Office of Assessment

SAM HOUSTON STATE UNIVERSITY

A Report of the Course-Embedded

Texas Assessment of Critical Thinking Skills (TACTS)

PHIL 2303

Fall 2023-Spring 2024

Description of Texas Assessment of Critical Thinking Skills (TACTS)

Each fall and spring semester, the Texas Assessment of Critical Thinking Skills (TACTS) is administered within sections of PHIL 2303: Critical Thinking. The TACTS is a locally developed, proprietary instrument designed to measure critical thinking skills and empirical and quantitative skills. The instrument consists of 20 multiple choice questions and is administered to students enrolled in those courses at the start and end of each semester. Because the instrument was developed by faculty with expertise in teaching and assessing critical thinking, it is assumed that the instrument has content-related validity (Banta & Palomba, 2015). Additionally, as this test was embedded within normal sections of PHIL 2303, the student scores represent authentic student work (Banta & Palomba, 2015; Kuh et al., 2015).

The student data presented within this report reflect student performance regarding the Texas Higher Education Coordinating Board's Core Learning Objectives of Critical Thinking Skills and Empirical and Quantitative Skills (THECB, 2024). The THECB (2024) defines these concepts as follows:

- Critical Thinking Skills: creative thinking, innovation, inquiry, and analysis, evaluation, and synthesis of information
- Empirical and Quantitative Skills: manipulation and analysis of numerical data or observable facts resulting in informed conclusions

These data should therefore be used in conjunction with other data to fully understand student knowledge and ability with regards to these Core Learning Objectives.

Methodology

A total of 204 students took the pretest, and a total of 53 students took the posttest for all sections of PHIL 2303: Critical Thinking for the 2023-2024 academic year; however, not all student test scores were used for analysis. To determine whether student performance increased from pre- to posttest, a dependent samples *t*-test was used for analysis. Student identification numbers were collected along with student scores to identify each student's score on both the pretest and posttest. A total of 41 students could be identified as taking both the pre- and posttests. All statistical analysis was therefore conducted on only those students for whom both pre- and posttest scores could be identified.

Prior to conducting inferential statistics to determine whether differences were present between the students' pre- to posttest scores, checks were conducted to determine the extent to which these data were normally distributed. All four of the standardized skewness and kurtosis coefficients were within the limits of normality of +/-3 (Onwuegbuzie & Daniel, 2002) for the face-to-face, online, and combined student population. Therefore, a parametric dependent samples *t*-test was used to analyze the student performance data for the combined populations. A complete breakdown of the standardized skewness and kurtosis coefficients is in Table 1.

Table 1

Standardized Skewness and Kurtosis Values for Student Pre- and Posttest Scores

Student Population	Standardized Skewness Coefficient	Standardized Kurtosis Coefficient
Face-to-Face Students		
Pretest	-0.27	-1.26
Posttest	0.01	-0.68
Online Students		
Pretest	-0.18	1.11
Posttest	0.57	-0.10
All Students		
Pretest	-0.18	0.14
Posttest	0.39	-0.30

Results

A parametric dependent samples *t*-test did not reveal a statistically significant difference between the pre- to posttest scores for students enrolled in face-to-face sections of PHIL 2303: Critical Thinking for the 2023-2024 academic year, $t(10) = -0.26$, $p = .803$. The average student score increased from 35.00% to 35.91%, for an increase of 0.91%. This equated to an average increase of 0.18 questions answered correctly from pre- to posttest. Readers are directed to Table 2 for a breakdown of these results.

Table 2

Descriptive Statistics for Student Pre- and Posttest Scores on Course-Embedded Test in PHIL 2303: Critical Thinking for 2023-2024 (Face-to-Face)

Test Version	*M*	*SD*	*M %*	*SD %*
Pretest Scores	7.00	2.79	35.00	13.96
Posttest Scores	7.18	2.60	35.91	13.00

Note. The number of students was 11.

A parametric dependent samples *t*-test did not reveal a statistically significant difference between the pre- to posttest scores for students enrolled in online sections of PHIL 2303: Critical Thinking for the 2023-2024 academic year, $t(29) = -1.59$, $p = .122$. The average student score increased from 33.33% to 37.50%, for an increase of 4.17%. This equated to an average increase of 0.83 questions answered correctly from pre- to posttest. Readers are directed to Table 3 for a breakdown of these results.

Table 3

Descriptive Statistics for Student Pre- and Posttest Scores on Course-Embedded Test in PHIL 2303: Critical Thinking for 2023-2024 (Online)

Test Version	*M*	*SD*	*M %*	*SD %*
Pretest Scores	6.67	2.32	33.33	11.62
Posttest Scores	7.50	2.43	37.50	12.16

Note. The number of students was 30.

A parametric dependent samples *t*-test did not reveal a statistically significant difference between the pre- to posttest scores for all students enrolled in sections of PHIL 2303: Critical Thinking for the 2023-2024 academic year, $t(40) = -1.55$, $p = .130$. The average student score increased from 33.78% to 37.07%, for an increase of 3.29%. This equated to an average increase of 0.65 questions answered correctly from pre- to posttest. Readers are directed to Table 4 for a breakdown of these results.

Table 4

Descriptive Statistics for Student Pre- and Posttest Scores on Course-Embedded Test in PHIL 2303: Critical Thinking for 2023-2024 (All Students)

Test Version	*M*	*SD*	*M %*	*SD %*
Pretest Scores	6.76	2.43	33.78	12.13
Posttest Scores	7.41	2.45	37.07	12.25

Note. The number of students was 41.

Additional important information regarding student performance can also be gained through an item analysis of student pre- and posttest performance on individual test questions for each of the examined student populations. This item analysis revealed that students in face-to-face sections scored statistically significantly lower on 1 of the 20 test questions (Question 19) from pre- to posttest. Readers are directed to Table 5 for a complete breakdown of item analysis data for face-to-face students.

Table 5

Percentage of Face-to-Face Students Correctly Answering Pre- and Posttest Questions for 2023-2024

	Pretest %	Posttest %	Mean Difference	*p*	Cohen's *d*
Question 1	36	27	(9)	0.341	
Question 2	36	55	19	0.167	
Question 3	9	27	18	0.341	
Question 4	27	0	(27)	0.082	
Question 5	36	36	0	1.000	
Question 6	0	0	0	1.000	
Question 7	18	36	18	0.341	
Question 8	55	64	9	0.588	
Question 9	36	45	9	0.588	
Question 10	9	27	18	0.341	
Question 11	27	36	9	0.676	
Question 12	9	9	0	1.000	
Question 13	55	64	9	0.676	
Question 14	18	18	0	1.000	
Question 15	36	45	9	0.341	
Question 16	64	73	9	0.341	
Question 17	55	18	(37)	0.104	
Question 18	55	45	(10)	0.676	
Question 19	45	9	(36)	0.038*	0.84

Question 20	73	82	9	0.588	

Note. $n = 11$. (Decrease in score from pretest to posttest); * significant at $p \leq 0.05$; ** significant at $p \leq 0.01$; *** significant at $p \leq 0.001$. Cohen's d from 0.2 – 0.49 indicates a small effect size, 0.50-0.79 indicates a moderate effect size, and 0.80 and higher indicates a large effect size (Cohen, 1988).

An item analysis for students in online sections revealed they scored statistically significantly higher on 4 of the 20 test questions (Questions 7, 9, 11, and 16) as well as statistically significantly lower on Question 3 from pre- to posttest. Readers are directed to Table 6 for a complete breakdown of item analysis data for online students.

Table 6

Percentage of Online Students Correctly Answering Pre- and Posttest Questions for 2023-2024

	Pretest %	Posttest %	Mean Difference	*p*	Cohen's *d*
Question 1	17	23	6	0.536	
Question 2	37	43	6	0.601	
Question 3	27	7	(20)	0.031*	0.55
Question 4	40	37	(3)	0.787	
Question 5	60	57	(3)	0.745	
Question 6	0	7	7	0.161	
Question 7	23	50	27	0.030*	0.57
Question 8	17	13	(4)	0.745	
Question 9	40	70	30	0.010**	0.62
Question 10	20	7	(13)	0.161	
Question 11	23	47	24	0.050*	0.51
Question 12	23	30	7	0.423	
Question 13	67	63	(4)	0.745	
Question 14	13	20	7	0.423	
Question 15	27	23	(4)	0.573	
Question 16	50	70	20	0.031*	0.41
Question 17	27	33	6	0.536	
Question 18	60	43	(17)	0.134	
Question 19	33	33	0	1.000	
Question 20	63	73	10	0.326	

Note. $n = 30$. (Decrease in score from pretest to posttest); * significant at $p \leq 0.05$; ** significant at $p \leq 0.01$; *** significant at $p \leq 0.001$. Cohen's d from 0.2 – 0.49 indicates a small effect size, 0.50-0.79 indicates a moderate effect size, and 0.80 and higher indicates a large effect size (Cohen, 1988).

An item analysis for students in all sections combined revealed that face-to-face and online students scored statistically significantly higher on 3 of the 20 questions (Questions 7, 9, and 16) from pre- to posttest, and they approached significance on Question 11. Readers are directed to Table 7 for a complete breakdown of item analysis data for all students.

Table 7

Percentage of All Students Correctly Answering Pre- and Posttest Questions for 2023-2024

	Pretest %	Posttest %	Mean Difference	*p*	Cohen's *d*
Question 1	22	24	2	0.767	
Question 2	37	46	9	0.323	
Question 3	22	12	(10)	0.253	
Question 4	37	27	(10)	0.323	
Question 5	54	51	(3)	0.785	
Question 6	0	5	5	0.160	
Question 7	22	46	24	0.016*	0.52
Question 8	27	27	0	1.000	
Question 9	39	63	24	0.011*	0.49
Question 10	17	12	(5)	0.570	
Question 11	24	44	20	0.058	
Question 12	20	24	4	0.486	
Question 13	63	63	0	1.000	
Question 14	15	20	5	0.534	
Question 15	29	29	0	1.000	
Question 16	54	71	17	0.018*	0.35
Question 17	34	29	(5)	0.623	
Question 18	59	44	(15)	0.135	
Question 19	37	27	(10)	0.323	
Question 20	66	76	10	0.253	

Note. $n = 41$. (Decrease in score from pretest to posttest); * significant at $p \leq 0.05$; ** significant at $p \leq 0.01$; *** significant at $p \leq 0.001$. Cohen's *d* from 0.2 – 0.49 indicates a small effect size, 0.50-0.79 indicates a moderate effect size, and 0.80 and higher indicates a large effect size (Cohen, 1988).

References

Banta, T. W., & Palomba, C. A. (2015). *Assessment essentials: Planning, implementing, and improving assessment in higher education* (2nd ed.). Jossey-Bass.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum.

Kuh, G. D., Ikenberry, S. O., Jankowski, N. A., Cain, T. R., Ewell, P. T., Hutchings, P., & Kinzie, J. (2015). *Using evidence of student learning to improve higher education*. Jossey-Bass.

Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools, 9*(1), 73-90.

Texas Higher Education Coordinating Board. (2024). *Texas Core Curriculum*. https://www.highered.texas.gov/institutional-resources-programs/public-universities-health-related-institutions/transfer-resources/texas-core-curriculum-tcc/