

**Office of Academic  
Planning and Assessment**

A Report of the Course Embedded

Texas Assessment of Critical Thinking Skills (TACTS)

2019-2020

## Description of Introduction to Philosophy Pre- to Post-Test Assessment

Each fall and spring semester the Texas Assessment of Critical Thinking Skills (TACTS) test is administered within sections of PHIL 2303: Critical Thinking. The TACTS is a locally-developed, proprietary instrument designed to measure critical thinking, 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. As 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, 2020). The THECB (2020) 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 618 students took the pre-test and a total 450 students took the post-test for all sections of PHIL 2303: Critical Thinking for the 2019-2020 academic year; however, not all student test scores were used for analysis. In order to determine whether student performance increased from pre-to-post, dependent samples *t*-tests were used for analysis. Student SamID's were collected along with student scores in order to identify each student's score on both the pre- and post-test. A total of 367 students provided their SamID's and took both the pre- and post-tests. All statistical analysis was therefore conducted on only those students for whom both pre- and post-test scores could be identified. In order to further disaggregate the results, data for face-to-face and online students were also analyzed separately. The 2019-2020 academic year brought an additional challenge due to the COVID-19 crisis. Midway through the spring 2020 semester, SHSU entered a period of emergency remote instruction. Therefore, student results for both the fall and spring semesters were also analyzed individually in order to understand what differences may have existed in the TACTS scores for students enrolled in fall and spring semesters.

Prior to conducting inferential statistics to determine whether differences were present between the students' pre- to post-test scores, checks were conducted to determine the extent to which these data were normally distributed. All of the standardized skewness and kurtosis coefficients were within the limits of normality of +/-3 for the face-to-face, the online student populations, and the combined populations (Onwuegbuzie & Daniel, 2002). Therefore, parametric dependent samples *t*-tests were used for all statistical analysis. Readers are directed to Table 1 for a breakdown of the standardized skewness and kurtosis results.

Table 1

*Standardized Skewness and Kurtosis Values for Student Pre- and Post-test Scores*

Student Population	Standardized Skewness Coefficient	Standardized Kurtosis Coefficient
Face-to-Face Students		
Pre-Test	2.31	0.58
Post-Test	0.14	-0.58
Online Students		
Pre-Test	1.19	-0.17
Post-Test	1.11	-0.68
All Students		
Pre-Test	2.58	0.25
Post-Test	0.81	-0.99

**Results**

A parametric dependent samples *t*-test revealed a statistically significant difference between the pre-to-post scores for students enrolled in face-to-face sections of PHIL 2303: Critical Thinking for the 2019-2020 academic year,  $t(265) = -6.20, p < .001$ . This difference represented a small effect size (Cohen's *d*) of 0.41 (Cohen, 1988). The average student score increased from 34.70% to 39.81%, for an increase of 5.11%. This equated to an average increase of 1.02 questions answered correctly from pre-to-post. Readers are directed to Table 2 for a breakdown of these results.

Table 2

*Descriptive Statistics for Student Pre- and Post-Scores on Course-Embedded Test in PHIL 2303: Critical Thinking for 2019-2020 (Face-to-Face)*

Test Version	<i>M</i>	<i>SD</i>	<i>M</i> %	<i>SD</i> %
Pre-test Scores	6.94	2.24	34.70	11.20
Post-test Scores	7.96	2.75	39.81	13.74

*Note.* The number of students was 266.

A parametric dependent samples *t*-test did not reveal a statistically significant difference between the pre-to-post scores for students enrolled in online sections of PHIL 2303: Critical Thinking for the 2019-2020 academic year,  $t(100) = -0.10, p = .92$ . The average student score increased from 35.05% to 35.20%, for an increase of 0.15%. This equated to an average increase of 0.03 questions answered correctly from pre-to-post. Readers are directed to Table 3 for a breakdown of these results.

Table 3

*Descriptive Statistics for Student Pre- and Post-Scores on Course-Embedded Test in PHIL 2303: Critical Thinking for 2019-2020 (Online)*

Test Version	<i>M</i>	<i>SD</i>	<i>M %</i>	<i>SD %</i>
Pre-test Scores	7.01	2.56	35.05	12.80
Post-test Scores	7.04	2.53	35.20	12.63

*Note.* The number of students was 101.

A parametric dependent samples *t*-test revealed a statistically significant difference between the pre-to-post scores for all students enrolled in sections of PHIL 2303: Critical Thinking for the 2019-2020 academic year,  $t(366) = -5.16, p < .001$ . This difference represented a small effect size (Cohen's *d*) of 0.30 (Cohen, 1988). The average student score increased from 33.37% to 38.41%, for an increase of 5.04%. This equated to an average increase of 1.01 questions answered correctly from pre-to-post. Readers are directed to Table 4 for a breakdown of these results.

Table 4

*Descriptive Statistics for Student Pre- and Post-Scores on Course-Embedded Test in PHIL 2303: Critical Thinking for 2019-2020 (All Students)*

Test Version	<i>M</i>	<i>SD</i>	<i>M %</i>	<i>SD %</i>
Pre-test Scores	6.96	2.33	34.80	11.64
Post-test Scores	7.71	2.72	38.54	13.58

*Note.* The number of students was 367.

In order to help understand the potential impact of the transition to remote instruction in the spring 2020 semester, TACTS data from the fall and spring semesters were also examined separately. This examination did reveal differences in student learning for face-to-face students from the fall to spring semesters.

A parametric dependent samples *t*-test revealed a statistically significant difference between the pre-to-post scores for students enrolled in face-to-face courses during the fall 2019 semester  $t(196) = -7.10, p < .001$ . This difference represented a moderate effect size (Cohen's *d*) of 0.55 (Cohen, 1988). The average student score increased from 34.57% to 41.35%, for an increase of 6.78%. This equated to an average increase of 1.36 questions answered correctly from pre-to-post. However, a parametric dependent samples *t*-test for students enrolled in face-to-face courses in the spring semester did not reveal a statistically significant difference  $t(68) = -0.24, p = .81$ . Student scores were virtually unchanged from pre-to-post, with a pretest percentage of 35.07% and a post-test percentage of 35.43%. No meaningful differences were observed in the performance of online students from fall to spring, with neither the fall,  $t(58) = -0.53, p = .60$ , or spring,  $t(41) = -0.48, p = .64$ , online populations demonstrating statistically significant gains from pre-to-post. The reader is directed to Table 5 for a breakdown of these results.

Table 5

*Descriptive Statistics for Student Pre- and Post-Scores on Course-Embedded Test in PHIL 2303: Critical Thinking for 2019-2020 by Semester*

	<i>M</i>	<i>SD</i>	<i>M %</i>	<i>SD %</i>
Fall 2019 Semester				
Face-to-Face Students (n = 197)				
Pre-Test Scores	6.91	2.26	34.57	11.29
Post-Test Scores	8.27	2.63	41.35	13.14
Online Students (n = 59)				
Pre-Test Scores	7.00	2.71	35.00	13.55
Post-Test Scores	7.20	2.61	36.02	13.06
Spring 2020 Semester				
Face-to-Face Students (n = 69)				
Pre-Test Scores	7.01	2.20	35.07	11.00
Post-Test Scores	7.09	2.91	35.43	14.54
Online Students (n = 42)				
Pre-Test Scores	7.02	2.36	35.12	11.82
Post-Test Scores	6.81	2.41	34.05	12.06

Additional important information regarding student performance can also be gained through an item analysis of student pre- and post-test performance on individual test questions for each of the examined student populations. Typically, this is done for the fall and spring populations combined; however, given the impact of the transition to remote instruction in spring 2020, this item analysis is provided separately for the fall 2019 and spring 2020 semesters.

This item analysis revealed that students in face-to-face sections for the fall 2019 semester scored statistically significantly higher on 7 of the 20 test questions (Questions 1, 8, 9, 10, 12, 16, 20) from pre-to-post. Readers are directed to Table 6 for a complete breakdown of item analysis data for fall 2019 face-to-face students.

Table 6

*Percentage of Face-to-Face Students Correctly Answering Pre- and Post-Test Questions for Fall 2019*

	Pre-Test	Post-Test	Mean Difference	Cohen's <i>d</i>
Question 1	22.84%	36.04%	13.20%**	0.29
Question 2	56.35%	58.88%	2.53%	
Question 3	9.64%	12.18%	2.54%	
Question 4	32.49%	35.03%	2.54%	
Question 5	74.62%	74.62%	0.00%	
Question 6	3.55%	7.61%	4.06%	
Question 7	26.90%	29.44%	2.54%	
Question 8	18.27%	57.85%	39.31%***	0.89
Question 9	17.77%	49.74%	31.97%***	0.72
Question 10	6.60%	12.69%	6.09%*	0.21
Question 11	35.02%	42.64%	7.62%	

Question 12	18.78%	33.50%	14.72%***	0.34
Question 13	72.08%	71.57%	-0.51%	
Question 14	14.21%	16.75%	2.54%	
Question 15	30.46%	27.92%	-2.54%	
Question 16	69.04%	77.16%	8.12%*	0.18
Question 17	34.52%	26.90%	-7.62%	
Question 18	47.72%	50.25%	2.53%	
Question 19	31.47%	25.38%	6.09%	
Question 20	69.03%	81.73%	12.70%**	0.30

Note.  $n = 197$ . \* 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 indicate a small effect size, 0.50-0.79 indicate a moderate effect size, and 0.80 and higher indicate a large effect size (Cohen, 1988).

An item analysis revealed that students in online sections for the fall 2019 semester scored statistically significantly higher on 1 of the 20 test questions (Question 9) from pre-to-post. Furthermore, students in online sections scored statistically significantly lower on 1 of the 20 test questions (Question 3) from pre-to-post. Readers are directed to Table 7 for a complete breakdown of item analysis data for fall 2019 online students.

Table 7

*Percentage of Online Students Correctly Answering Pre- and Post-Test Questions for Fall 2019*

	Pre-Test	Post-Test	Mean Difference	Cohen's $d$
Question 1	33.90%	42.37%	8.47%	
Question 2	45.76%	50.85%	5.09%	
Question 3	20.34%	6.78%	-13.56%*	-0.40
Question 4	32.20%	30.51%	-1.69%	
Question 5	57.63%	50.85%	-6.78%	
Question 6	6.78%	5.08%	-1.7%	
Question 7	20.34%	27.12%	6.78%	
Question 8	20.34%	18.64%	1.7%	
Question 9	49.15%	71.19%	22.04%**	0.46
Question 10	8.47%	10.17%	1.7%	
Question 11	30.51%	27.12%	3.39%	
Question 12	27.12%	30.51%	3.39%	
Question 13	67.80%	69.49%	1.69%	
Question 14	11.86%	10.17%	-1.69%	
Question 15	22.03%	28.81%	6.78%	
Question 16	54.24%	55.93%	1.69%	
Question 17	30.51%	38.98%	8.47%	
Question 18	42.37%	40.68%	-1.69%	
Question 19	30.51%	23.73%	-6.78%	
Question 20	88.14%	81.36%	-6.78%	

Note.  $n = 59$ . \* 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 indicate a small effect size, 0.50-0.79 indicate a moderate effect size, and 0.80 and higher indicate a large effect size (Cohen, 1988).

An item analysis revealed that students in face-to-face sections for the spring 2020 semester scored statistically significantly higher on 2 of the 20 test questions (Questions 1, 9) from pre-to-post. Furthermore, students in face-to-face sections scored statistically significantly lower on 2 of the 20 test questions (Questions 5, 19) from pre-to-post. Readers are directed to Table 8 for a complete breakdown of item analysis data for spring 2020 face-to-face students.

Table 8

*Percentage of Face-to-Face Students Correctly Answering Pre- and Post-Test Questions for Spring 2020*

	Pre-Test	Post-Test	Mean Difference	Cohen's <i>d</i>
Question 1	31.88%	47.83%	15.95%*	
Question 2	52.17%	44.93%	-7.24%	
Question 3	10.14%	17.39%	7.25%	
Question 4	33.33%	27.54%	-5.79%	
Question 5	71.01%	55.07%	-15.94%*	
Question 6	1.45%	7.25%	5.80%	
Question 7	31.88%	31.88%	0.00%	
Question 8	17.39%	17.39%	0.00%	
Question 9	17.39%	50.72%	33.33%***	
Question 10	8.70%	14.49%	5.79%	
Question 11	34.78%	44.93%	10.15%	
Question 12	24.64%	34.78%	10.14%	
Question 13	69.57%	56.52%	-13.05%	
Question 14	15.94%	18.84%	2.90%	
Question 15	26.09%	20.29%	-5.80%	
Question 16	60.87%	65.22%	4.35%	
Question 17	30.43%	31.88%	1.45%	
Question 18	44.93%	36.23%	-8.70%	
Question 19	40.58%	17.39%	-23.19%***	
Question 20	78.26%	68.12%	-10.14%	

*Note.*  $n = 69$ . \* 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 indicate a small effect size, 0.50-0.79 indicate a moderate effect size, and 0.80 and higher indicate a large effect size (Cohen, 1988).

Finally, an item analysis revealed that students in online sections for the spring 2020 semester scored statistically significantly higher on 1 of the 20 test questions (Question 6) from pre-to-post. Furthermore, students in online sections scored statistically significantly lower on 1 of the 20 test questions (Question 5) from pre-to-post. Readers are directed to Table 9 for a complete breakdown of item analysis data for spring 2020 online students.

Table 9

*Percentage of Online Students Correctly Answering Pre- and Post-Test Questions for Spring 2020*

	Pre-Test	Post-Test	Mean Difference	Cohen's <i>d</i>
Question 1	40.48%	57.14%	16.66%	
Question 2	52.38%	50.00%	-2.38%	
Question 3	4.76%	7.14%	2.38%	
Question 4	30.95%	30.95%	0.00%	
Question 5	78.57%	50.00%	-28.57%**	0.62
Question 6	4.76%	21.43%	16.67%*	0.50
Question 7	23.81%	26.19%	2.38%	
Question 8	9.52%	16.67%	7.15%	
Question 9	45.24%	35.71%	-9.53%	
Question 10	4.76%	11.90%	7.14%	
Question 11	26.19%	35.71%	9.52%	
Question 12	40.48%	23.81%	-16.67%	
Question 13	71.43%	73.81%	2.38%	
Question 14	19.05%	19.05%	0.00%	
Question 15	23.81%	16.67%	-7.14%	
Question 16	66.67%	59.52%	-7.15%	
Question 17	28.57%	26.19%	-2.38%	
Question 18	30.95%	33.33%	2.38%	
Question 19	23.81%	16.67%	-7.14%	
Question 20	76.19%	69.05%	-7.14%	

*Note.*  $n = 42$ . \* 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 indicate a small effect size, 0.50-0.79 indicate a moderate effect size, and 0.80 and higher indicate a large effect size (Cohen, 1988).

## References

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