



Office of Assessment  
SAM HOUSTON STATE UNIVERSITY

A Report of the Course-Embedded

Texas Assessment of Critical Thinking Skills (TACTS)

PHIL 2303

Fall 2022-Spring 2023

### **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, 2023). The THECB (2023) 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 246 students took the pretest, and a total of 149 students took the posttest for all sections of PHIL 2303: Critical Thinking for the 2022-2023 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 104 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  $\pm 3$  (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	0.59	0.42
Posttest	-0.01	-0.62
Online Students		
Pretest	0.34	-0.01
Posttest	0.66	0.71
All Students		
Pretest	0.46	0.11
Posttest	0.27	-0.20

**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 2022-2023 academic year,  $t(51) = -1.92, p = .061$ . The average student score increased from 32.40% to 35.67%, for an increase of 3.27%. This equated to an average increase of 0.65 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 2022-2023 (Face-to-Face)*

Test Version	<i>M</i>	<i>SD</i>	<i>M</i> %	<i>SD</i> %
Pretest Scores	6.48	2.31	32.40	11.57
Posttest Scores	7.13	2.34	35.67	11.72

*Note.* The number of students was 52.

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 2022-2023 academic year,  $t(51) = 1.93, p = .060$ . The average student score decreased from 33.37% to 29.90%, for a decrease of 3.47%. This equated to an average decrease of 0.69 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 2022-2023 (Online)*

Test Version	<i>M</i>	<i>SD</i>	<i>M</i> %	<i>SD</i> %
Pretest Scores	6.67	2.37	33.37	11.83
Posttest Scores	5.98	2.60	29.90	13.00

*Note.* The number of students was 52.

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 2022-2023 academic year,  $t(103) = 0.08, p = .940$ . The average student score decreased from 32.89% to 32.79%, for a decrease of 0.10%. This equated to an average decrease of 0.02 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 2022-2023 (All Students)*

Test Version	<i>M</i>	<i>SD</i>	<i>M %</i>	<i>SD %</i>
Pretest Scores	6.58	2.33	32.89	11.65
Posttest Scores	6.56	2.53	32.79	12.65

*Note.* The number of students was 104.

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 higher on 3 of the 20 test questions (Questions 1, 9, and 18) from pre- to posttest, as well as statistically significantly lower on Question 4. 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 2022-2023*

	Pretest %	Posttest %	Mean Difference	<i>p</i>	Cohen's <i>d</i>
Question 1	29	50	21	0.004**	0.44
Question 2	35	46	11	0.224	
Question 3	10	13	3	0.532	
Question 4	44	25	(19)	0.017*	0.40
Question 5	65	63	(2)	0.811	
Question 6	4	8	4	0.420	
Question 7	27	25	(2)	0.799	
Question 8	8	13	5	0.261	
Question 9	33	63	30	0.001***	0.63
Question 10	13	13	0	1.000	
Question 11	38	40	2	0.821	
Question 12	21	17	(4)	0.532	
Question 13	65	69	4	0.659	
Question 14	10	17	7	0.252	
Question 15	23	21	(2)	0.766	
Question 16	65	63	(2)	0.799	
Question 17	40	33	(7)	0.376	
Question 18	29	48	19	0.032*	0.40
Question 19	19	17	(2)	0.785	

Question 20	69	65	(4)	0.659
-------------	----	----	-----	-------

*Note.*  $n = 52$ . (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 no statistically significant differences 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 2022-2023*

	Pretest %	Posttest %	Mean Difference	$p$	Cohen's $d$
Question 1	29	29	0	n/a	
Question 2	40	37	(3)	0.642	
Question 3	13	15	2	0.799	
Question 4	31	29	(2)	0.821	
Question 5	52	38	(14)	0.090	
Question 6	15	10	(5)	0.411	
Question 7	23	29	6	0.371	
Question 8	29	23	(6)	0.411	
Question 9	37	46	9	0.322	
Question 10	13	13	0	n/a	
Question 11	29	27	(2)	0.799	
Question 12	15	13	(2)	0.709	
Question 13	62	60	(2)	0.837	
Question 14	25	15	(10)	0.168	
Question 15	17	21	4	0.569	
Question 16	63	52	(11)	0.135	
Question 17	29	19	(10)	0.133	
Question 18	35	35	0	n/a	
Question 19	37	25	(12)	0.182	
Question 20	73	62	(11)	0.135	

*Note.*  $n = 52$ . (Decrease in score from pretest to posttest)

An item analysis for students in all sections combined revealed that face-to-face and online students scored statistically significantly higher on Question 9 from pre- to posttest, and they approached significance on Question 1. 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 2022-2023*

	Pretest %	Posttest %	Mean Difference	<i>p</i>	Cohen's <i>d</i>
Question 1	29	39	10	0.055	
Question 2	38	41	3	0.540	
Question 3	12	14	2	0.551	
Question 4	38	27	(11)	0.070	
Question 5	59	51	(8)	0.171	
Question 6	10	9	(1)	0.820	
Question 7	25	27	2	0.697	
Question 8	18	18	0	n/a	
Question 9	35	55	20	0.003**	0.41
Question 10	13	13	0	n/a	
Question 11	34	34	0	n/a	
Question 12	18	15	(3)	0.470	
Question 13	63	64	1	0.880	
Question 14	17	16	(1)	0.843	
Question 15	20	21	1	0.836	
Question 16	64	58	(6)	0.210	
Question 17	35	26	(9)	0.106	
Question 18	32	41	9	0.158	
Question 19	28	21	(7)	0.225	
Question 20	71	63	(8)	0.184	

*Note.*  $n = 104$ . (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. (2023). *Texas Core Curriculum*.  
<https://www.highered.texas.gov/institutional-resources-programs/public-universities-health-related-institutions/transfer-resources/texas-core-curriculum-tcc/>