Office of Academic Planning and Assessment

A Report of the Course Embedded

Texas Assessment of Critical Thinking Skills (TACTS)

PHIL 2303

2021-2022

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, 2022). The THECB (2022) 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 385 students took the pretest, and a total of 246 students took the posttest for all sections of PHIL 2303: Critical Thinking for the 2021-2022 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 167 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 online student population, and three of the four coefficients were within the limits of normality for the face-to-face and combined student populations. 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	2.95	2.71
Posttest	3.48	2.48

Online Students		
Pretest	1.15	1.04
Posttest	0.12	-0.89
All Students		
Pretest	3.20	2.96
Posttest	1.96	2.04

Results

A parametric dependent samples *t*-test revealed 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 2021-2022 academic year, $t(114) = -3.56$, $p < .001$. This difference represented a small effect size (Cohen's *d*) of 0.31 (Cohen, 1988). The average student score increased from 34.17% to 37.83%, for an increase of 3.66%. This equated to an average increase of 0.74 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 2021-2022 (Face-to-Face)

Test Version	*M*	*SD*	*M %*	*SD %*
Pretest Scores	6.83	2.44	34.17	12.17
Posttest Scores	7.57	2.27	37.83	11.36

Note. The number of students was 115.

A parametric dependent samples *t*-test revealed no statistically significant differences between the pre- to posttest scores for students enrolled in online sections of PHIL 2303: Critical Thinking for the 2021-2022 academic year, $t(51) = 0.78$, $p = 0.438$. The average student score decreased from 30.48% to 29.23%, for a decrease of 1.25%. This equated to an average decrease of 0.25 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 2021-2022 (Online)

Test Version	*M*	*SD*	*M %*	*SD %*
Pretest Scores	6.10	2.25	30.48	11.26
Posttest Scores	5.85	2.41	29.23	12.06

Note. The number of students was 52.

A parametric dependent samples *t*-test revealed a statistically significant difference between the pre- to posttest scores for all students enrolled in sections of PHIL 2303: Critical Thinking for the 2021-2022 academic year, $t(166) = -2.42$, $p = 0.017$. This difference approached a small effect size (Cohen's *d*) of 0.18 (Cohen, 1988). The average student score increased from 33.02% to 35.15%, for an increase of 2.13%. This equated to an average increase of 0.43 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 2021-2022 (All Students)

Test Version	*M*	*SD*	*M %*	*SD %*
Pretest Scores	6.60	2.40	33.02	11.99
Posttest Scores	7.03	2.44	35.15	12.22

Note. The number of students was 167.

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 2 of the 20 test questions (Questions 1 and 9) from pre- to posttest, as well as statistically significantly lower on 2 of the 20 test questions (Questions 5 and 15). 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 2021-2022

	Pretest %	Posttest %	Mean Difference	*p*	Cohen's *d*
Question 1	37	68	31	<.001***	0.65
Question 2	50	44	(6)	0.309	
Question 3	12	11	(1)	0.820	
Question 4	32	40	8	0.161	
Question 5	70	55	(15)	0.015*	0.31
Question 6	6	7	1	0.783	
Question 7	18	25	7	0.117	
Question 8	24	34	10	0.086	
Question 9	28	50	22	<.001***	0.46
Question 10	8	14	6	0.127	
Question 11	31	41	10	0.109	
Question 12	23	27	4	0.519	
Question 13	77	74	(3)	0.482	
Question 14	13	10	(3)	0.534	
Question 15	17	3	(14)	<.001***	0.49
Question 16	63	70	7	0.117	
Question 17	34	36	2	0.764	
Question 18	35	39	4	0.468	
Question 19	29	23	(6)	0.345	
Question 20	76	85	9	0.055	

Note. $n = 115$. (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 2021-2022

	Pretest %	Posttest %	Mean Difference	*p*	Cohen's *d*
Question 1	13	23	10	0.133	
Question 2	48	46	(2)	0.837	
Question 3	15	13	(2)	0.766	
Question 4	37	27	(10)	0.200	
Question 5	50	46	(4)	0.659	
Question 6	12	8	(4)	0.485	
Question 7	17	12	(5)	0.371	
Question 8	13	13	0	1.000	
Question 9	37	42	5	0.537	
Question 10	13	12	(1)	0.742	
Question 11	27	27	0	1.000	
Question 12	17	15	(2)	0.766	
Question 13	52	58	6	0.472	
Question 14	19	17	(2)	0.766	
Question 15	19	8	(11)	0.083	
Question 16	65	56	(9)	0.341	
Question 17	17	29	12	0.135	
Question 18	44	38	(6)	0.497	
Question 19	23	33	10	0.229	
Question 20	69	62	(7)	0.322	

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 2 of the 20 test questions (Questions 1 and 9) from pre- to posttest, as well as statistically significantly lower on 2 of the 20 test questions (Questions 5 and 15). 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 2021-2022

	Pretest %	Posttest %	Mean Difference	*p*	Cohen's *d*
Question 1	30	54	24	<.001***	0.50
Question 2	50	45	(5)	0.340	
Question 3	13	12	(1)	0.716	
Question 4	34	36	2	0.594	
Question 5	63	52	(11)	0.022*	0.22
Question 6	8	7	(1)	0.828	
Question 7	18	21	3	0.413	
Question 8	21	28	7	0.124	
Question 9	31	48	17	<.001***	0.35
Question 10	10	13	3	0.275	
Question 11	30	37	7	0.180	
Question 12	22	23	1	0.670	
Question 13	69	69	0	0.887	
Question 14	15	13	(2)	0.484	
Question 15	17	4	(13)	<.001***	0.43
Question 16	63	65	2	0.682	
Question 17	29	34	5	0.303	
Question 18	38	39	1	0.806	
Question 19	27	26	(1)	0.895	
Question 20	74	78	4	0.319	

Note. $n = 167$. (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

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