Predicting Student Performance on the Developmental Reading Assessment, 2nd Edition:

An Independent Comparison of Two Different Tests

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Abstract

The current study compares the relationship of the *istation's Indicators of Progress* (ISIP) and the *Measures of Academic Progress* (MAP) reading assessments with the widely accepted *Developmental Reading Assessment*, 2nd Edition (DRA2) using single predictor regression. Then using a series of regression analyses, a conversion formula and table are created to convert an ISIP score into an estimated DRA2 score. Using data gathered from K-5th grade students in a large suburban district in Texas, the predicted (R^2) values derived from regression analyses between the ISIP and the DRA2 and the MAP and DRA2 were compared. In all grades with comparable data, the ISIP was moderately to highly correlated with the DRA2, and the ISIP was more highly correlated with the DRA2 than was the MAP.

The original impetus for this study was primarily due to the time demands placed on K-5th grade teachers in the Frisco (Texas) school district as they individually assessed each of their students multiple times per year using the Developmental Reading Assessment, 2nd Edition (DRA2). The teachers felt that the DRA2 did a good job of providing accurate estimates of a student's reading ability. However, they were also interested in finding a faster means of assessing their students reading level and progress.

A secondary driving force that led to this current study was the desire to be more selective in the assessments administered across the district; to find a more efficient test to accomplish the same process as multiple tests. An informal audit of the reading assessments used in the district at the elementary level indicated that students were taking the *Measures of Academic Progress* (MAP) reading assessment beginning in 2nd grade, *istation's Indicators of Progress* (ISIP) reading assessment from K-5th grade, the *Texas Assessment of Knowledge and Skills* (TAKS) reading assessment from 3rd-5th grade, the DRA2 reading assessment from K-2nd grade for all students and 3rd-5th grade for struggling readers, the *Iowa Test of Basic Skills* (ITBS) in various grades, and a few other assessments administered at various campuses. This audit caused the district to consider whether it was: (a) over-testing the students, and (b) under-utilizing the data gained from all of these assessments. The last thing desired was to waste precious instructional time gathering assessment data that would sit undisturbed in some databank and never be used. In order to determine which assessments to keep, it was decided to compare the relationship between the MAP and the DRA2 and the ISIP and the DRA2. Since the teachers already felt confident in the reliability of the DRA2, the scores of the two computer-adaptive tests (MAP and ISIP) were compared with this one-on-one DRA2 assessment. This study's first research question is: *Does the MAP RIT*[1] *score or the ISIP overall theta score do a better job of predicting a student's performance on the DRA2 for K-5*th *grade students?*

After establishing that the ISIP overall ability (θ) score did a better job of predicting a DRA2 score than the MAP RIT score, a regression equation that predicted a student's estimated DRA2 score using their ISIP score was derived. From this equation, a test score conversion chart for the ISIP overall theta score to the DRA2 score was produced. This study's second research question is: *What regression equation best fits the relationship between the ISIP overall theta score and the DRA2 score such that the* R^2 *is maximized?*

Methods

Measures

The ISIP and the MAP are both computer adaptive reading assessments designed to monitor student progress in overall reading ability. The ISIP assesses K-3rd grade students in five reading sub-domains: phonemic awareness, alphabetic knowledge, vocabulary, comprehension, and fluency (Mathes, Torgensen, & Herron, 2011), and 4th-12th grade students in four sub-domains of reading: word analysis, fluency, vocabulary, and comprehension (istation, 2011). The MAP reading assessment is also subdivided into two groups: the MAP for Primary Grades which is designed to assess K - 2nd grade students and the original MAP designed to assess the reading development of 2nd – 10th graders (NWEA, 2009). The current study contains no MAP for Primary Grades administrations, so only comparisons with the original MAP for grades 2nd – 5thwill be explored in this report. All further references to the MAP used here are to the MAP reading assessment designed for 2nd – 10th grade students. This MAP assessment measures reading development across five sub-domains: evaluative reading comprehension, interpretive

[1] RIT stands for the "RaschUnIT", which is derived using the Rasch model (NWEA, 2009, p. 16).

reading comprehension, literal reading comprehension, literary response and analysis, and word analysis and vocabulary (NWEA, 2009).

The DRA2 also measures students reading level and is subdivided into two measurement tools: DRA2 for K-3rd Grade Readers and the DRA2 for 4th-8th Grade Readers (Pearson, 2009). However, the DRA2 is not a computer adaptive assessment, but is a one-on-one teacher administered assessment. According to the DRA2 technical manual, the K-3rd grade version of the test takes less than 60 minutes to administer to each student. The 4th-8th grade version takes 55 to 70 minutes to administer. Although the DRA2 is a well-established one-on-one reading assessment, the time required to individually assess every student in a class multiple times per year can be burdensome. The MAP test does not have a time limit. According to its technical documentation, on average, it takes about 65 minutes to administer (NWEA, 2009). The ISIP takes much less time, with an average administration of less than 30 minutes (Mathes, Torgensen, & Herron, 2011). An advantage of both the MAP and the ISIP is that both are taken on a computer. Therefore, they can be administered to an entire class simultaneously. This greatly reduces the time spent administering the reading assessment one student at a time.

Sample 1

The current study occurred in two phases. First, student DRA2, ISIP, and MAP scores were gathered from a large suburban school district in Texas. A total of 13,638 K - 5th grade students who had taken the DRA2 and the ISIP and 571 2nd – 5th grade students who had taken the DRA2, ISIP, and the MAP at the beginning of the 2010-2011 school year made up the data sets. The demographic breakdown of the study participants (Table 1) was similar to the demographic breakdown of K-12th grade public school children in the nation as a whole. In 2009, the US student distribution was approximately 55% White, 15% African American, 22%

Hispanic, and 4% Asian (National Center for Educational Statistics, 2011). The majority of students who took both the ISIP and the DRA2 came from grades K-3 and the majority of students who took all three assessments came from grade 2 (Table 1). This is because the district only administered the DRA2 to struggling readers beginning in the 3rd grade.

Table 1: Sample 1 Demographics and Test Scores

	Kindergarten		1st		2nd		3rd		4th		5th	
Students	3177		3249		3305		2837		627		443	
By Gender												
Male	1582	51%	1703	52%	1618	49%	1431	50%	325	52%	240	54%
Female	1539	49%	1546	48%	1687	51%	1406	50%	302	48%	203	46%
By Ethnicity												
American Indian/Alaskan Native	20	1%	15	0%	15	0%	14	0%	3	0%	1	0%
Asian	443	14%	489	15%	498	15%	400	14%	60	10%	45	10%
Black/ African American	264	8%	295	9%	269	8%	266	9%	90	14%	69	16%
Hispanic	395	12%	431	13%	474	14%	401	14%	117	19%	100	23%
Native Hawaiian/ Pacific Islander	2	0%	1	0%	2	0%	4	0%	1	0%	1	0%
Two or More Races	95	3%	85	3%	88	3%	67	2%	8	1%	10	2%
White	1958	62%	1933	59%	1959	59%	1685	59%	348	56%	217	49%
Qualifing for Free/Reduced Lunch	338	46%	364	45%	414	44%	384	45%	145	46%	116	47%
Qualifing for Special Ed. Services	227	31%	256	32%	307	33%	322	38%	122	38%	92	37%
Limited English Proficientcy	168	23%	190	23%	213	23%	151	18%	50	16%	40	16%
Mean DRA2 (Standard Deviation)	2.47	(3.38)	11.72	(8.32)	25.9	(9.96)	33.94	(8.06)	35.72	(7.91)	40.7	(8.01)
Mean MAP-RIT (Standard Deviation)	NA	NA	NA	NA	182.12	(14.74)	197.14	(14.91)	187.18	(12.33)	203.8	(8.71)
Mean ISIP (Standard Deviation)	188.13	(11.49)	210.17	(13.41)	233.01	(15.95)	250.88	(52.53)	1867.57	(158.43)	1976.13	(160.13)
Mean ISIP - Fluency Rate (Standard Deviation)	NA	NA	3.89	(12.35)	39.34	(37.18)	79.34	(42.13)	86.12	(63.46)	135.71	(68.78)

Sample 2

In a follow-up analysis, ISIP and DRA2 assessment data was gathered for K-5th grade students across the school district. 11,097 K - 5th grade students had taken both the DRA2 and the ISIP assessments in the late spring of 2011. Again, the demographics (Table 2) are similar to the 2009 national average, with a slight overrepresentation of Asian students in this sample (National Center for Educational Statistics, 2011). Parallel to sample 1, the number of students administered the DRA2 decreased after 2nd grade. Since the district did not administer the MAP reading assessment in the spring of 2011, a comparison of the MAP and the ISIP about their relationship to the DRA2 could not be performed with this sample.

Table 2: Sample 2 Demographics and Test Scores

	Kindergarten	1st	2nd	3rd	4th	5th
Students	3274	3337	3325	648	371	142
By Gender						
Male	1660 (51%)	1739 (52%)	1636 (49%)	350 (54%)	197 (53%)	82 (58%)
Female	1614 (49%)	1598 (48%)	1689 (51%)	298 (46%)	174 (47%)	60 (42%)
By Ethnicity						
American Indian/ Alaskan Native	23 (1%)	16 (< 1%)	18 (1%)	2 (< 1%)	3 (1%)	0 (0%)
African American	273 (8%)	302 (9%)	271 (8%)	68 (10%)	59 (16%)	21 (15%)
Asian	467 (14%)	514 (15%)	494 (15%)	94 (15%)	24 (6%)	13 (9%)
Hispanic	402 (12%)	451 (14%)	497 (15%)	101 (16%)	83 (22%)	30 (21%)
Native Hawaiian/Pacific Islander	2 (< 1%)	1 (< 1%)	5 (< 1%)	1 (< 1%)	0 (0%)	0 (0%)
White	2007 (61%)	1972 (59%)	1952 (59%)	368 (57%)	193 (52%)	69 (49%)
Two or More Races	100 (3%)	81 (2%)	88 (3%)	14 (2%)	9 (2%)	9 (6%)
Qualifing for Free/Reduced Lunch	316 (10%)	342 (10%)	402 (12%)	104 (16%)	102 (27%)	37 (26%)
Qualifing for Special Ed. Services	215 (7%)	228 (7%)	287 (9%)	97 (15%)	73 (20%)	36 (25%)
Limited English Proficientcy	184 (6%)	260 (8%)	278 (8%)	53 (8%)	36 (10%)	20 (14%)
Mean DRA2 (SD)	10.07 (7.35)	24.38 (9.48)	33.49 (7.53)	35.94 (7.10)	39.26 (6.10)	45.60 (9.53)
Mean ISIP (SD)	209.46 (16.45)	230.87 (18.52)	246.36 (19.97)	256.57 (21.35)	1954.44 (187.04)	2020.34 (206.22)
Mean ISIP - Fluency Rate (SD)	NA	80.52 (31.70)	103.83 (32.61)	97.91 (43.46)	126.46 (41.97)	123.66 (38.32)

Statistical Analysis

The first research question asked, "*Does the MAP RIT score or the ISIP overall theta score do a better job of predicting a student's performance on the DRA2 for K-5th grade students?"* To address this question, a set of single-predictor regression analyses were performed on the sample 1 data to determine the amount of variation in the DRA2 score that a student's ISIP and MAP score explained. Regression is a statistical analysis that uses the variation in one or more predictor variables to help explain the variation in an outcome variable. In other words, using regression, the pattern of scores in one variable can be used to predict how a student will perform on a second variable. The strength of the relationship between the predictor variable and the outcome variable is quantified by the coefficient of agreement (R^2) derived from the regression formula. This is the square of the correlation coefficient between the outcomes and the predicted value. It can fall between 0 and 1. An R^2 of zero indicates that the predictor variable(s) is entirely unrelated to the outcome variable. As such, knowing a person's score on the predictor variable(s) does not provide any insight into how that same person might perform on the outcome variable. An R^2 near 1, on the other hand, indicates that if the outcome on the predictor variable(s) is known, a pretty good estimate of how a person will perform on the outcome variable can be made. The current study looked at the relationship between a student's ISIP score and their DRA2 score and the relationship between a student's MAP score and their DRA2 score. To determine whether the MAP or the ISIP assessment had a stronger relationship with the DRA2, the R^2 values derived from their individual regression analyses were compared. The predictor variable (MAP or ISIP) with the highest R^2 did a better job of predicting a student's score on the DRA2.

The second research question is "*Which regression equation best fits the relationship between the ISIP overall theta score and the DRA2 score such that the R^2 is maximized?"* To answer this question, a series of regression models were compared. These comparisons were based on two criteria: (a) maximizing the R^2, and (b) maintaining as much parsimony as possible. The second part of this study sought to derive the simplest possible formula that explained the maximum amount of variation in the DRA2 score. The best fitting regression formula was used to create a conversion chart between a student's ISIP score and a predicted DRA2 score.

Findings

Research Question 1

*Does the MAP RIT score or the ISIP overall theta score do a better job of predicting a student's performance on the DRA2 for K-5th grade students?*Nineteen single-predictor regression equations were run to determine whether the ISIP or the MAP score was a better predictor of a student's DRA2 score (Table 3). Six regressions using the MAP score as a predictor variable matched with six corresponding regressions using ISIP as a predictor variable.

Table 3: Sample 1 Regression Results

Matched Regression Results

Variables	Grades	R^2	Sample Size
DRA2 ~ ISIP	2nd Grade	0.65	3305
DRA2 ~ MAP	2nd Grade	0.59	430
DRA2 ~ ISIP	3rd Grade	0.53	2832
DRA2 ~ MAP	3rd Grade	0.51	93
DRA2 ~ ISIP	4th Grade	0.46	627
DRA2 ~ MAP	4th Grade	0.26	28
DRA2 ~ ISIP	5th Grade	0.33	443
DRA2 ~ MAP	5th Grade	0.26	20
DRA2 ~ ISIP	2nd - 3rd Grade	0.64	6137
DRA2 ~ MAP	2nd - 3rd Grade	0.61	523
DRA2 ~ ISIP	4th - 5th Grade	0.45	1070
DRA2 ~ MAP	4th - 5th Grade	0.53	48

Unmatched Regression Results

Variables	Grades	R^2	Sample Size
DRA2 ~ ISIP	Kindergarten	0.33	3177
DRA2 ~ ISIP	1st Grade	0.64	3249
DRA2 ~ ISIP	K - 1st Grade	0.67	6426
DRA2 ~ ISIP	K - 2nd Grade	0.81	9731
DRA2 ~ ISIP	K - 3rd Grade	0.85	12,563
DRA2 ~ ISIP	1st - 2nd Grade	0.77	6554
DRA2 ~ MAP	2nd - 5th Grade	0.6	571

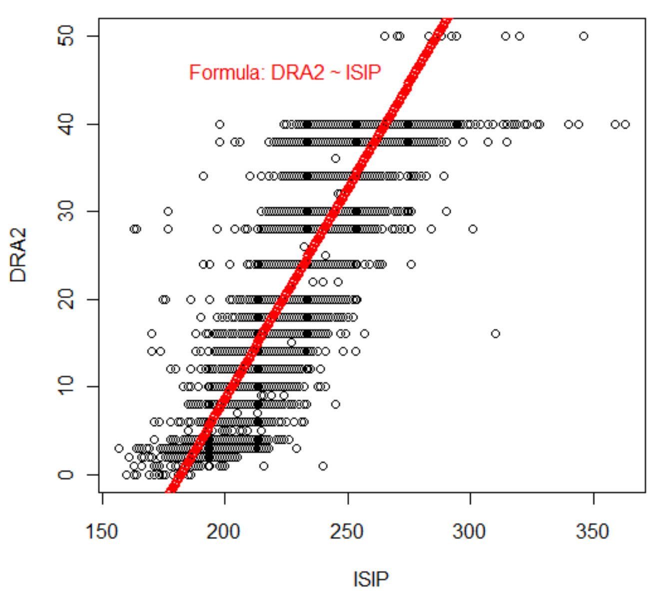
These regressions, matched by grade level(s), helped determine which assessment did a better job of predicting a student's performance on the DRA2. In all but one of the six matched groups (2nd grade, 3rd grade, 4th grade, 5th grade, 2nd – 3rd grade, and 4th – 5th grade), the ISIP was a better DRA2 predictor than the MAP. Differences in R^2 ranged from (0.02 to 0.2). The ISIP also had large R^2 values for some of the groups with no corresponding MAP data. For example, the K - 2nd and the K - 3rd grade clusters had R^2 values of 0.81 and 0.85 respectively. This means that 81 to 85 percent of the variation in the DRA2 for these age ranges is explained by the variation in student scores on the ISIP. Thus, an ISIP score is a strong predictor of a DRA2 score for elementary students.

Research Question 2

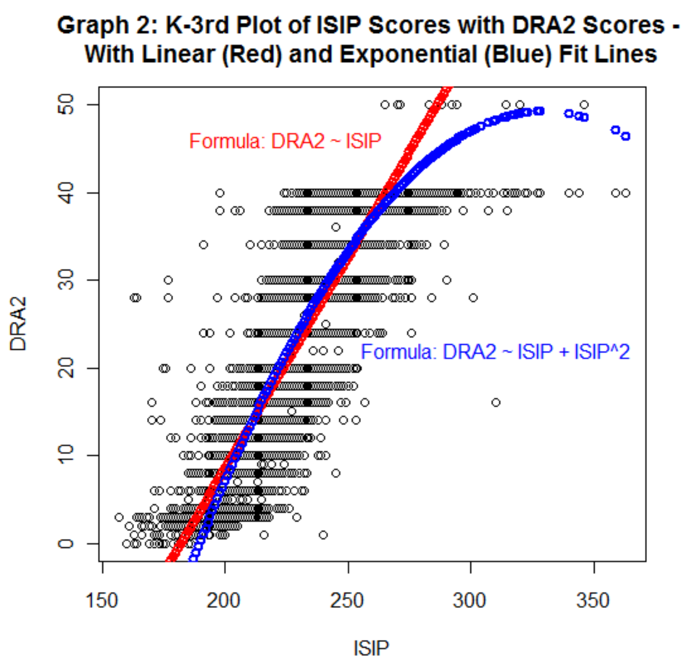
Which regression equation best fits the relationship between the ISIP overall theta score and the DRA2 score such that the R^2 is maximized? In order to answer this question a set of single- and multiple-predictor regressions were fit to the ISIP/DRA2 data from sample 2 (N = 11,097). These were evaluated based upon the goals of (a) maximizing the explained variance (R^2) and (b) maintaining parsimony in the model. Since the ISIP changes scales in the 4th grade, two separate analyses were conducted on the K – 3rd grade data and the 4th – 5th grade data. Various graphical representations of the data were also used to help determine which variables should be included in the model.

K – 3rd grade formula. The analyses began with a simple linear one-predictor model (Graph 1) and obtained an R^2 of 0.76.

Graph 1: K-3rd Plot of ISIP Scores with DRA2 Scores - With Simple Linear Fit Line

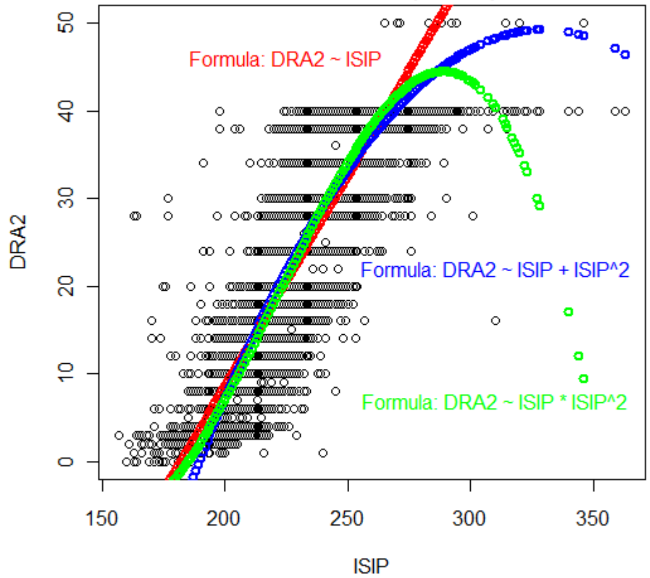


Examination of the graph shows that the data may be following more of an exponential curve pattern. An exponential predictor variable ($ISIP^2$)was added to the model. The addition of this component yielded an R^2 of 0.78. After examining the model graphically (Graph 2), it appeared that this model should include an interaction between the linear and exponential components to allow for a better fit line to accommodate the leftward curve of the data when the DRA2 is less than 5.



An interaction between the ISIP score and the squared ISIP score was added to the regression equation. The addition of this interaction resulted in an R^2 of 0.8 (Graph 3).

Graph 3: K-3rd Plot of ISIP Scores with DRA2 Scores - With Linear (Red), Exponential (Blue), and Exponential w/ an Interaction Effect (Green) Fit Lines



The addition of this interaction term pushed the R^2 above 0.8. It allowed the fit line (green) to account, at least partially, for the leftward curve of the data when the DRA2 is less than 5. However, the green fit line adjusts too slowly to the leftward curve and predicts a DRA2 score of zero at a higher corresponding ISIP score than even the simple linear fit line (red). Further, both of the fit lines that include an exponential predictor variable (green and blue) must be restricted to a given range of ISIP scores to prevent the formula from predicting lower DRA2 scores as the ISIP scores increase. For example, as the green fit line (with the interaction effect and the exponential ISIP score) moves past an ISIP score of approximately 280, it begins to predict a smaller and smaller DRA2 score. Therefore, the conversion formula is only useful for ISIP scores that are less than 280. Finally, for the bulk of the data (DRA2 between 1 and 40), all three models produce almost identical predictions. Because of these limiting factors for the regression equations containing exponential variables, the use the simple linear regression to create an ISIP to DRA2 Conversion formula for K-3rd grade studentswas chosen.

The primary obstacle in using regression to estimate a DRA2 score from an ISIP score is that the DRA2 does not follow a pure interval scale. As the DRA2 score increases from 0 to 50, the gap between possible DRA2 scores begins to widen. After the DRA2 is above 40, the gap jumps by 10 DRA2 points. Thus, a student can achieve either a 40 or a 50, but nothing in between. This factor inhibits the precision of any linear regression model for DRA2 scores greater than 40. It would, perhaps, be more appropriate to fit an ordered multinomial logistic regression model to all data greater than 40. However, because this data is sparse, and has no DRA2 scores greater than 50, this estimate would likely be biased downward towards 40. Therefore, even though the accuracy of the model for DRA2 scores greater than 40 is unknown, the safest bet (from a statistical perspective) is to trust the projections created by the data that this study has. It is possible that the apparent rightward curve at the high end of the ISIP scores is merely a chance occurrence that might disappear if more students who achieved a DRA2 score of 50 or above were available for this study.

The simple linear regression model produced the following output:

Output 1: Regression results for DRA2 predicted by ISIP

```
Call:
lm(formula = dra2 ~ isip, data = gk3)

Residuals:
Min       1Q       Median       3Q       Max
-46.952   -4.152   -0.363       4.100    37.192

Coefficients:
             Estimate     Std. Error     t value     Pr(>|t|)
(Intercept) -87.550293    0.608959       -143.8      <2e-16 ***
Isip         0.480724     0.002623        183.3      <2e-16 ***
---
Signif.codes:0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6.237 on 10559 degrees of freedom
Multiple R-squared: 0.7609,Adjusted R-squared: 0.7609
F-statistic: 3.36e+04 on 1 and 10559 DF, p-value: < 2.2e-16
```

The ISIP explained 76 percent of the variance in the DRA2 with all variables significant at the 0.05 significance level. From this output, the conversion formula for estimating a DRA2 score from an ISIP score for K - 3rd grade students is:

$$\boldsymbol{ISIP} < 182\ DRA\mathbf{2} = \mathbf{0}$$

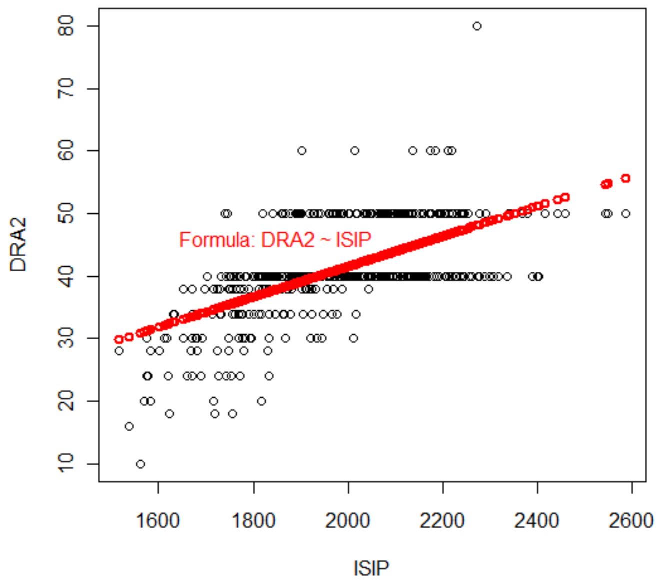
$$\mathbf{182} \leq \boldsymbol{ISIP} \leq \mathbf{287}\ \boldsymbol{Predicted\ DRA}2 = -\mathbf{87.550293} + \mathbf{0.480724} * \boldsymbol{ISIP\ Score}$$

$$\boldsymbol{ISIP} > 287 DRA\mathbf{2} = \mathbf{50}+$$

The formula is restricted to the range of ISIP scores between 182 and 287 to prevent predictions of negative DRA2 scores and, on the high end, to prevent end users from relying on predictions based on a linear extrapolation that exceeds the bounds of the dataset used to produce the conversion formula. In other words, this restriction prevents the end user from assuming a child is reading at a DRA2 level of 70 based on a converted ISIP score when, in reality, it cannot be said, with any certainty, because of the data range limitations, whether or not that child really should be reading on that level. Therefore, while projections can be made for ISIP scores above 287, it is recommended that it be stated that the student is reading at a DRA2 level at or above 50.

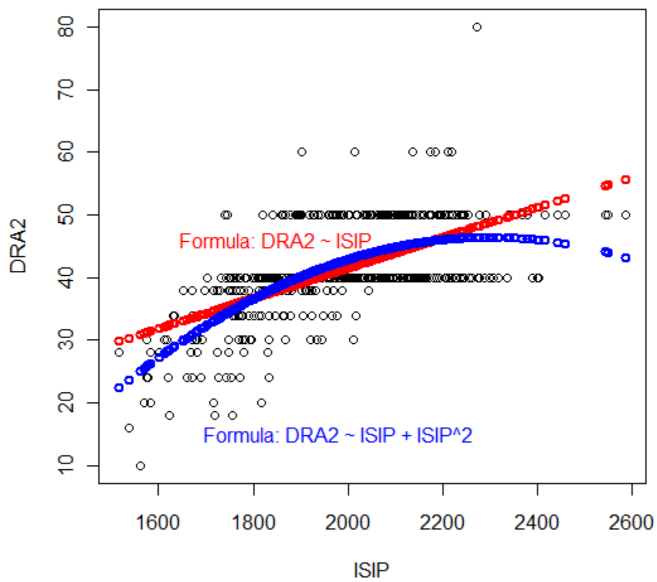
4th – 5th grade formula. Following the same process used for deriving the K-3rd grade formula, a simple linear regression model was fit to the DRA2/ISIP data for the 4th – 5th grade data (N = 494). This model produced an R^2 of 0.35 (Graph 4). This much smaller R^2 is likely due to the inconsistency in the DRA2 scale (i.e., below 40, there are small intervals between reading levels, but after 40 the scale stretches to 10 point intervals).

Graph 4: 4th - 5th Plot of ISIP Scores with DRA2 Scores - With Linear Fit Line

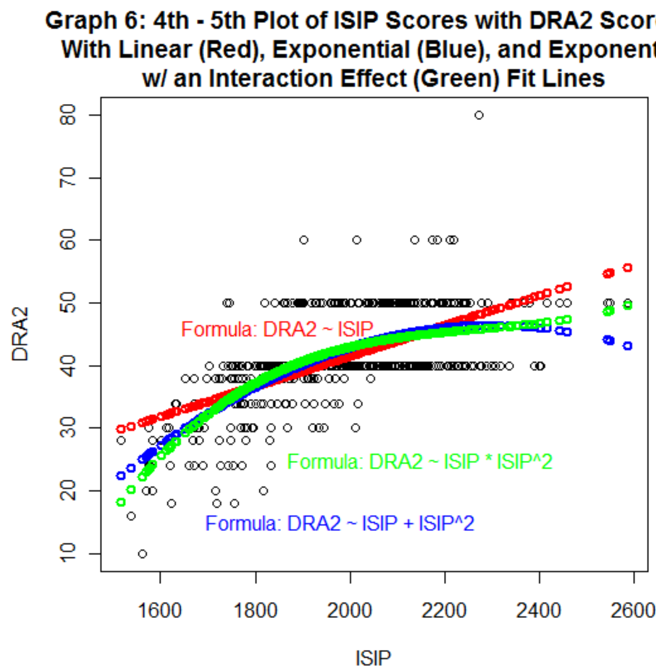


Since the linear model line of best fit is overestimating student DRA2 scores for ISIP scores lower than 1750, an exponential was added to the equation to allow the equation to model this non-linear trend in DRA2 scores (Graph 5).

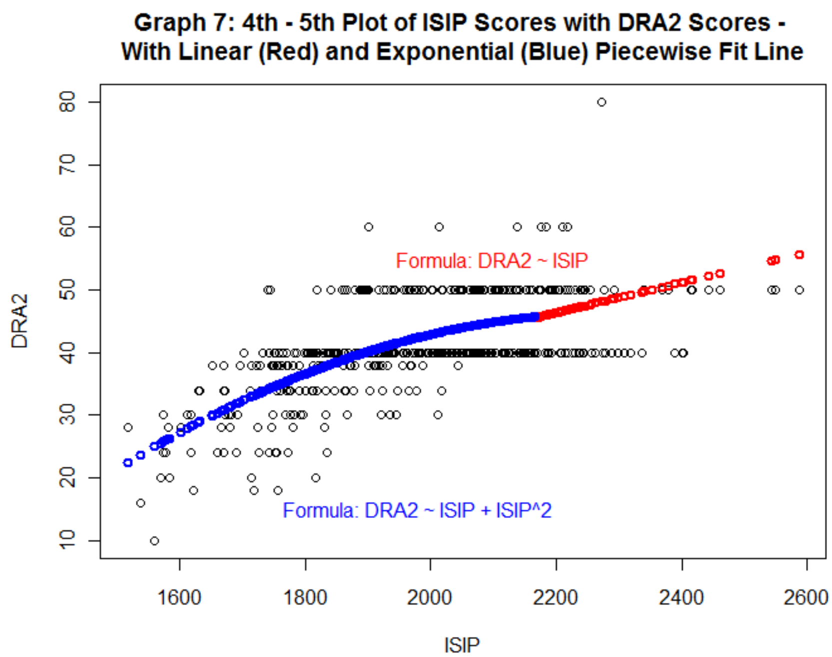
Graph 5: 4th - 5th Plot of ISIP Scores with DRA2 Scores - With Linear (Red) and Exponential (Blue) Fit Lines



This increased the R^2 to 0.41 allowed the fit line to more accurately model the score patterns of students with lower DRA2 scores. Finally, an interaction effect was added to the regression equation and the R^2 increased slightly to 0.42 (Graph 6).



Because this interaction effect added complexity to the model, but did not significantly increase the model fit (R^2 increased only 0.01), it was rejected. Instead the exponential equation (without the interaction) was accepted as the conversion equation.This was done because it increased the R^2 by 0.06, explaining 6% more of the variance in the DRA2 score than the simple linear fit line. In addition, it fit the data better than the linear model for student scores on the low end. Because it begins to reverse its upward positive relationship around an ISIP score of 2170, however, the linear line serves as the line of best fit from 2170 forward (Graph 7).



These two regression formula's produced the following outputs:

Output 2: Regression results for DRA2 predicted by ISIP – Simple Linear Model

```
Call:
lm(formula = dra2 ~ isip, data = g45)

Residuals:
Min         1Q        Median        3Q        Max
-20.913   -3.794     -0.544        3.803     31.879

Coefficients:
              Estimate     Std. Error      t value      Pr(>|t|)
(Intercept)   -6.8659      2.9812          -2.303       0.0217 *
isip           0.0242      0.0015          16.132       <2e-16 ***
---
Signif.codes:0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6.208 on 492 degrees of freedom
Multiple R-squared: 0.346, Adjusted R-squared: 0.3446
F-statistic: 260.2 on 1 and 492 DF, p-value: < 2.2e-16
```

Output 3: Regression results for DRA2 predicted by ISIP – Exponential Model

```
Call:
lm(formula = dra2 ~ isip + isip2, data = g45)

Residuals:
Min       1Q       Median       3Q       Max
-17.238   -4.466   -0.645       4.365    33.590

Coefficients:
               Estimate     Std. Error     t value     Pr(>|t|)
(Intercept)   -1.611e+02   2.213e+01      -7.281      1.33e-12 ***
isip           1.804e-01   2.227e-02       8.101      4.36e-15 ***
isip2         -3.922e-05   5.579e-06      -7.029      7.02e-12 ***
---
Signif.codes:0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 5.923 on 491 degrees of freedom
Multiple R-squared: 0.4057,Adjusted R-squared: 0.4033
F-statistic: 167.6 on 2 and 491 DF, p-value: < 2.2e-16
```

From these outputs, the 4th-5th grade conversion formula is:

$$\boldsymbol{ISIP} < 1500\ \boldsymbol{DRA2} = \ \mathbf{20}\ \boldsymbol{or\ less}$$

$$\mathbf{1500}\ \leq \boldsymbol{ISIP} \leq \mathbf{2170}\ \boldsymbol{DRA2} = \ -\mathbf{161.0909}\ +\ \mathbf{0.1804264} * \boldsymbol{ISIP} - \mathbf{0.0000392151} * \boldsymbol{ISIP}^{\mathbf{2}}$$

$$\mathbf{2170}\ < ISIP \leq 2600\ \boldsymbol{DRA2} = \ -\mathbf{6.8659} +\ \mathbf{0.0242} * \boldsymbol{ISIP}$$

$$\boldsymbol{ISIP} > 2600\boldsymbol{DRA2} = \ \mathbf{60} +$$

As with the K-3rd grade formula, the limits of 1500 and 2600 are placed on the formula to prevent extrapolating beyond the limits of the dataset. It is possible to apply the formulas to data outside of this range, but the accuracy of such conversions is unknown.

Discussion

The current study compared the relationship of the MAP and ISIP reading assessments with the DRA2 using 19 separate regression analyses. On five of the six occasions where the groups overlapped, the ISIP did a better job of predicting the DRA2 score. A separate dataset (sample 2) of 11,097 student records was then used to create a formula for converting an ISIP score to a DRA2 score. Because the ISIP assessment changes scales in 4th grade, a separate formula was produced for the 4th-5th grade sample. The K-3rd grade regression model explained 76 percent of the variation in the DRA2. This high R^2 indicates that the two assessments are highly correlated and the conversion formula derived from the regression analysis is highly reliable.

The 4th-5th grade formula, however, only explained between 35 and 41 percent of the variation in the DRA2. Since the final fit line was created by piecing together two separate regression analyses, no full model R^2 value can be derived. The lower R^2 values for the models indicate that predictions based on the formula will likely havea significant degree of error. Therefore, the 4th-5th grade conversion chart should be interpreted with more caution.

Limitations

The first section of this study (Research Question 1) is limited in a few respects. First, the lack of MAP data for K-1st graders makes it impossible to determine whether the ISIP or the MAP is a better predictor of a DRA2 score for students in these grades. It can be said that the ISIP is a strong predictor ($R^2 = 0.67$) for this age range, but the predictive power of the MAP is not known. This study also offers no information on the relationship between the MAP for Primary Grades and the DRA2. Further, the sample sizes for the regression equations containing the MAP score as an independent variable were consistently smaller than the regression equations containing the ISIP score as an independent variable. For most of the regression analyses, the dataset contained a sufficient number of MAP and DRA2 matched cases to provide accurate estimates of the MAP's predictive strength. However, the sample size for the regressions containing the MAP for 4th grade ($n = 28$) and 5th grade ($n = 20$) were too small to produce trustworthy estimates. These limitations should be considered when making generalizations from this study's findings regarding the alignment of the MAP with the DRA2.

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Appendix

K-3rd Grade Conversion Chart	
ISIP	***DRA2***
185-186	A-1
187-190	2-3
191-194	4
195-198	6
199-202	8
203-207	10
208-211	12
212-215	14
216-219	16
220-223	18
224-232	20
233-240	24
241-244	28
245-252	30
253-261	34
262-265	38
266-277	40
278-288	50
289+	60

4th - 5th Grade Conversion Chart	
ISIP	***DRA2***
	A-1
	2-3
	4
	6
	8
	10
	12
	14
	16
	18
1543 or less	20 or less
1544-1614	24
1615-1652	28
1653-1737	30
1738-1836	34
1837-1895	38
1896-2184	40
2185-2680	50
2681+	60+