.097	0.171	0.058	0.131	0.020	0.135	0.085	0.121	0.071
65	PK 13	0.155	0.096	0.118	0.134	0.243	0.092	0.165	0.024	0.217	0.155	0.178	0.119
66	PK 16	0.179	0.109	0.226	0.158	0.341	0.102	0.168	0.052	0.226	0.159	0.176	0.154
67	PK 18	0.252	0.141	0.215	0.208	0.359	0.126	0.245	0.046	0.269	0.201	0.278	0.219
68	PK 21	0.084	0.049	0.097	0.042	0.197	0.024	0.088	0.037	0.107	0.085	0.082	0.055
69	PK 23	0.115	0.091	0.112	0.073	0.155	0.043	0.115	0.052	0.102	0.072	0.078	0.078
70	PK 26	0.183	0.122	0.172	0.177	0.241	0.134	0.179	0.071	0.231	0.136	0.216	0.178
71	PK 28	0.174	0.107	0.139	0.139	0.231	0.116	0.188	0.040	0.205	0.106	0.212	0.159
72	PK 31	0.171	0.105	0.154	0.163	0.257	0.100	0.167	0.049	0.225	0.128	0.250	0.197
73	PK 33	0.126	0.049	0.191	0.113	0.212	0.062	0.118	0.027	0.173	0.100	0.111	0.064

			13 SS25	14 SS27	15 SS29	16 M1	17 M3	18 M5	19 M6	20 M8	21 M10	22 M11	23 M13	24 M15
74	CSL	1	0.151	0.114	0.152	0.143	0.267	0.063	0.175	0.044	0.195	0.170	0.157	0.156
75	CSL	5	0.076	0.057	0.047	0.095	0.106	0.062	0.084	0.040	0.074	0.054	0.122	0.082
76	CSL	6	0.173	0.140	0.221	0.126	0.341	0.111	0.221	0.007	0.212	0.178	0.170	0.141
77	CSL	8	0.145	0.057	0.196	0.127	0.270	0.061	0.188	0.005	0.230	0.201	0.191	0.123
78	CSL	11	0.219	0.156	0.196	0.177	0.328	0.144	0.186	0.037	0.241	0.184	0.222	0.207
79	CSL	13	0.213	0.151	0.135	0.175	0.281	0.145	0.235	0.029	0.248	0.176	0.258	0.206
80	CSL	16	0.158	0.085	0.099	0.196	0.246	0.119	0.182	0.043	0.233	0.157	0.225	0.208
81	CSL	18	0.113	0.067	0.140	0.076	0.193	0.051	0.111	-0.007	0.150	0.110	0.123	0.118
82	CSL	21	0.102	0.102	0.080	0.069	0.100	0.045	0.043	0.020	0.096	0.055	0.116	0.078
83	CSL	23	0.178	0.110	0.175	0.139	0.285	0.076	0.197	0.042	0.213	0.165	0.172	0.156
84	CSL	26	0.186	0.096	0.249	0.155	0.352	0.064	0.244	0.057	0.265	0.244	0.170	0.175
85	CSL	28	0.047	0.065	0.026	0.053	0.055	0.044	0.038	0.009	0.078	0.031	0.048	0.026
86	CSL	51	0.182	0.133	0.194	0.150	0.343	0.052	0.259	0.033	0.277	0.256	0.200	0.210
87	CSL	33	0.190	0.101	0.221	0.153	0.259	0.055	0.161	0.026	0.230	0.163	0.185	0.142
88	CSL	36	0.185	0.146	0.162	0.145	0.267	0.071	0.179	0.056	0.236	0.154	0.180	0.151
89	CSL	38	0.213	0.156	0.162	0.167	0.272	0.081	0.217	0.040	0.226	0.149	0.175	0.174
90	CSR	1	0.058	0.020	0.018	0.016	0.062	0.033	0.022	-0.005	0.062	0.045	0.012	0.012
91	CSR	3	0.186	0.106	0.216	0.228	0.333	0.101	0.248	0.028	0.305	0.195	0.241	0.200
92	CSR	5	0.186	0.155	0.139	0.195	0.250	0.098	0.201	0.064	0.230	0.178	0.261	0.214
93	CSR	7	0.078	0.061	0.127	0.078	0.143	0.077	0.055	0.038	0.127	0.066	0.116	0.092
94	CSR	9	0.176	0.130	0.230	0.226	0.346	0.112	0.239	0.077	0.281	0.230	0.227	0.199
95	CSR	11	0.248	0.191	0.209	0.242	0.391	0.094	0.268	0.048	0.304	0.202	0.279	0.217
96	CSR	13	0.198	0.176	0.185	0.144	0.237	0.066	0.173	0.034	0.221	0.134	0.210	0.156
97	CSR	15	0.147	0.113	0.063	0.140	0.176	0.109	0.142	0.035	0.145	0.103	0.176	0.176
98	CSR	17	0.141	0.106	0.096	0.131	0.208	0.108	0.146	0.052	0.199	0.138	0.164	0.170
99	CSR	19	0.181	0.136	0.182	0.157	0.296	0.101	0.231	0.044	0.285	0.152	0.256	0.209
100	CSR	21	0.266	0.172	0.286	0.223	0.385	0.142	0.298	0.049	0.333	0.244	0.284	0.225
101	CSR	23	0.178	0.100	0.213	0.138	0.284	0.078	0.188	0.020	0.225	0.176	0.185	0.158
102	CSR	25	0.188	0.108	0.229	0.182	0.316	0.104	0.211	0.023	0.272	0.194	0.207	0.230
103	CSR	27	0.222	0.151	0.185	0.208	0.362	0.134	0.253	0.095	0.307	0.221	0.283	0.220
104	CSR	29	0.118	0.070	0.172	0.145	0.245	0.066	0.139	0.021	0.183	0.135	0.139	0.131
105	CSW	1	0.180	0.118	0.226	0.196	0.385	0.101	0.227	0.038	0.285	0.218	0.230	0.164
106	CSW	4	0.136	0.071	0.134	0.146	0.225	0.123	0.131	0.048	0.199	0.169	0.196	0.145
107	CSW	7	0.130	0.107	0.085	0.092	0.151	0.060	0.082	0.056	0.126	0.092	0.123	0.117
108	CSW	10	0.082	0.095	0.083	0.138	0.146	0.090	0.117	0.045	0.148	0.094	0.171	0.123
109	CSW	13	0.123	0.135	0.127	0.146	0.201	0.087	0.149	0.044	0.186	0.149	0.142	0.141
110	CSW	16	0.075	0.037	0.125	0.146	0.208	0.074	0.169	-0.009	0.189	0.124	0.134	0.135
111	CSW	19	0.099	0.073	0.103	0.125	0.173	0.077	0.114	0.053	0.152	0.108	0.129	0.105
112	CSW	22	0.106	0.082	0.121	0.129	0.192	0.091	0.178	0.033	0.217	0.108	0.152	0.146
113	CSW	25	0.099	0.129	0.123	0.132	0.154	0.075	0.120	0.036	0.155	0.115	0.123	0.127
114	CSW	28	0.198	0.124	0.241	0.191	0.359	0.091	0.213	0.049	0.292	0.202	0.220	0.216
115	CSW	31	0.180	0.107	0.152	0.160	0.244	0.113	0.172	0.027	0.204	0.146	0.198	0.161
116	CSW	34	0.196	0.144	0.240	0.173	0.377	0.096	0.267	0.049	0.319	0.246	0.206	0.192
117	CSW	37	0.178	0.119	0.123	0.150	0.212	0.108	0.138	0.050	0.187	0.095	0.180	0.159
118	CSW	40	0.152	0.119	0.188	0.165	0.254	0.117	0.201	0.016	0.238	0.169	0.191	0.151
119	CSW	43	0.158	0.117	0.192	0.133	0.247	0.084	0.195	0.041	0.219	0.129	0.175	0.142

BEST COPY AVAILABLE

			25 GKM 16	26 GKM 18	27 GKM 20	28 GKM 21	29 GKM 23	30 GKM 25	31 GKL 1	32 GKL 3	33 GKL 7	34 GKL 8	35 GKL 11	36 GKL 13
25	GKM	16	1.000											
26	GKM	18	0.238	1.000										
27	GKM	20	0.195	0.241	1.000									
28	GKM	21	0.295	0.318	0.299	1.000								
29	GKM	23	0.326	0.329	0.286	0.421	1.000							
30	GKM	25	0.229	0.202	0.172	0.268	0.270	1.000						
31	GKL	1	0.141	0.173	0.084	0.153	0.159	0.095	1.000					
32	GKL	3	0.162	0.148	0.109	0.144	0.153	0.091	0.121	1.000				
33	GKL	7	0.186	0.198	0.117	0.188	0.167	0.118	0.204	0.183	1.000			
34	GKL	8	0.136	0.152	0.114	0.165	0.214	0.070	0.148	0.134	0.114	1.000		
35	GKL	11	0.099	0.140	0.128	0.137	0.159	0.063	0.127	0.144	0.170	0.114	1.000	
36	GKL	13	0.234	0.192	0.157	0.222	0.207	0.121	0.179	0.213	0.219	0.161	0.198	1.000
37	GKL	16	0.187	0.168	0.134	0.170	0.214	0.095	0.179	0.167	0.144	0.176	0.129	0.228
38	GKL	18	0.190	0.210	0.171	0.196	0.225	0.105	0.145	0.190	0.193	0.159	0.187	0.270
39	GKL	21	0.128	0.143	0.110	0.141	0.154	0.119	0.086	0.133	0.173	0.094	0.115	0.184
40	GKL	23	0.076	0.110	0.053	0.076	0.098	0.052	0.034	0.056	0.001	0.087	0.089	0.087
41	GKL	26	0.126	0.184	0.129	0.148	0.219	0.122	0.167	0.140	0.167	0.139	0.146	0.181
42	GKL	28	0.109	0.163	0.106	0.148	0.152	0.130	0.163	0.156	0.167	0.107	0.163	0.242
43	GKL	31	0.078	0.116	0.064	0.072	0.111	0.112	0.114	0.089	0.118	0.074	0.100	0.146
44	GKL	33	0.136	0.160	0.125	0.152	0.159	0.158	0.112	0.098	0.165	0.114	0.103	0.175
45	GKS	1	0.133	0.134	0.101	0.144	0.155	0.073	0.120	0.147	0.177	0.103	0.132	0.177
46	GKS	3	0.173	0.134	0.088	0.134	0.153	0.039	0.077	0.076	0.110	0.071	0.115	0.134
47	GKS	5	0.226	0.306	0.217	0.273	0.313	0.175	0.206	0.204	0.245	0.189	0.202	0.281
48	GKS	7	0.076	0.124	0.116	0.105	0.131	0.037	0.092	0.059	0.073	0.082	0.073	0.103
49	GKS	9	0.299	0.288	0.206	0.295	0.320	0.165	0.189	0.265	0.280	0.205	0.221	0.315
50	GKS	11	0.181	0.205	0.151	0.229	0.244	0.102	0.129	0.145	0.177	0.130	0.125	0.193
51	GKS	13	0.112	0.130	0.121	0.120	0.124	0.107	0.078	0.097	0.157	0.064	0.061	0.171
52	GKS	15	0.189	0.183	0.151	0.215	0.242	0.111	0.122	0.155	0.184	0.149	0.116	0.179
53	GKS	17	0.182	0.207	0.163	0.211	0.187	0.112	0.162	0.133	0.146	0.103	0.119	0.134
54	GKS	19	0.172	0.194	0.143	0.216	0.255	0.091	0.146	0.146	0.156	0.190	0.137	0.221
55	GKS	21	0.096	0.156	0.085	0.140	0.170	0.057	0.053	0.041	0.072	0.100	0.072	0.119
56	GKS	23	-0.011	-0.013	-0.045	-0.030	-0.077	-0.007	0.004	-0.016	0.000	-0.042	-0.039	-0.016
57	GKS	25	0.207	0.227	0.166	0.228	0.247	0.153	0.159	0.207	0.188	0.150	0.138	0.269
58	GKS	27	0.122	0.147	0.133	0.157	0.156	0.073	0.072	0.134	0.101	0.100	0.122	0.161
59	GKS	29	0.165	0.251	0.154	0.221	0.208	0.140	0.152	0.162	0.161	0.130	0.119	0.197
60	PK	1	0.215	0.188	0.156	0.226	0.169	0.175	0.182	0.222	0.227	0.117	0.132	0.228
61	PK	3	0.126	0.137	0.083	0.088	0.137	0.099	0.132	0.124	0.174	0.076	0.100	0.167
62	PK	6	0.220	0.238	0.192	0.237	0.254	0.133	0.182	0.181	0.169	0.185	0.164	0.252
63	PK	8	0.162	0.182	0.145	0.164	0.156	0.078	0.140	0.123	0.144	0.075	0.119	0.162
64	PK	11	0.135	0.104	0.092	0.117	0.120	0.067	0.079	0.121	0.164	0.096	0.079	0.149
65	PK	13	0.174	0.168	0.130	0.157	0.181	0.087	0.139	0.136	0.178	0.136	0.110	0.188
66	PK	16	0.228	0.218	0.157	0.217	0.232	0.114	0.150	0.168	0.186	0.124	0.143	0.256
67	PK	18	0.229	0.272	0.208	0.251	0.255	0.140	0.160	0.242	0.268	0.189	0.216	0.319
68	PK	21	0.081	0.053	0.056	0.069	0.063	0.064	0.050	0.096	0.152	0.053	0.039	0.126
69	PK	23	0.056	0.097	0.097	0.112	0.112	0.090	0.054	0.057	0.115	0.067	0.071	0.112
70	PK	26	0.147	0.206	0.142	0.183	0.225	0.080	0.126	0.168	0.122	0.136	0.111	0.213
71	PK	28	0.177	0.183	0.145	0.188	0.196	0.066	0.091	0.162	0.129	0.124	0.122	0.208
72	PK	31	0.170	0.199	0.167	0.205	0.204	0.130	0.140	0.137	0.155	0.091	0.135	0.171
73	PK	33	0.090	0.109	0.090	0.108	0.093	0.136	0.132	0.091	0.166	0.099	0.060	0.129

			25 M16	26 M18	27 M20	28 M21	29 M23	30 M25	31 L1	32 L3	33 L7	34 L8	35 L11	36 L13
74	CSL	1	0.220	0.212	0.164	0.233	0.202	0.163	0.162	0.153	0.156	0.141	0.101	0.155
75	CSL	3	0.052	0.091	0.045	0.092	0.103	0.056	0.047	0.090	0.088	0.062	0.059	0.103
76	CSL	6	0.267	0.237	0.160	0.208	0.246	0.192	0.147	0.198	0.266	0.121	0.099	0.241
77	CSL	8	0.188	0.186	0.159	0.196	0.169	0.134	0.134	0.124	0.166	0.097	0.119	0.187
78	CSL	11	0.220	0.251	0.150	0.265	0.261	0.130	0.180	0.204	0.214	0.175	0.174	0.264
79	CSL	13	0.188	0.256	0.194	0.246	0.269	0.148	0.182	0.204	0.178	0.187	0.164	0.243
80	CSL	16	0.149	0.203	0.152	0.199	0.187	0.147	0.149	0.177	0.162	0.121	0.142	0.222
81	CSL	18	0.114	0.145	0.066	0.082	0.122	0.098	0.136	0.103	0.125	0.007	0.097	0.170
82	CSL	21	0.044	0.082	0.054	0.084	0.109	0.028	0.069	0.125	0.089	0.112	0.123	0.152
83	CSL	23	0.185	0.199	0.144	0.165	0.184	0.135	0.156	0.157	0.134	0.097	0.118	0.179
84	CSL	26	0.258	0.214	0.161	0.244	0.219	0.165	0.168	0.182	0.238	0.140	0.140	0.239
85	CSL	28	0.037	0.067	0.052	0.057	0.054	0.036	0.051	0.037	0.023	0.025	0.040	0.060
86	CSL	31	0.232	0.233	0.182	0.254	0.206	0.200	0.184	0.241	0.241	0.125	0.155	0.234
87	CSL	33	0.188	0.200	0.135	0.170	0.167	0.102	0.174	0.182	0.232	0.119	0.150	0.242
88	CSL	36	0.175	0.197	0.173	0.218	0.218	0.129	0.117	0.168	0.185	0.121	0.136	0.231
89	CSL	38	0.195	0.197	0.146	0.228	0.219	0.106	0.146	0.188	0.203	0.132	0.113	0.261
90	CSR	1	0.028	0.021	0.021	0.037	0.039	0.045	0.052	0.018	0.068	0.033	0.008	0.055
91	CSR	3	0.215	0.243	0.219	0.235	0.220	0.186	0.166	0.226	0.226	0.160	0.158	0.279
92	CSR	5	0.159	0.213	0.187	0.216	0.225	0.129	0.124	0.182	0.149	0.177	0.162	0.201
93	CSR	7	0.061	0.098	0.094	0.083	0.112	0.082	0.081	0.078	0.082	0.104	0.087	0.104
94	CSR	9	0.251	0.250	0.202	0.270	0.235	0.175	0.178	0.212	0.170	0.172	0.158	0.266
95	CSR	11	0.276	0.272	0.209	0.298	0.272	0.164	0.222	0.253	0.256	0.154	0.214	0.333
96	CSR	13	0.155	0.196	0.140	0.164	0.186	0.113	0.140	0.212	0.180	0.117	0.145	0.224
97	CSR	15	0.117	0.174	0.135	0.158	0.202	0.085	0.117	0.124	0.093	0.144	0.110	0.128
98	CSR	17	0.148	0.161	0.126	0.137	0.186	0.098	0.119	0.141	0.139	0.138	0.164	0.205
99	CSR	19	0.203	0.244	0.180	0.200	0.233	0.165	0.189	0.186	0.159	0.166	0.120	0.256
100	CSR	21	0.274	0.299	0.207	0.320	0.256	0.188	0.224	0.265	0.321	0.173	0.162	0.324
101	CSR	23	0.170	0.192	0.159	0.169	0.178	0.149	0.105	0.196	0.203	0.114	0.135	0.196
102	CSR	25	0.212	0.240	0.194	0.242	0.205	0.179	0.158	0.178	0.215	0.112	0.158	0.220
103	CSR	27	0.259	0.298	0.239	0.273	0.281	0.203	0.187	0.189	0.184	0.134	0.177	0.251
104	CSR	29	0.162	0.148	0.131	0.132	0.139	0.167	0.107	0.126	0.165	0.078	0.116	0.186
105	CSW	1	0.228	0.236	0.163	0.207	0.217	0.170	0.197	0.200	0.211	0.143	0.182	0.282
106	CSW	4	0.157	0.180	0.138	0.151	0.181	0.130	0.099	0.105	0.163	0.104	0.086	0.155
107	CSW	7	0.124	0.104	0.097	0.126	0.141	0.082	0.103	0.101	0.086	0.068	0.124	0.152
108	CSW	10	0.060	0.123	0.099	0.128	0.141	0.067	0.123	0.093	0.089	0.095	0.100	0.141
109	CSW	13	0.140	0.158	0.138	0.161	0.174	0.145	0.104	0.122	0.148	0.091	0.143	0.190
110	CSW	16	0.097	0.096	0.119	0.116	0.079	0.125	0.092	0.143	0.111	0.097	0.104	0.165
111	CSW	19	0.133	0.153	0.090	0.122	0.156	0.098	0.128	0.097	0.093	0.103	0.106	0.121
112	CSW	22	0.153	0.179	0.151	0.170	0.177	0.167	0.119	0.129	0.112	0.077	0.093	0.154
113	CSW	25	0.110	0.153	0.111	0.151	0.161	0.120	0.115	0.130	0.125	0.101	0.119	0.148
114	CSW	28	0.241	0.229	0.161	0.245	0.243	0.192	0.210	0.220	0.220	0.162	0.168	0.203
115	CSW	31	0.208	0.191	0.131	0.173	0.203	0.124	0.130	0.152	0.163	0.148	0.118	0.225
116	CSW	34	0.244	0.248	0.170	0.232	0.267	0.214	0.193	0.218	0.256	0.169	0.178	0.266
117	CSW	37	0.153	0.190	0.152	0.201	0.205	0.118	0.136	0.140	0.151	0.135	0.152	0.189
118	CSW	40	0.173	0.204	0.165	0.195	0.202	0.169	0.123	0.141	0.163	0.127	0.169	0.229
119	CSW	43	0.183	0.181	0.144	0.184	0.195	0.200	0.144	0.149	0.120	0.098	0.132	0.248

			37 GKL 16	38 GKL 18	39 GKL 21	40 GKL 23	41 GKL 26	42 GKL 28	43 GKL 31	44 GKL 33	45 GKS 1	46 GKS 3	47 GKS 5	48 GKS 7
37	GKL	16	1.000											
38	GKL	18	0.198	1.000										
39	GKL	21	0.100	0.152	1.000									
40	GKL	23	0.091	0.062	0.200	1.000								
41	GKL	26	0.169	0.144	0.128	0.063	1.000							
42	GKL	28	0.164	0.207	0.134	0.057	0.198	1.000						
43	GKL	31	0.090	0.102	0.106	0.071	0.169	0.241	1.000					
44	GKL	33	0.149	0.116	0.089	0.039	0.199	0.289	0.244	1.000				
45	GKS	1	0.134	0.148	0.091	0.071	0.103	0.125	0.049	0.099	1.000			
46	GKS	3	0.118	0.148	0.068	0.060	0.071	0.080	0.052	0.079	0.132	1.000		
47	GKS	5	0.242	0.297	0.155	0.078	0.213	0.226	0.144	0.175	0.203	0.201	1.000	
48	GKS	7	0.088	0.096	0.045	0.042	0.061	0.059	0.061	0.060	0.066	0.094	0.122	1.000
49	GKS	9	0.301	0.338	0.179	0.117	0.241	0.247	0.134	0.188	0.228	0.195	0.421	0.075
50	GKS	11	0.176	0.220	0.118	0.059	0.137	0.149	0.107	0.130	0.151	0.115	0.279	0.114
51	GKS	13	0.156	0.155	0.097	0.045	0.111	0.114	0.057	0.095	0.116	0.068	0.189	0.065
52	GKS	15	0.195	0.198	0.106	0.071	0.173	0.133	0.086	0.109	0.137	0.135	0.316	0.107
53	GKS	17	0.150	0.200	0.102	0.066	0.133	0.113	0.094	0.104	0.131	0.121	0.295	0.116
54	GKS	19	0.195	0.241	0.137	0.067	0.148	0.150	0.091	0.103	0.152	0.139	0.280	0.097
55	GKS	21	0.077	0.096	0.046	0.026	0.061	0.042	0.045	0.069	0.101	0.055	0.143	0.102
56	GKS	23	-0.037	-0.024	-0.021	-0.024	-0.029	-0.034	-0.030	-0.030	0.001	0.017	-0.049	-0.016
57	GKS	25	0.223	0.247	0.187	0.063	0.176	0.205	0.116	0.167	0.202	0.158	0.342	0.101
58	GKS	27	0.106	0.163	0.072	0.070	0.132	0.122	0.079	0.096	0.109	0.113	0.227	0.088
59	GKS	29	0.189	0.187	0.160	0.084	0.155	0.168	0.108	0.158	0.152	0.096	0.268	0.102
60	PK	1	0.195	0.231	0.089	0.083	0.169	0.190	0.137	0.150	0.177	0.134	0.231	0.061
61	PK	3	0.161	0.148	0.113	0.058	0.126	0.151	0.069	0.102	0.111	0.075	0.168	0.056
62	PK	6	0.237	0.253	0.179	0.110	0.151	0.165	0.123	0.134	0.175	0.141	0.300	0.107
63	PK	8	0.155	0.164	0.132	0.050	0.147	0.106	0.092	0.095	0.138	0.113	0.184	0.094
64	PK	11	0.154	0.142	0.093	0.078	0.102	0.112	0.042	0.075	0.118	0.051	0.155	0.018
65	PK	13	0.188	0.179	0.147	0.053	0.166	0.151	0.096	0.140	0.123	0.076	0.198	0.065
66	PK	16	0.204	0.205	0.151	0.042	0.166	0.174	0.114	0.096	0.175	0.146	0.242	0.067
67	PK	18	0.275	0.317	0.190	0.072	0.210	0.232	0.167	0.186	0.209	0.177	0.360	0.093
68	PK	21	0.079	0.105	0.063	-0.003	0.068	0.088	0.031	0.058	0.075	0.055	0.099	0.051
69	PK	23	0.059	0.059	0.076	0.067	0.081	0.044	0.105	0.043	0.10[illegible]	0.039	0.137	0.039
70	PK	26	0.186	0.196	0.151	0.097	0.120	0.173	0.083	0.120	0.129	0.121	0.246	0.094
71	PK	28	0.188	0.214	0.145	0.090	0.139	0.144	0.087	0.083	0.138	0.104	0.239	0.086
72	PK	31	0.160	0.194	0.152	0.094	0.160	0.195	0.108	0.119	0.128	0.128	0.256	0.100
73	PK	33	0.120	0.103	0.088	0.043	0.090	0.166	0.103	0.129	0.101	0.099	0.130	0.052
74	CSL	1	0.169	0.167	0.117	0.060	0.162	0.141	0.133	0.167	0.099	0.088	0.226	0.035
75	CSL	3	0.096	0.072	0.053	0.038	0.076	0.098	0.041	0.034	0.049	0.061	0.126	0.052
76	CSL	6	0.207	0.242	0.218	0.042	0.176	0.212	0.166	0.170	0.172	0.174	0.206	0.067
77	CSL	8	0.175	0.178	0.114	0.056	0.165	0.173	0.083	0.124	0.121	0.107	0.214	0.037
78	CSL	11	0.254	0.280	0.179	0.099	0.204	0.230	0.128	0.149	0.181	0.147	0.318	0.082
79	CSL	13	0.227	0.254	0.189	0.108	0.181	0.201	0.125	0.155	0.157	0.146	0.286	0.106
80	CSL	16	0.186	0.204	0.159	0.100	0.166	0.211	0.112	0.127	0.162	0.098	0.224	0.079
81	CSL	18	0.079	0.121	0.074	0.039	0.077	0.122	0.079	0.079	0.093	0.045	0.168	0.049
82	CSL	21	0.121	0.161	0.092	0.046	0.119	0.124	0.072	0.099	0.037	0.040	0.138	0.071
83	CSL	23	0.179	0.202	0.144	0.096	0.137	0.185	0.089	0.121	0.125	0.101	0.225	0.076
84	CSL	26	0.244	0.207	0.174	0.068	0.185	0.205	0.122	0.171	0.177	0.143	0.258	0.031
85	CSL	28	0.048	0.061	0.030	0.014	0.041	0.039	0.027	0.046	0.034	0.036	0.071	0.008
86	CSL	31	0.228	0.214	0.158	0.059	0.179	0.191	0.144	0.207	0.149	0.100	0.253	0.035
87	CSL	33	0.233	0.244	0.151	0.107	0.151	0.186	0.086	0.138	0.149	0.154	0.259	0.065
88	CSL	36	0.209	0.228	0.124	0.051	0.149	0.192	0.124	0.144	0.138	0.103	0.273	0.078
89	CSL	38	0.196	0.207	0.146	0.104	0.162	0.131	0.103	0.122	0.173	0.123	0.276	0.072
90	CSR	1	0.024	0.031	0.035	-0.006	0.034	0.018	0.035	0.033	0.029	-0.013	0.018	0.047
91	CSR	3	0.276	0.284	0.158	0.097	0.190	0.201	0.090	0.145	0.210	0.154	0.311	0.110
92	CSR	5	0.180	0.212	0.165	0.107	0.189	0.172	0.108	0.147	0.149	0.112	0.275	0.125

			37 L16	38 L18	39 L21	40 L23	41 L26	42 L28	43 L31	44 L33	45 S1	46 S3	47 S5	48 S7
93	CSR	7	0.106	0.080	0.067	0.052	0.083	0.085	0.061	0.083	0.022	0.059	0.131	0.061
94	CSR	9	0.224	0.260	0.157	0.085	0.203	0.190	0.124	0.173	0.191	0.157	0.305	0.093
95	CSR	11	0.289	0.330	0.199	0.063	0.190	0.230	0.091	0.151	0.204	0.133	0.337	0.069
96	CSR	13	0.208	0.233	0.117	0.023	0.156	0.186	0.125	0.146	0.112	0.114	0.266	0.066
97	CSR	15	0.115	0.147	0.125	0.072	0.145	0.127	0.059	0.089	0.135	0.106	0.207	0.066
98	CSR	17	0.188	0.178	0.139	0.090	0.145	0.164	0.064	0.128	0.146	0.116	0.203	0.076
99	CSR	19	0.205	0.243	0.154	0.080	0.185	0.200	0.107	0.159	0.150	0.136	0.274	0.080
100	CSR	21	0.308	0.315	0.233	0.068	0.224	0.261	0.175	0.190	0.223	0.175	0.346	0.113
101	CSR	23	0.210	0.200	0.166	0.063	0.163	0.186	0.128	0.172	0.157	0.121	0.242	0.063
102	CSR	25	0.196	0.215	0.182	0.119	0.217	0.221	0.139	0.215	0.153	0.154	0.258	0.059
103	CSR	27	0.219	0.260	0.195	0.110	0.205	0.224	0.137	0.193	0.169	0.130	0.275	0.100
104	CSR	29	0.158	0.147	0.132	0.079	0.146	0.203	0.140	0.185	0.106	0.079	0.190	0.056
105	CSW	1	0.241	0.230	0.186	0.077	0.194	0.200	0.101	0.189	0.201	0.160	0.288	0.054
106	CSW	4	0.142	0.126	0.135	0.044	0.129	0.117	0.080	0.106	0.126	0.091	0.179	0.073
107	CSW	7	0.105	0.135	0.078	0.039	0.057	0.098	0.070	0.063	0.063	0.060	0.173	0.043
108	CSW	10	0.100	0.149	0.088	0.057	0.092	0.116	0.079	0.052	0.068	0.061	0.157	0.062
109	CSW	13	0.182	0.148	0.107	0.077	0.127	0.147	0.103	0.093	0.132	0.091	0.181	0.030
110	CSW	16	0.126	0.113	0.106	0.105	0.094	0.150	0.094	0.124	0.127	0.082	0.146	0.043
111	CSW	19	0.134	0.140	0.125	0.059	0.127	0.130	0.073	0.084	0.064	0.088	0.179	0.073
112	CSW	22	0.124	0.104	0.112	0.059	0.115	0.130	0.096	0.150	0.104	0.057	0.169	0.057
113	CSW	25	0.103	0.169	0.117	0.065	0.095	0.127	0.090	0.088	0.073	0.034	0.154	0.046
114	CSW	28	0.231	0.259	0.171	0.025	0.228	0.227	0.115	0.167	0.167	0.131	0.317	0.074
115	CSW	31	0.171	0.201	0.140	0.081	0.131	0.176	0.119	0.127	0.137	0.132	0.240	0.084
116	CSW	34	0.168	0.249	0.173	0.089	0.229	0.241	0.126	0.202	0.224	0.151	0.280	0.073
117	CSW	37	0.180	0.200	0.175	0.093	0.164	0.193	0.115	0.125	0.111	0.115	0.245	0.053
118	CSW	40	0.178	0.160	0.160	0.093	0.163	0.200	0.162	0.185	0.146	0.096	0.245	0.063
119	CSW	43	0.154	0.169	0.169	0.079	0.186	0.264	0.202	0.259	0.135	0.079	0.216	0.085

			49 GKS 9	50 GKS 11	51 GKS 13	52 GKS 15	53 GKS 17	54 GKS 19	55 GKS 21	56 GKS 23	57 GKS 25	58 GKS 27	59 GKS 29	60 PK 1
49	GKS	9	1.000											
50	GKS	11	0.327	1.000										
51	GKS	13	0.209	0.156	1.000									
52	GKS	15	0.322	0.243	0.065	1.000								
53	GKS	17	0.299	0.232	0.111	0.241	1.000							
54	GKS	19	0.294	0.234	0.091	0.224	0.173	1.000						
55	GKS	21	0.144	0.150	0.064	0.093	0.110	0.101	1.000					
56	GKS	23	-0.014	-0.021	0.032	-0.054	-0.020	-0.058	0.007	1.000				
57	GKS	25	0.362	0.235	0.172	0.237	0.229	0.250	0.121	-0.028	1.000			
58	GKS	27	0.229	0.158	0.091	0.158	0.179	0.139	0.074	-0.024	0.157	1.000		
59	GKS	29	0.294	0.206	0.141	0.156	0.217	0.158	0.162	-0.016	0.248	0.173	1.000	
60	PK	1	0.347	0.190	0.159	0.198	0.179	0.177	0.081	0.075	0.234	0.135	0.194	1.000
61	PK	3	0.252	0.079	0.139	0.088	0.045	0.106	0.012	-0.021	0.193	0.087	0.100	0.177
62	PK	6	0.373	0.222	0.160	0.261	0.225	0.253	0.071	-0.051	0.282	0.162	0.197	0.274
63	PK	8	0.198	0.144	0.109	0.121	0.125	0.116	0.075	0.011	0.174	0.092	0.135	0.194
64	PK	11	0.231	0.129	0.112	0.110	0.093	0.128	0.003	-0.006	0.153	0.087	0.127	0.204
65	PK	13	0.236	0.139	0.150	0.137	0.145	0.169	0.074	-0.029	0.187	0.108	0.157	0.210
66	PK	16	0.292	0.177	0.190	0.169	0.169	0.208	0.077	0.020	0.278	0.131	0.179	0.268
67	PK	18	0.397	0.242	0.246	0.226	0.217	0.268	0.086	0.021	0.345	0.181	0.223	0.331
68	PK	21	0.170	0.060	0.079	0.073	0.032	0.050	0.026	-0.014	0.116	0.043	0.072	0.152
69	PK	23	0.113	0.100	0.056	0.071	0.171	0.088	0.090	-0.024	0.106	0.103	0.086	0.086
70	PK	26	0.289	0.232	0.139	0.176	0.139	0.183	0.099	-0.033	0.235	0.134	0.191	0.173
71	PK	28	0.264	0.192	0.101	0.161	0.180	0.169	0.091	-0.034	0.223	0.137	0.195	0.156
72	PK	31	0.260	0.190	0.130	0.130	0.147	0.156	0.073	-0.031	0.191	0.128	0.191	0.226
73	PK	33	0.191	0.104	0.101	0.056	0.109	0.071	0.051	0.007	0.142	0.098	0.107	0.158
74	CSL	1	0.245	0.132	0.092	0.134	0.120	0.138	0.059	-0.015	0.188	0.102	0.196	0.190
75	CSL	3	0.137	0.072	0.054	0.072	0.079	0.049	0.037	0.005	0.092	0.056	0.090	0.085
76	CSL	6	0.291	0.153	0.155	0.170	0.211	0.159	0.072	0.046	0.251	0.159	0.228	0.299
77	CSL	8	0.235	0.131	0.134	0.129	0.117	0.146	0.049	-0.001	0.198	0.113	0.160	0.248
78	CSL	11	0.374	0.221	0.136	0.216	0.202	0.233	0.088	-0.033	0.302	0.147	0.223	0.243
79	CSL	13	0.307	0.228	0.129	0.203	0.161	0.192	0.082	-0.028	0.262	0.151	0.217	0.247
80	CSL	16	0.248	0.164	0.160	0.121	0.167	0.152	0.093	-0.016	0.190	0.142	0.200	0.211
81	CSL	18	0.186	0.13	0.162	0.089	0.135	0.110	0.064	0.024	0.136	0.064	0.143	0.182
82	CSL	21	0.154	0.098	0.045	0.096	0.063	0.116	0.038	-0.042	0.124	0.076	0.061	0.110
83	CSL	23	0.259	0.176	0.132	0.142	0.153	0.148	0.063	0.015	0.208	0.124	0.181	0.242
84	CSL	26	0.314	0.174	0.154	0.172	0.162	0.179	0.068	0.024	0.262	0.163	0.203	0.330
85	CSL	28	0.055	0.037	0.012	0.048	0.040	0.026	0.012	-0.028	0.045	0.026	0.055	0.058
86	CSL	31	0.300	0.196	0.185	0.144	0.144	0.142	0.052	0.020	0.243	0.123	0.211	0.274
87	CSL	33	0.339	0.191	0.143	0.192	0.148	0.181	0.062	-0.026	0.261	0.161	0.199	0.277
88	CSL	36	0.312	0.216	0.150	0.207	0.182	0.165	0.069	-0.044	0.243	0.111	0.195	0.201
89	CSL	38	0.307	0.194	0.130	0.199	0.164	0.200	0.058	-0.018	0.253	0.143	0.177	0.203

			49 S9	50 S11	51 S13	52 S15	53 S17	54 S19	55 S21	56 S23	57 S25	58 S27	59 S29	60 PK1
90	CSR	1	0.035	0.028	0.045	0.027	0.009	0.012	0.014	-0.006	0.033	0.026	0.005	0.053
91	CSR	3	0.351	0.232	0.159	0.189	0.247	0.196	0.089	-0.020	0.305	0.194	0.260	0.283
92	CSR	5	0.284	0.191	0.121	0.167	0.200	0.171	0.087	-0.076	0.228	0.155	0.195	0.214
93	CSR	7	0.114	0.065	0.083	0.065	0.062	0.084	0.011	-0.015	0.097	0.084	0.070	0.105
94	CSR	9	0.359	0.188	0.183	0.188	0.208	0.189	0.104	0.009	0.298	0.177	0.243	0.253
95	CSR	11	0.406	0.256	0.212	0.211	0.238	0.257	0.096	-0.032	0.323	0.155	0.246	0.314
96	CSR	13	0.307	0.178	0.143	0.164	0.142	0.152	0.046	-0.021	0.222	0.138	0.174	0.234
97	CSR	15	0.222	0.139	0.098	0.148	0.125	0.158	0.080	-0.026	0.165	0.116	0.157	0.125
98	CSR	17	0.234	0.140	0.111	0.107	0.092	0.148	0.059	-0.010	0.193	0.117	0.165	0.171
99	CSR	19	0.299	0.212	0.161	0.159	0.171	0.180	0.077	-0.019	0.266	0.170	0.233	0.227
100	CSR	21	0.425	0.230	0.232	0.205	0.218	0.247	0.104	-0.013	0.357	0.197	0.271	0.361
101	CSR	23	0.286	0.161	0.162	0.155	0.150	0.161	0.060	-0.005	0.226	0.123	0.195	0.255
102	CSR	25	0.316	0.187	0.156	0.166	0.209	0.145	0.110	-0.009	0.229	0.151	0.246	0.228
103	CSR	27	0.342	0.202	0.146	0.198	0.215	0.187	0.118	-0.028	0.271	0.170	0.241	0.239
104	CSR	29	0.230	0.117	0.100	0.122	0.082	0.097	0.036	-0.010	0.142	0.107	0.152	0.200
105	CSW	1	0.341	0.201	0.163	0.148	0.182	0.161	0.095	0.026	0.262	0.162	0.238	0.264
106	CSW	4	0.211	0.114	0.096	0.116	0.096	0.121	0.046	-0.010	0.168	0.108	0.135	0.180
107	CSW	7	0.170	0.112	0.059	0.142	0.097	0.140	0.081	-0.064	0.106	0.088	0.109	0.121
108	CSW	10	0.177	0.102	0.096	0.094	0.060	0.115	0.058	-0.033	0.115	0.090	0.104	0.084
109	CSW	13	0.175	0.143	0.071	0.139	0.120	0.134	0.067	-0.010	0.162	0.060	0.118	0.133
110	CSW	16	0.146	0.127	0.115	0.056	0.069	0.094	0.035	0.008	0.145	0.076	0.089	0.143
111	CSW	19	0.162	0.120	0.053	0.108	0.093	0.111	0.058	-0.001	0.131	0.074	0.139	0.124
112	CSW	22	0.155	0.094	0.079	0.100	0.093	0.105	0.054	-0.042	0.115	0.103	0.146	0.126
113	CSW	25	0.208	0.121	0.056	0.126	0.087	0.149	0.057	-0.047	0.157	0.093	0.116	0.100
114	CSW	28	0.353	0.190	0.134	0.182	0.161	0.183	0.077	-0.001	0.284	0.161	0.223	0.244
115	CSW	31	0.283	0.166	0.152	0.147	0.129	0.172	0.069	-0.007	0.212	0.111	0.179	0.218
116	CSW	34	0.376	0.231	0.192	0.186	0.190	0.197	0.065	-0.004	0.266	0.167	0.195	0.281
117	CSW	37	0.251	0.180	0.067	0.184	0.151	0.190	0.084	-0.049	0.189	0.129	0.175	0.186
118	CSW	40	0.262	0.133	0.113	0.125	0.143	0.168	0.044	-0.051	0.173	0.135	0.170	0.226
119	CSW	43	0.234	0.147	0.122	0.123	0.128	0.135	0.034	-0.018	0.179	0.111	0.177	0.219

			61 PK 3	62 PK 6	63 PK 8	64 PK 11	65 PK 13	66 PK 16	67 PK 18	68 PK 21	69 PK 23	70 PK 26	71 PK 28	72 PK 31
61	PK	3	1.000											
62	PK	6	0.184	1.000										
63	PK	8	0.145	0.187	1.000									
64	PK	11	0.153	0.173	0.143	1.000								
65	PK	13	0.192	0.228	0.137	0.169	1.000							
66	PK	16	0.234	0.283	0.194	0.192	0.224	1.000						
67	PK	18	0.313	0.354	0.215	0.244	0.282	0.345	1.000					
68	PK	21	0.129	0.112	0.113	0.114	0.114	0.106	0.190	1.000				
69	PK	23	0.037	0.096	0.082	0.038	0.098	0.090	0.099	0.045	1.000			
70	PK	26	0.162	0.216	0.153	0.126	0.179	0.232	0.308	0.107	0.111	1.000		
71	PK	28	0.169	0.210	0.134	0.122	0.193	0.262	0.303	0.076	0.071	0.223	1.000	
72	PK	31	0.156	0.238	0.152	0.143	0.180	0.222	0.271	0.068	0.092	0.196	0.209	1.000
73	PK	33	0.160	0.106	0.133	0.100	0.138	0.131	0.214	0.110	0.047	0.134	0.097	0.129
74	CSL	1	0.167	0.208	0.139	0.107	0.131	0.154	0.218	0.082	0.079	0.150	0.167	0.143
75	CSL	3	0.084	0.106	0.047	0.062	0.028	0.104	0.143	0.048	0.027	0.118	0.043	0.079
76	CSL	6	0.189	0.235	0.216	0.207	0.196	0.238	0.300	0.190	0.071	0.203	0.234	0.244
77	CSL	8	0.173	0.179	0.141	0.134	0.165	0.178	0.257	0.117	0.052	0.195	0.140	0.181
78	CSL	11	0.181	0.271	0.170	0.170	0.202	0.246	0.339	0.108	0.090	0.249	0.278	0.206
79	CSL	13	0.166	0.293	0.194	0.135	0.229	0.275	0.300	0.077	0.124	0.239	0.210	0.244
80	CSL	16	0.144	0.216	0.161	0.127	0.162	0.170	0.250	0.108	0.097	0.201	0.201	0.202
81	CSL	18	0.112	0.145	0.083	0.128	0.150	0.155	0.190	0.042	0.059	0.132	0.101	0.145
82	CSL	21	0.093	0.150	0.071	0.054	0.097	0.103	0.163	0.065	0.014	0.119	0.093	0.085
83	CSL	23	0.152	0.152	0.161	0.115	0.164	0.192	0.262	0.108	0.081	0.180	0.180	0.200
84	CSL	26	0.210	0.215	0.193	0.205	0.224	0.246	0.308	0.140	0.110	0.181	0.201	0.223
85	CSL	28	0.040	0.034	0.037	0.011	0.039	0.055	0.064	0.022	0.049	0.030	0.039	0.036
86	CSL	31	0.187	0.216	0.162	0.184	0.190	0.220	0.295	0.103	0.077	0.195	0.194	0.229
87	CSL	33	0.244	0.289	0.181	0.196	0.189	0.267	0.295	0.137	0.065	0.219	0.201	0.170
88	CSL	36	0.152	0.226	0.150	0.146	0.147	0.217	0.254	0.101	0.087	0.188	0.190	0.132
89	CSL	38	0.127	0.282	0.190	0.175	0.144	0.239	0.266	0.098	0.077	0.205	0.189	0.221
90	CSR	1	0.009	0.001	0.041	0.029	0.067	0.043	0.028	0.029	-0.019	0.051	0.025	0.006
91	CSR	3	0.243	0.301	0.245	0.221	0.265	0.263	0.380	0.172	0.112	0.279	0.249	0.247
92	CSR	5	0.152	0.232	0.165	0.167	0.203	0.195	0.260	0.083	0.122	0.207	0.168	0.185
93	CSR	7	0.089	0.127	0.067	0.125	0.116	0.099	0.122	0.050	0.045	0.083	0.084	0.100
94	CSR	9	0.212	0.271	0.233	0.193	0.232	0.265	0.346	0.149	0.125	0.236	0.218	0.216
95	CSR	11	0.215	0.319	0.236	0.220	0.242	0.324	0.382	0.182	0.113	0.256	0.252	0.243
96	CSR	13	0.166	0.236	0.154	0.139	0.162	0.210	0.285	0.136	0.066	0.187	0.177	0.167
97	CSR	15	0.092	0.156	0.119	0.091	0.132	0.159	0.167	0.045	0.082	0.115	0.137	0.131
98	CSR	17	0.142	0.191	0.129	0.121	0.171	0.166	0.225	0.074	0.068	0.165	0.155	0.181
99	CSR	19	0.229	0.250	0.208	0.199	0.229	0.247	0.353	0.142	0.071	0.205	0.239	0.189
100	CSR	21	0.237	0.315	0.229	0.257	0.296	0.343	0.411	0.196	0.105	0.305	0.287	0.282
101	CSR	23	0.189	0.239	0.195	0.186	0.209	0.237	0.307	0.126	0.063	0.203	0.200	0.198
102	CSR	25	0.170	0.242	0.183	0.177	0.192	0.241	0.296	0.132	0.107	0.224	0.224	0.232
103	CSR	27	0.182	0.234	0.212	0.163	0.226	0.239	0.340	0.112	0.123	0.217	0.245	0.226
104	CSR	29	0.178	0.192	0.142	0.102	0.174	0.154	0.202	0.112	0.062	0.145	0.178	0.185
105	CSW	1	0.197	0.301	0.203	0.178	0.204	0.269	0.348	0.141	0.098	0.253	0.185	0.237
106	CSW	4	0.084	0.180	0.128	0.121	0.149	0.148	0.201	0.081	0.045	0.140	0.146	0.163
107	CSW	7	0.101	0.102	0.047	0.066	0.065	0.097	0.154	0.061	0.065	0.112	0.107	0.090
108	CSW	10	0.070	0.152	0.094	0.047	0.111	0.093	0.151	0.035	0.059	0.123	0.113	0.108
109	CSW	13	0.105	0.153	0.088	0.082	0.120	0.151	0.188	0.046	0.065	0.141	0.125	0.130
110	CSW	16	0.105	0.171	0.106	0.101	0.124	0.149	0.178	0.063	0.084	0.126	0.102	0.127
111	CSW	19	0.058	0.118	0.074	0.047	0.104	0.119	0.146	0.034	0.032	0.110	0.078	0.090
112	CSW	22	0.105	0.132	0.121	0.095	0.144	0.124	0.149	0.076	0.058	0.127	0.109	0.128
113	CSW	25	0.088	0.123	0.059	0.048	0.104	0.105	0.153	0.050	0.083	0.118	0.100	0.118
114	CSW	28	0.201	0.283	0.196	0.182	0.206	0.240	0.338	0.117	0.107	0.226	0.200	0.207
115	CSW	31	0.161	0.228	0.151	0.128	0.178	0.180	0.279	0.112	0.071	0.182	0.209	0.155
116	CSW	34	0.219	0.283	0.255	0.158	0.215	0.282	0.368	0.158	0.116	0.258	0.234	0.248
117	CSW	37	0.131	0.214	0.128	0.112	0.158	0.195	0.258	0.082	0.091	0.168	0.201	0.202
118	CSW	40	0.155	0.187	0.149	0.133	0.173	0.205	0.277	0.111	0.101	0.187	0.157	0.189
119	CSW	43	0.158	0.176	0.143	0.137	0.185	0.199	0.226	0.109	0.073	0.167	0.148	0.193

			73 PK 33	74 CSL 1	75 CSL 3	76 CSL 6	77 CSL 8	78 CSL 11	79 CSL 13	80 CSL 16	81 CSL 18	82 CSL 21	83 CSL 23	84 CSL 26
73	PK	33	1.000											
74	CSL	1	0.122	1.000										
75	CSL	3	0.032	0.049	1.000									
76	CSL	6	0.218	0.258	0.097	1.000								
77	CSL	8	0.117	0.216	0.151	0.241	1.000							
78	CSL	11	0.138	0.242	0.119	0.308	0.245	1.000						
79	CSL	13	0.121	0.235	0.093	0.328	0.222	0.326	1.000					
80	CSL	16	0.088	0.153	0.158	0.203	0.312	0.261	0.244	1.000				
81	CSL	18	0.157	0.123	0.029	0.233	0.182	0.210	0.144	0.174	1.000			
82	CSL	21	0.036	0.093	0.059	0.155	0.111	0.167	0.143	0.125	0.092	1.000		
83	CSL	23	0.121	0.187	0.077	0.248	0.217	0.284	0.242	0.197	0.200	0.124	1.000	
84	CSL	26	0.160	0.257	0.103	0.370	0.296	0.316	0.275	0.219	0.167	0.162	0.292	1.000
85	CSL	28	0.060	0.043	0.019	0.063	-0.002	0.058	0.055	0.038	0.029	0.018	0.061	0.081
86	CSL	31	0.199	0.254	0.093	0.345	0.282	0.273	0.233	0.196	0.181	0.117	0.285	0.372
87	CSL	33	0.166	0.229	0.099	0.313	0.248	0.297	0.265	0.202	0.179	0.116	0.221	0.345
88	CSL	36	0.117	0.163	0.052	0.153	0.159	0.243	0.241	0.182	0.091	0.125	0.207	0.206
89	CSL	38	0.118	0.162	0.062	0.234	0.200	0.226	0.244	0.165	0.168	0.089	0.192	0.250
90	CSR	1	0.014	0.049	0.021	0.074	0.048	0.038	0.014	0.036	0.081	0.038	0.073	0.039
91	CSR	3	0.184	0.226	0.094	0.304	0.249	0.318	0.310	0.256	0.196	0.118	0.267	0.316
92	CSR	5	0.099	0.177	0.075	0.252	0.207	0.238	0.243	0.212	0.140	0.153	0.211	0.221
93	CSR	7	0.067	0.120	0.064	0.148	0.103	0.102	0.116	0.083	0.107	0.088	0.032	0.129
94	CSR	9	0.151	0.201	0.130	0.326	0.261	0.299	0.274	0.268	0.224	0.134	0.242	0.319
95	CSR	11	0.143	0.233	0.105	0.274	0.285	0.321	0.341	0.262	0.228	0.150	0.313	0.320
96	CSR	13	0.155	0.146	0.116	0.242	0.181	0.225	0.225	0.182	0.119	0.129	0.219	0.266
97	CSR	15	0.064	0.099	0.082	0.134	0.111	0.169	0.166	0.154	0.080	0.067	0.111	0.138
98	CSR	17	0.099	0.136	0.079	0.183	0.154	0.189	0.204	0.196	0.147	0.080	0.168	0.221
99	CSR	19	0.189	0.205	0.084	0.296	0.206	0.245	0.256	0.212	0.171	0.117	0.257	0.299
100	CSR	21	0.254	0.237	0.113	0.343	0.315	0.368	0.342	0.272	0.208	0.134	0.330	0.335
101	CSR	23	0.193	0.140	0.086	0.271	0.222	0.266	0.239	0.188	0.174	0.105	0.235	0.260
102	CSR	25	0.201	0.189	0.074	0.265	0.214	0.252	0.266	0.238	0.214	0.089	0.220	0.286
103	CSR	27	0.159	0.252	0.098	0.277	0.270	0.311	0.298	0.249	0.140	0.130	0.244	0.310
104	CSR	29	0.140	0.146	0.066	0.211	0.158	0.196	0.219	0.199	0.162	0.063	0.165	0.233
105	CSW	1	0.177	0.223	0.121	0.294	0.227	0.271	0.247	0.279	0.173	0.078	0.225	0.272
106	CSW	4	0.123	0.113	0.067	0.215	0.157	0.182	0.163	0.183	0.114	0.072	0.153	0.187
107	CSW	7	0.022	0.109	0.084	0.114	0.115	0.133	0.121	0.114	0.019	0.081	0.102	0.108
108	CSW	10	0.031	0.048	0.066	0.123	0.089	0.128	0.160	0.147	0.082	0.051	0.096	0.093
109	CSW	13	0.089	0.114	0.089	0.137	0.127	0.194	0.159	0.134	0.091	0.093	0.117	0.154
110	CSW	16	0.106	0.073	0.068	0.165	0.117	0.153	0.153	0.158	0.070	0.085	0.145	0.189
111	CSW	19	0.084	0.105	0.052	0.060	0.113	0.143	0.116	0.119	0.081	0.050	0.123	0.141
112	CSW	22	0.092	0.117	0.045	0.151	0.140	0.145	0.162	0.159	0.102	0.062	0.150	0.167
113	CSW	25	0.066	0.099	0.039	0.120	0.078	0.163	0.145	0.105	0.068	0.064	0.123	0.123
114	CSW	28	0.150	0.217	0.083	0.304	0.254	0.294	0.265	0.224	0.151	0.150	0.219	0.323
115	CSW	31	0.120	0.125	0.103	0.170	0.182	0.242	0.206	0.186	0.113	0.123	0.177	0.191
116	CSW	34	0.245	0.226	0.111	0.313	0.238	0.317	0.272	0.235	0.217	0.159	0.259	0.340
117	CSW	37	0.124	0.170	0.072	0.219	0.158	0.247	0.250	0.158	0.106	0.102	0.196	0.210
118	CSW	40	0.132	0.184	0.080	0.236	0.202	0.229	0.235	0.232	0.100	0.107	0.185	0.270
119	CSW	43	0.149	0.154	0.079	0.264	0.199	0.224	0.216	0.196	0.109	0.121	0.203	0.251

		85 CSL 28	86 CSL 31	87 CSL 33	88 CSL 36	89 CSL 38	90 CSR 1	91 CSR 3	92 CSR 5	93 CSR 7	94 CSR 9	95 CSR 11	96 CSR 13
85	CSL 28	1.000											
86	CSL 31	0.106	1.000										
87	CSL 33	0.058	0.308	1.000									
88	CSL 36	0.026	0.199	0.253	1.000								
89	CSL 38	0.043	0.240	0.258	0.217	1.000							
90	CSR 1	0.028	0.061	0.023	0.007	-0.001	1.000						
91	CSR 3	0.067	0.278	0.327	0.254	0.280	0.043	1.000					
92	CSR 5	0.074	0.250	0.211	0.197	0.174	0.069	0.261	1.000				
93	CSR 7	0.029	0.159	0.099	0.082	0.123	0.032	0.133	0.127	1.000			
94	CSR 9	0.046	0.333	0.300	0.234	0.277	0.045	0.356	0.276	0.152	1.000		
95	CSR 11	0.051	0.319	0.344	0.303	0.304	0.040	0.395	0.309	0.112	0.366	1.000	
96	CSR 13	0.050	0.231	0.253	0.210	0.206	0.055	0.282	0.215	0.101	0.308	0.510	1.000
97	CSR 15	0.040	0.163	0.125	0.141	0.123	0.026	0.164	0.180	0.087	0.180	0.172	0.123
98	CSR 17	0.032	0.225	0.185	0.139	0.183	0.029	0.206	0.179	0.055	0.222	0.230	0.165
99	CSR 19	0.059	0.317	0.251	0.238	0.243	0.038	0.324	0.235	0.116	0.309	0.345	0.260
100	CSR 21	0.050	0.374	0.380	0.281	0.351	0.058	0.396	0.277	0.114	0.395	0.478	0.352
101	CSR 23	0.059	0.322	0.273	0.204	0.239	0.060	0.329	0.230	0.124	0.275	0.325	0.220
102	CSR 25	0.045	0.346	0.274	0.208	0.223	0.047	0.327	0.229	0.087	0.283	0.309	0.232
103	CSR 27	0.084	0.334	0.250	0.222	0.230	0.037	0.293	0.287	0.095	0.310	0.335	0.244
104	CSR 29	0.034	0.229	0.217	0.172	0.170	0.055	0.219	0.167	0.075	0.198	0.219	0.167
105	CSW 1	0.042	0.301	0.272	0.208	0.238	0.026	0.305	0.228	0.104	0.308	0.314	0.211
106	CSW 4	0.035	0.206	0.170	0.118	0.143	0.039	0.202	0.144	0.080	0.192	0.226	0.157
107	CSW 7	0.036	0.132	0.118	0.113	0.124	0.022	0.105	0.131	0.069	0.132	0.155	0.111
108	CSW 10	0.036	0.079	0.115	0.091	0.086	0.041	0.141	0.120	0.068	0.123	0.154	0.101
109	CSW 13	0.034	0.166	0.115	0.118	0.134	0.025	0.150	0.147	0.102	0.202	0.198	0.153
110	CSW 16	0.043	0.188	0.158	0.102	0.125	0.044	0.180	0.146	0.087	0.142	0.157	0.113
111	CSW 19	0.033	0.132	0.133	0.114	0.069	0.020	0.157	0.126	0.030	0.168	0.164	0.132
112	CSW 22	0.046	0.142	0.116	0.109	0.113	0.035	0.163	0.150	0.075	0.150	0.160	0.153
113	CSW 25	0.029	0.142	0.114	0.135	0.101	0.042	0.134	0.156	0.094	0.151	0.181	0.144
114	CSW 28	0.042	0.292	0.249	0.225	0.275	0.014	0.320	0.280	0.126	0.318	0.338	0.253
115	CSW 31	0.042	0.162	0.192	0.192	0.180	0.029	0.262	0.200	0.122	0.251	0.243	0.198
116	CSW 34	0.023	0.364	0.288	0.224	0.254	0.020	0.369	0.217	0.134	0.289	0.340	0.211
117	CSW 37	0.073	0.196	0.175	0.182	0.175	0.043	0.232	0.187	0.101	0.213	0.232	0.182
118	CSW 40	0.068	0.267	0.192	0.198	0.195	0.034	0.222	0.177	0.109	0.234	0.268	0.211
119	CSW 43	0.046	0.263	0.179	0.215	0.172	0.045	0.222	0.169	0.095	0.204	0.231	0.198

			97 CSR 15	98 CSR 17	99 CSR 19	100 CSR 21	101 CSR 23	102 CSR 25	103 CSR 27	104 CSR 29	105 CSW 1	106 CSW 4	107 CSW 7	108 CSW 10
97	CSR	15	1.000											
98	CSR	17	0.127	1.000										
99	CSR	19	0.172	0.202	1.000									
100	CSR	21	0.213	0.282	0.479	1.000								
101	CSR	23	0.139	0.206	0.322	0.459	1.000							
102	CSR	25	0.157	0.211	0.301	0.380	0.343	1.000						
103	CSR	27	0.199	0.210	0.294	0.391	0.298	0.419	1.000					
104	CSR	29	0.107	0.163	0.228	0.255	0.232	0.262	0.272	1.000				
105	CSW	1	0.144	0.223	0.265	0.374	0.294	0.324	0.281	0.225	1.000			
106	CSW	4	0.112	0.137	0.154	0.254	0.174	0.180	0.190	0.139	0.216	1.000		
107	CSW	7	0.105	0.087	0.111	0.117	0.082	0.092	0.141	0.060	0.129	0.087	1.000	
108	CSW	10	0.047	0.108	0.119	0.130	0.112	0.111	0.144	0.077	0.169	0.117	0.096	1.000
109	CSW	13	0.114	0.112	0.164	0.200	0.176	0.126	0.198	0.120	0.178	0.140	0.084	0.193
110	CSW	16	0.089	0.142	0.166	0.213	0.184	0.101	0.156	0.169	0.243	0.109	0.042	0.133
111	CSW	19	0.109	0.115	0.113	0.183	0.138	0.158	0.142	0.090	0.147	0.105	0.070	0.166
112	CSW	22	0.132	0.142	0.143	0.182	0.148	0.188	0.188	0.144	0.209	0.107	0.092	0.069
113	CSW	25	0.083	0.115	0.116	0.182	0.120	0.141	0.168	0.097	0.142	0.095	0.084	0.173
114	CSW	28	0.170	0.210	0.296	0.348	0.271	0.281	0.301	0.206	0.327	0.207	0.150	0.130
115	CSW	31	0.134	0.149	0.207	0.283	0.242	0.215	0.231	0.149	0.266	0.195	0.119	0.112
116	CSW	34	0.142	0.192	0.312	0.400	0.311	0.352	0.316	0.229	0.366	0.226	0.111	0.203
117	CSW	37	0.156	0.134	0.206	0.285	0.168	0.225	0.275	0.160	0.220	0.143	0.131	0.121
118	CSW	40	0.147	0.166	0.236	0.303	0.233	0.245	0.275	0.221	0.262	0.163	0.112	0.126
119	CSW	43	0.141	0.175	0.224	0.312	0.237	0.253	0.262	0.230	0.240	0.152	0.088	0.122

			109 CSW 13	110 CSW 16	111 CSW 19	112 CSW 22	113 CSW 25	114 CSW 28	115 CSW 31	116 CSW 34	117 CSW 37	118 CSW 40	119 CSW 43
109	CSW	13	1.000										
110	CSW	16	0.160	1.000									
111	CSW	19	0.131	0.126	1.000								
112	CSW	22	0.127	0.226	0.181	1.000							
113	CSW	25	0.168	0.117	0.315	0.222	1.000						
114	CSW	28	0.199	0.206	0.155	0.182	0.173	1.000					
115	CSW	31	0.132	0.173	0.119	0.150	0.114	0.257	1.000				
116	CSW	34	0.208	0.219	0.174	0.183	0.143	0.395	0.307	1.000			
117	CSW	37	0.139	0.106	0.109	0.128	0.149	0.212	0.189	0.267	1.000		
118	CSW	40	0.179	0.159	0.139	0.157	0.146	0.261	0.199	0.294	0.244	1.000	
119	CSW	43	0.135	0.188	0.158	0.134	0.131	0.206	0.190	0.286	0.216	0.345	1.000