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ABSTRACT

After an extensive review of relevant research, this paper describes a study concerning the relationship between the American College Test (ACT) and the Pre-Professional Skills Test (PPST). Specifically, the study assessed the extent to which ACT scores predict PPST scores. Subjects included 169 Harding University students (42 males and 127 females) who took the PPST for the first time between January 1, 1989 and December 31, 1989; and who also took the ACT prior to admission to the University. Moderately to substantially high correlations between the ACT and PPST were found. All 15 correlations between the five ACT scores (natural science, English, mathematics, social science, and composite) and the three PPST scores (reading, writing, and mathematics) were statistically significant. The ACT composite accounted for 44% to 64% of the variance in PPST scores. All students failing to meet the state cutoff scores on any portion of the PPST (reading, 170; writing, 171; and mathematics, 169) scored less than 22 on the ACT composite. Six regression equations were presented for predicting PPST scores from ACT scores. Data support the ACT as a reliable predictor of PPST scores, and policies could be considered that would exempt students from the PPST based upon their ACT scores. Seven data tables are included. (Author/RLC)

Predicting PPST Scores from ACT scores

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Abstract

This study investigated the relationship between the American College Test (ACT) and the Pre-Professional Skills Test (PPST), specifically the extent to which ACT scores predict PPST scores. Subjects included 169 Harding University students who took the PPST for the first time between January 1, 1989, and December 31, 1989, and who also took the ACT prior to admission to the university. All 15 correlations (.48 to .81) between the 5 ACT scores (natural science, English, mathematics, social science, and composite) and the 3 PPST scores (reading, writing, and mathematics) were statistically significant ($p < .001$). All students failing to meet the state cutoff scores on any portion of the PPST (reading, 170; writing, 171; and mathematics, 169) scored less than 22 on the ACT composite. Six regression equations were presented for predicting PPST scores from ACT scores. Data support the ACT as a reliable predictor of PPST scores, and policies could be considered which would exempt students from the PPST based upon their ACT scores.

Predicting PPST scores from ACT scores

Twelve states require the Pre-Professional Skills Test (PPST) as a qualifying examination for teacher certification: Arizona, Arkansas, Delaware, Kansas, Maine, Minnesota, Nebraska, Nevada, Tennessee, Texas, West Virginia, and Wisconsin. Eight of these states require the PPST for admission to the Teacher Education Programs within the state. Six require it for certification. (Nebraska and West Virginia require the PPST both for certification and Teacher Education Program admission). Two states, Tennessee and West Virginia, exempt individuals from the PPST if they have high American College test (ACT) scores (ACT composite > 20 and > 24, respectively) or Scholastic Aptitude Test (SAT) scores (> 989 and > 1034, respectively). This study investigates the relationship between the ACT and the PPST and examines using ACT scores to predict PPST scores.

Various factors have been found to be related to PPST scores. ACT scores (Aksamit, Mitchell, & Pozebl, 1987; Heard & Ayers, 1988; Nance & Kinnison, 1988; Sibert, 1989; Stoker & Tarrab, 1985), SAT scores (Bethel, Connelly, de Hart, Armant, & Hunsucker-Evans, 1986), race (Bethel et al., 1986), major (Bethel et

al., 1986; Nance & Kinnison, 1988), and grade point average (Nance & Kinnison, 1988; Sibert, 1989). Other factors whose relationship with the PPST have been studied include sex, repeating the PPST test, basic skills test scores, high school size, ethnicity of the high school, amount of preparation for the PPST, age, high school rank, and reading ability.

Several studies have investigated the relationship between PPST and ACT scores. Stoker and Tarrab (1985) found correlations between the PPST and ACT from .68 to .77. Aksamit et al. (1987) found correlations between PPST and ACT from .44 to .76 ($p < .001$ for all correlations) and also found that the ACT composite score accounted for 55%, 44%, and 50% of the PPST reading, writing, and mathematics variances, respectively.

Aksamit et al. (1987) identified three canonical variates of PPST and ACT scores: a basic skills component, a mathematics component, and a reading component. The canonical correlations of these three variates with the composite sets of PPST and ACT variables were .86, .55, and .30, respectively ($p < .001$). Aksamit et al. (1987) concluded that "the evidence is rather conclusive that there is

considerable shared variance between the PPST and ACT" (p. 51).

Aksamit et al. (1987) suggested that regression equations could be generated for the highest ACT correlates of PPST subtests. They found the following to be the highest correlates of each PPST subtest: ACT composite and PPST reading (r = .74), ACT English and PPST writing (r = .72), and ACT math and PPST math (r = .76). They suggested that ACT cut scores could be linked to PPST cut scores using regression equations. High school students scoring less than the ACT cut scores would be required to take the PPST in college to determine if their deficiency had been overcome. The students who met the ACT cut scores would be exempt from the PPST.

Heard & Ayers (1988) found correlations between the ACT and PPST subtests ranging from .55 to .80. The highest correlations were between the ACT composite and PPST reading (.79), the ACT mathematics and the PPST writing (.80) and the ACT English and PPST mathematics (.75). (There appeared to be inconsistency in the Heard & Ayers' data.) All of these correlations were statistically significant ($p < .01$).

Heard & Ayers (1988) derived the following regression equations:

PPST reading = 158.26 + 1.28(ACT composite) - .44(ACT math) + .01(Composite English GPA)

PPST writing = 155.48 + .95(ACT English) + .53(Composite English GPA) - .03(ACT composite).

PPST mathematics = 165.08 + .06(ACT math) + .48(ACT composite). (p. 199)

Heard & Ayers concluded that "the ACT composite score was the overall best predictor of success on the three tests of the PPST" (1988, p. 199-200). They further stated that "it appears questionable whether there is a need for the PPST when scores are available from the ACT" (1988, p. 200).

Bethel et al. (1986) found the strongest predictor of PPST reading scores was the SAT verbal score with a multiple correlation of .75. The strongest predictor in this study for the PPST mathematics was the SAT mathematics with multiple correlation of .80, and the ACT English was found to be the strongest predictor for the PPST writing with a multiple correlation of .84.

With ACT removed as an independent variable, Bethel et. al (1986) found the strongest predictor of

the PPST reading score was the SAT verbal score (multiple r = .78). The strongest predictor of the PPST mathematics was the SAT mathematics (multiple r = .70), and next high school rank (multiple r = .72). The multiple regression analysis for predicting the PPST writing score selected SAT writing (multiple r = .70) as the strongest predictor, then grade point average (multiple r = .78), and third SAT verbal score (multiple r = .76).

Nance & Kennison (1988) found correlations between the PPST and the ACT ranging from .47 to .76 ($p < .05$ for all correlations). They only compared the ACT composite, ACT English, and ACT math scores with the three PPST subtests. Of these comparisons the strongest predictor of PPST reading was the ACT composite (r = .63). The strongest predictor for the PPST writing was the ACT English (r = .64), and the strongest predictor for the PPST math was the ACT composite (r = .76).

Stoker and Tarrab (1985) found the following correlations: PPST math and ACT math (.70), PPST writing and ACT English (.75), and PPST reading and ACT English (.68). All three of these correlations were statistically significant. They also found the

following correlations with for the ACT composite: PPST math (.69), PPST writing (.61), and PPST reading (.67). In their sample of 129 students, all eight students who scored below 12 on the ACT composite failed one or more of the three PPST tests. (Minimum passing scores in Texas were 172 on the PPST reading, 171 on the PPST math, and 173 on the PPST writing.)

Stoker and Tarrab (1985) also found a few interesting individual cases. One student scored one on the ACT math yet passed the PPST. Another student scored 20 on the ACT composite but failed the PPST writing. Another student also scored 20 on the ACT composite and failed the PPST reading. They suggested some students might take advantage of the time between the ACT and the PPST to remediate deficiencies. They suggested that "perhaps students should not be considered for the Teacher Education Program unless they can score above a certain ACT level" (p. 45).

Sibert (1989) found correlations between the ACT and PPST subtests ranging from .39 to .74. The strongest predictor of PPST reading scores was the ACT composite (.74). The strongest predictor for PPST math was ACT math (.70). The strongest for PPST writing was ACT English (.64). All of these correlations were

significant at the .01 level. The ACT composite score was the factor weighing the most in 8 of the 11 regression equations in Sibert's study.

Duke and Duke (1989) tested the relationship between the PPST mathematics examination and the ACT subtests and found the following correlations: .84 with the ACT composite; .80 with the ACT mathematics; .58 with the ACT English; .64 with the ACT social studies; and .73 with the ACT natural science. All five of these correlations were statistically significant ($p < .001$). They also found a statistically significant difference between the pass/fail rate of elementary education majors (30.4% failed) and other majors (11.1% failed, chi-square = 6.91, $p < .01$). Duke and Duke (1989) also found a statistically significant relationship between PPST mathematics scores and grade point average ($r = .53$, $p < .001$) and a significant relationship between the PPST mathematics score and Mathematics 115 semester grades (Mathematics for Elementary Teachers, $r = .60$, $p < .001$).

Duke and Duke (1989) derived the following regression equation: PPST math = .9029(ACT composite) + .3706(ACT math) + 151.7171. In this equation the ACT

composite score and the ACT math score together accounted for 75.07% of the variance in the PPST mathematics scores.

Duke and Duke (1989) suggested further research into the question of whether the requirement of the PPST mathematics examination should be lifted for those with high ACT scores. They state, "further research would help to determine the feasibility of this and what cut-off score might be appropriate" (p. 28).

Design of the Study

This ex post facto study was based upon data from 169 Harding University students who took the PPST for the first time between January 1, 1989, and December 31, 1989, and who also took the ACT prior to admission to the university. Transfer students are not required to submit ACT scores to Harding. Hence, the sample excludes most transfer students. Since a passing score on the PPST is required for admission to the Teacher Education Program at this university, most of the subjects were in the first or second semester of the sophomore year. There were 42 males and 127 females in the sample.

This sample was not intended to be a representative sample of all teacher education

candidates in Arkansas. Harding University is a private, church-related, liberal arts-oriented university enrolling approximately 3,200 undergraduates from more than 45 of the 50 states and more than 20 foreign countries. This should be kept in mind when making generalizations from this study.

Procedure

Scores were obtained for the three PPST subtests (mathematics, reading, and writing) and the ACT (English, social science, natural science, mathematics, and composite score) for all students at Harding University who took both tests. These scores were obtained from the Testing Office of the university. Students who took the PPST prior to January 1, 1989, were omitted. (Cutoff PPST scores went into effect in Arkansas on January 1, 1989.) In addition, for students who took the PPST more than once between January 1, 1989, and December 31, 1989, only the first-time PPST scores were used. Subsequent PPST scores were omitted.

Results

Table 1 presents descriptive statistics for the ACT and PPST scores of the 169 subjects. Tables 2 and 3 present ACT and PPST means for Arkansas and the

Table 1

Descriptive Statistics for ACT and PPST Scores of the Sample (N = 169)

	Min	Max	Mean	SD
ACT-English	8	31	20.8	4.2
ACT-Math	1	34	18.6	7.0
ACT-Soc. Sci.	3	32	19.3	6.2
ACT-Nat. Sci.	10	34	22.6	5.4
ACT-Composite	9	31	20.5	4.8
PPST-Math	161	190	177.7	7.2
PPST-Reading	166	188	178.3	5.3
PPST-Writing	162	186	175.5	3.7

Table 2

Mean ACT Scores for High School Graduates and College Freshmen

	H S Graduates		Col. Fres'..
Test	Ark[a]	Nat'l[b]	Nat'l[c]
ACT-English	18.2	18.4	18.9
ACT-Math	15.2	17.1	17.7
ACT-Soc. Sci.	16.1	17.2	18.2
ACT-Nat. Sci.	20.3	21.2	21.7
ACT-Composite	17.6	18.6	19.7

[a]1989 Arkansas high school graduating class, N = 16925 (ACT . . . St. Composite of Arkansas, 1989, p. 2)

[b]1989 national high school graduating class, N = 855171 (ACT . . . National Report. 1989, p. 2)

[c]A 10% sample (n = 46682) of ACT-tested, enrolled freshmen in the 1080 colleges participating in the 1986-87 ACT class profile (ACT class profile, 1987, p. 2)

Table 3

National Mean PPST Scores[a]

Test	Mean	SD	N
PPST-Math	177.2	7.0	103,514[b]
PPST-Reading	177.6	5.8	73,057[c]
PPST-Writing	175.4	4.1	103,514[b]

[a]For college juniors and below (Pre-Professional Skills Tests Score Interpretation Guide, 1989, p. 6)

[b]Based upon examinees tested between July, 1986, and June, 1989.

[c]Based upon examinees tested between July, 1987, and June, 1989.

nation. This study's sample had higher mean ACT scores than the national mean for college freshmen on all five ACT scores and higher mean PPST scores than the national sample for all three PPST subtests.

The fifteen correlations between the subjects' ACT and PPST scores ranged from .43 to .81 (see Table 4). All the correlations were moderately to substantially high, and all were statistically significant ($p < .001$).

On January 1, 1989, minimum passing PPST scores went into effect for Teacher Education Program applicants in the state of Arkansas: PPST math, 169; PPST reading, 170; PPST writing, 171. Of the 169 subjects in this study, 33 did not meet these minimum scores on one or more of the three PPST subtests on their first attempt. Of these 33, 24 failed one PPST subtest, 6 failed two PPST subtests, and 3 subjects failed all three of the PPST subtests. Of the 169 subjects, 19 failed the PPST math test, 15 failed the PPST reading test, and 11 failed the PPST writing test. The ACT scores of these who failed the PPST are given in Table 5. All 33 subjects who failed the PPST scored less than 22 on the ACT composite. There were a total of 100 subjects who scored less than 22 on the ACT

Table 4

Correlation of ACT and PPST Scores

	Pre-Professional Skills Test		
ACT	Math	Reading	Writing
ACT-English	.53	.67	.72
ACT-Math	.81	.51	.43
ACT-Soc. Sci.	.61	.74	.61
ACT-Nat. Sci.	.68	.64	.55
ACT-Composite	.80	.75	.66

Note. For all fifteen correlation, $p < .001$ ($N = 169$).

Table 5

ACT Scores of Subjects Failing the PPST (n = 33)

	ACT Subtests				
ACT Score	Eng	Math	Soc Sci	Nat Sci	Comp
	PPST Math Failures (n = 19)				
Min ACT	9	1	3	11	9
Max ACT	27	22	24	24	21
Mean ACT	17.6	8.6	14.2	16.7	14.4
	PPST Reading Failures (n = 15)				
Min ACT	9	1	3	13	9
Max ACT	21	22	16	25	18
Mean ACT	15.5	13.5	13.5	18.7	15.1
	PPST Writing Failures (n = 11)				
Min ACT	8	2	8	13	9
Max ACT	20	25	20	25	21
Mean ACT	14.2	13.5	13.5	18.7	15.1

Note. PPST failing scores: PPST-Math < 169, PPST-Reading < 170, PPST-Writing < 171.

composite: 33 of these failed at least one part of the PPST and 67 of these passed all three parts of the PPST (see Table 6).

The following three regression equations were generated:

PPST math = .48(ACT math) + .62(ACT composite) + 156.10. (1)

PPST reading = 1.48(ACT composite) - .31(ACT math) - .29(ACT nat sci) + 160.46. (2)

PPST writing = .49(ACT Eng) + .15(ACT soc sci) + 162.43. (3)

In each of these three equations the ACT variable which entered the equation first is given as the first variable in the equation, the second variable to enter the equation is given second, and the third variable is given third.

The two independent variables in Equation 1 have a multiple correlation of .84 with PPST math and account for 71% of its variance. The three independent variables in Equation 2 have a multiple correlation of .78 with PPST reading and account for 62% of its variance. The two independent variables in Equation 3 have a multiple correlation of .74 with PPST writing and account for 55% of its variance.

Table 6

Number of Subjects Failing the PPST by ACT Composite

ACT-Comp	No. Failing PPST Math	Read	Writ	Total Failing	Total Passing
9	2	2	1	2[a]	0
10	0	0	0	0	0
11	3	3	1	3	0
12	2	1	2	3	1
13	1	0	0	1	1
14	2	3	1	4	2
15	1	3	1	5	6
16	2	1	2	4	3
17	3	1	0	4	9
18	0	1	0	1	16
19	1	0	1	2	6
20	1	0	0	1	13
21	1	0	2	3	10
22+	0	0	0	0	69
TOTAL	19	15	11	33	136

[a]Some subjects failed more than one part of the PPST. None had ACT composites less than nine.

If the ACT composite score is entered as the first variable in the regression equations, the following equations are generated:

PPST math = 1.19(ACT composite) + 153.25 (4)

PPST reading = .82(ACT composite) + 161.59 (5)

PPST writing = .51(ACT composite) + 165.06. (6)

In Equation 4 the ACT composite has a correlation of .80 with PPST math and accounts for 64% of its variance. In Equation 5 the ACT composite has a correlation of .75 with PPST reading and accounts for 56% of its variance. In Equation 6 the ACT composite score has a correlation of .66 with PPST writing and accounts for 44% of its variance.

Based upon Equations 4 through 6, more than 99% of the subjects with ACT composite scores of 20 or higher could expect to pass the PPST on the first attempt (see Table 7). Consequently, it would seem reasonable to establish cutoff scores on the ACT composite and permit individuals with ACT composite scores higher than the cutoff to be exempt from the PPST. This study would suggest an ACT composite cutoff score of 20 to 22. Inasmuch as Tennessee, a neighboring state, has already adopted a policy exempting individuals from the PPST if they score 21 or higher, perhaps Arkansas

Table 7

Percentage Likely to Fail the PPST at each ACT Composite Score

ACT Composite	Percent Likely to Fail the PPST		
	Math	Reading	Writing
1-7	99+	95+	97+
8	99	88	92
9	99	74	84
10	96	56	73
11	88	37	59
12	73	22	45
13	54	12	32
14	35	6	22
15	19	3	14
16	10	1	9
17	4	< 1	5
18	2	< 1	3
19	< 1	< 1	2
20-36	< 1	< 1	< 1

Note. Based upon Equations 4, 5, and 6.

should consider a similar policy with 21 as the cutoff score. If such a policy had been in effect on the subjects in this study, only three of the subjects who failed the PPST on their first attempt would have been exempted from the PPST based upon their ACT composite scores. A total of 79 subjects would have been exempt from the PPST. This would have represented a combined savings of $3950 ($50 x 79) in PPST examination fees for these subjects.

Additional research could be conducted using a representative statewide sample of teacher education applicants in Arkansas. Further research could also focus not only on the predictive validity of the ACT, but also on content validity. Particular attention on the ACT-PPST Writing relationship seems warranted for two reasons: this was the lowest relationship in this study, and the ACT does not include an essay, whereas the PPST does.

Summary and Conclusion

This study found moderately to substantially high correlations between the ACT and the PPST (r = .43 to .81). All of these correlations were statistically significant ($p < .001$). Correlations between the ACT composite and the three PPST subtests were .80, PPST-

Math; .75, PPST-Reading; and .66, PPST-Writing ($p < .001$). Hence, the ACT composite accounted for 44% to 64% of the variance in PPST scores.

Six regression equations were derived, Equations 1-3 by stepwise entry of independent variables and Equations 4-6 by forced entry of only one independent variable (ACT composite):

PPST math = .48(ACT math) + .62(ACT comp) + 156.10 (1)

PPST reading = 1.48(ACT comp) - .31(ACT math) - .29(ACT nat sci) + 160.46 (2)

PPST writing = .49(ACT Eng) + .15(ACT soc sci) + 162.43 (3)

PPST math = 1.19(ACT comp) + 153.25 (4)

PPST reading = .82(ACT comp) + 161.59 (5)

PPST writing = .51(ACT comp) + 165.06 (6)

The multiple correlations between the independent variable(s) and the dependent variable in Equations 1-6 were .84, .78, .74, .80, .75, and .66, respectively, explaining 44% to 71% of the variance in the PPST subtests.

All subjects scoring 22 or higher on the ACT composite passed the PPST on their first attempt (passing scores = 169, PPST-Math; 170, PPST-Reading;

and 171, PPST-Writing). Consideration should be given to exempting individuals with ACT composites of 21 or higher from the PPST.

Bibliography

ACT high school profile report: H S graduating class 1989. St. composite for Arkansas. (1989). Iowa City, IA: The American College Testing Program (Code 040-000).

ACT class profile report: Enrolled 1986-87 freshmen. (1987). Iowa City, IA: The American College Testing Program (Code 9999).

ACT high school profile report: H S graduating class 1989, National report. (1989). Iowa City, IA: The American College Testing Program (Code 990-000).

Aksamit, D., Mitchell, J. V., & Pozebl, B. J. (1987). Relationship between PPST and ACT scores and their implications for the basic skills testing of prospective teachers. Journal of Teacher Education, 38, 48-52.

Bethel, L. J., Connelly, R. J., de Hart, F. B., Armant, G. F., & Hunsucker-Evans, S. M. (1986). Redesigning teacher education to recruit talented candidates and remediate "at risk" candidates using skills test scores and related data. Austin: The University of Texas at Austin. (ERIC Document Reproduction Service No. ED 268 083)

Bell, D., Daniel, A., Steinmiller, G., & Wheeler, G. (1986). Approval of teacher education: The Arkansas model. Batesville: Arkansas College. (ERIC Document Reproduction Service No. ED 274 660)

Duke, D. G. & Duke, J. R. (1989). Predictors of performance on the mathematics test of the Pre-Professional Skills Tests. Unpublished manuscript. Searcy, AR: Harding University.

Goodison, M. (1985, March). Testing the basic competencies of teacher education candidates with the Pre-Professional Skills Tests (PPST). Paper presented at the Annual Meeting of the American Educational Research Association and the National Council of Measurement in Education, Chicago, IL.

Heard, S. A., & Ayers, J.B. (1988). Validity of the American College Test in predicting success on the Pre-Professional Skills Test. Educational and Psychological Measurement, 48, 197-200.

Heger, R. K., & Burns, R. W. (1988). An analysis of El Paso high school and college student mathematics skills. College Student Journ , 22. 146-59.

Nance, J. L., & Kinnison, L. R. (1988). An examinatio: of ACT, PPST and ExCET performance of

teacher education candidates. Teacher Education and Practice, 5(1), 25-30.

Oppenheim, D. B. (1985). Review of Pre-Professional Skills Tests. In J. V. Mitchell, Jr. (Ed.), The Ninth Mental Measurements Yearbook; Vol. 2 (pp. 1187-1188). Lincoln, NE: The Buros Institute of Mental Measurements.

Pre-Professional Skills Test: score interpretation guide. (1987). Oakland, CA: Educational Testing Service.

PPST Bulletin of Information. (1988-89). Princeton, NJ: Educational Testing Service.

The PPST Guide. (1986). Princeton, NJ: Educational Testing Service.

Quellmalz, E. S. (1985). Review of Pre-Professional Skills Tests. In J. V. Mitchell, Jr. (Ed.), The Ninth Mental Measurements Yearbook; Vol. 2 (pp. 1188-1189). Lincoln, NE: The Buros Institute of Mental Measurements.

Salinger, T. S. (1986). Responding to the Preprofessional Skills Test. El Paso: University of Texas at El Paso, Department of Teacher Education. (ERIC Document Reproduction Service No. ED 268 113)

Salinger, T. S., & Burns, R. W. (1985). So you have to take the PPST? Education, 105(3), 236-239.

Sibert, P. C. (1989). Relationships among the ACT, PPST, NTE, ACT COMP, and the GPA. Cookeville: Tennessee Technological University, Center for Teacher Education Evaluation. (ERIC Document Reproduction Service No. ED 305 374)

Stoker, W. M., & Tarrab, M. (1985). The relationship between Pre-Professional Skills Tests and American College Tests. Teacher Education and Practice, 2(1), 43-45.

Test Analysis: Pre-Professional Skills Tests: October 24, 1987 Administration: Form 3JPS1. (1988). Unpublished statistical report. Princeton, NJ: Educational Testing Service.