A SoTL INVESTIGATION OF THE EFFECTIVENESS OF AN ONLINE PRAXIS PREPARATION COURSE

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ABSTRACT

Scholarship of Teaching and Learning (SoTL) investigations examine the relationship between instructional efficacy versus actual learning in higher education in higher education. This SoTL investigation examined the effectiveness of an online preparation course in improving performance on the Praxis in Speech-Language Pathology. Participants included 33 students enrolled in a speech-language pathology master's program. Utilizing scores from a pre-test, final examination and the SLP Praxis, data analysis measured performance during and after the course and determined the magnitude of improvement. Results confirmed that the course was effective in increasing scores and that the online independent study preparation course was an effective instructional approach for students preparing for the SLP Praxis.

KEY WORDS*:* Praxis, distance education, speech-language pathology, teaching and learning

INTRODUCTION

In the discipline of communication sciences and disorders (CSD), the gold standard for assessment of learning is the Praxis in Speech-Language Pathology (SLP Praxis), a standardized instrument which is the national certification and licensure examination. Although its multiple-choice format is common and its validity and reliability are well established, the SLP Praxis is unique in that, in addition to foundational, academic, and clinical knowledge, it also requires critical thinking (Paul & Elder, 2007) and reasoning skills such as evaluation, analysis and synthesis (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956), as well as test-taking strategy (Payne, 2001; Smith, 2016). For success on the Praxis, proficiency with these cognitive skills must be demonstrated together with professional knowledge.

Historically, as in other standardized tests such at the SAT and GRE, there has been a performance differential for some test takers, particularly minority individuals (Payne & Johnson, 2015). To close this performance gap, a variety of commercial products including test preparation textbooks and live review courses exist. However, neither the extent to which these resources improve performance; their relative usefulness; or whether best results derive from review or enhancement of test-taking strategies has been examined. In addition, it is unknown whether the mode of preparation, e.g., self or group study; or live versus online instruction is most effective. Toward the exploration of these questions, this SoTL investigation examined the effectiveness of a multi-feature online preparation course in improving test performance on the SLP Praxis.

Courses via online platforms, known as distance education (DE) courses, are widely accepted as a common instructional practice in higher education. DE utilizes technology to deliver instruction without the instructor being physically present in the same place as the student. During 2016, more than 2.9 million students enrolled in graduate programs in the U.S. (Ginder, Kelly-Reid, & Mann, 2017). The authors further report that more than 1.8 million (62%) of these students were enrolled in at least one DE course. Hence, there is an overwhelming popularity of DE which demands empirical investigation of its effectiveness.

Scholarship of Teaching and Learning (SoTL) is an emerging concept that can address this demand for investigation. SoTL research explores the reciprocal relationship between instructional effectiveness and learner outcomes. As such, SoTL seeks to examine the interaction of specific subject content, complexity of the subject matter and efficacy of the mode of instruction on learner outcomes. While SoTL methodological approaches vary, the typical approach allows the instructor/investigator to employ empirical research methods specific to the discipline and course content while using the classroom as a convenience sample.

O'Brien (2008) outlined four attributes of SoTL which include: 1) overarching concern for enhancing student learning; 2) deliberate empirical design for teaching; 3) systematic implementation, analysis, and evaluation of the research; and 4) contribution to scholarly practice through documentation, publication, and peer reviewed research articles. Furthermore, SoTL investigation is guided by the six qualitative standards for research and instruction including clear course objectives, adequate preparation, effective presentation, appropriate research methods, significant results and reflective critique (Glassick, Huber, & Maeroff, 1997). Drawing upon O'Brien's attributes of SoTL, as well as the standards proposed by Glassick, Huber, & Maeroff, this SoTL investigation examined the effectiveness of a multi-feature, online independent study preparation course in improving students' performance on the SLP Praxis.

Design of the SLP Praxis Course

The SLP Praxis Course© is an online interactive multi-feature course that presented the following components: 1) narrated modules on test-taking skills, 2) self-scoring Pre-test and final examination with explanations to correct and incorrect answers, 3) mandatory reading assignments with podcast summaries, 4)

optional videotaped course reviews, and 5) required discussion board for interactive class participation. A complete description of the course components is included in Appendix A. To pass the course, students were required to access the mandatory course elements during the timeframe in which they were assigned.

Lectures for test-taking skills were delivered through eight pre-recorded Voice-Over-PowerPoint© Test-taking Skills Modules of 15 to 20 minutes duration to familiarize students with the question format, cognitive skills, test-taking strategies and affective qualities needed for optimal performance (See Appendix B for learner outcomes). Corresponding reading assignments from the text (Payne, 2001) were required for each module. The course allowed interaction and Question & Answer with the instructor and classmates through an online Discussion Board. Each week, participants submitted questions from the module, as well as the assigned readings. This mechanism allowed the instructor to monitor participants' usage and ensure that the required components were completed.

Sixteen optional one-hour course review videotapes were available for use by participants as they deemed necessary. The videotapes presented both undergraduate and graduate courses constituting the content areas of the SLP Praxis. Participants could access any or all course review videotapes at any time during the course.

METHOD

This study utilized a single-group pre-test/post-test design to examine the effectiveness of a graduate-level course delivered via DE. Following a pre-test, participants engaged in the online SLP Praxis course. The Praxis served as a post-test for comparison of performance.

The SLP Praxis Course was offered over nine weeks during participants' final semester as a mandatory one-credit, 15-hour online course in independent study format. Participants included a cohort of 33 students enrolled in a speech-language pathology master's program. Participants represented a mix of cultural populations including African Americans, Caucasians, Pacific Islanders, East Indians, and Hispanics aged 24- 32 years. Reflecting the composition of the discipline, participants were exclusively female. All participants had a grade point average above 3.40.

Participants accessed the required course components according to a controlled weekly schedule which monitored usage to ensure that each module was completed and that the minimum time requirement for usage was achieved. However, the course reviews were not mandatory, and each participant used this component according to their own need.

Prior to engaging in the course activities, participants completed the Pre-test which provided baseline data for analysis. Similarly, a final examination served as a culminating requirement that also offered a practice opportunity for participants to exercise the skills learned. The main purpose of the final examination was to ascertain that participants mastered the learner outcomes. After completing the course, participants took the Praxis in accordance with their own schedule during the semester.

Pre-Test and Final Examination Development

The Pre-test and final examination questions were modeled to simulate the experience of the actual Praxis administration. Identical to the format of the 2014 redesign of the Praxis, questions were delivered in multiple-choice online format. Questions for the Pre-test were drawn from those retired from previous Praxis examinations (Educational Testing Service, 1982 and Educational Testing Service, 1995). Questions for the final examination were developed by the instructor and designed to simulate actual Praxis questions incorporating the cognitive and test-taking skills.

Consisting of 132 questions each, the Pre-test and final examination were designed to be completed within 2-1/2 hours, the established allowable time for the Praxis. In addition, the questions reflected the three Praxis content

categories including: 1) Foundations and Professional Practice, 2) Screening, Assessment, Evaluation, and Diagnosis, and 3) Planning, Implementation, and Evaluation of Treatment, with each category having 44 questions.

Data Analysis

Performance data from the Pre-test, final examination and Praxis were recorded and analyzed. The basic presumption of this investigation was that the SLP Praxis Course improved performance on the Praxis. For the analysis using Pre-test and Praxis scores, pairing to establish equivalence of these measures was required since the criterion for passing the Praxis varied with each administration due to the standardization process. For example, depending on the date the Praxis was taken by each participant, the number of questions scored ranged from 103 to 108, plus the number of score points required to pass with a scaled score of 162 (on a scale of 100 to 200) ranged from 57 to 70. An examinee receiving a passing score of 162 based on 105 questions might achieve the following distribution:

Category	Questions Scored	Points Earned
I	35	23
II	35	27
III	35	20
Total	**105**	**70**

Pairing of the final examination and Praxis was not conducted since final examination data were used solely to determine the extent to which learner outcomes were achieved and not compared to the Praxis.

To establish equivalence of the Pre-test and Praxis, the scores of each measure were paired for individual participants to equalize the number of questions counted, as well as the minimum correct answers for passing. Hence, for a given participant, questions were randomly chosen for removal from each participant's Pre-test so that both examinations ultimately consisted of the same number of questions in each content category. In addition, the number of questions required to score 162 on the Praxis was applied to the participant's Pre-test. Finally, a scaled score for the Pre-test was assigned to each participant to correspond to their Praxis score, i.e.., if a score of 67 on a test of 105 questions yielded a scaled score of 162, the same formula was applied to the participant's Pre-test. This process resulted in an adjusted Pre-test score which was used for comparison of the Pre-test to the Praxis.

Data analysis determined whether participants' scores improved because of the course, examined the magnitude of the difference in performance, as well as whether there was a relationship between scores on the various measures. Data analysis was conducted in three phases. Phase I examined whether participants' performance improved from the Pre-test to the final examination, as well as from the adjusted Pre-test to the Praxis. Three research questions guided the analyses of Phase I:

1) Is there a significant difference in correct answers on the Pre-test and final examination?
2) Is there a significant difference in correct answers on the adjusted Pre-test and Praxis?
3) Is there a significant difference in the pass/fail rates on the adjusted Pre-test and Praxis?

For questions #1 and #2, one-tailed t-tests for dependent samples were conducted to examine whether there were significant differences in group means with scores on the final examination being higher than the Pre-test; and scores on the Praxis being higher than the adjusted Pre-test. For question #3, a two-way Chi-Square analysis was conducted to examine the difference in the pass/fail rates on the adjusted Pre-test and the Praxis.

Assuming that participants' performance would improve from the adjusted Pre-test to the Praxis because of the course, the aim of Phase II was to mathematically determine the gain in score points added to the Praxis. Phase II examined the magnitude of increases in the total correct questions, as well as increases in the scaled score.

Phase III examined the association between the Pre-test and the Praxis. A Pearson correlational analysis was conducted on the adjusted Pre-test and Praxis scores. Typically, it is expected that high and low scores on the adjusted Pre-test should correspond to high and low scores on the Praxis (i.e., r = 1) in a linear relationship. The aim of the study was to reject this hypothesis and conclude that if the SLP Praxis Course improved participants' scores, there would be no linear relationship between the variables since low scorers on the Pre-test would score higher on the Praxis.

With the assumption that some participants might have scored high on the Praxis without the course, Phase III also examined whether the same participants who scored high/low on the adjusted Pre-test respectively scored high/low on the Praxis. A Spearman Rho correlational analysis was performed for this purpose.

RESULTS

Table 1 presents the results of the t-test analysis for scores on the Pre-test and final examination. Of a total of 132 points, the mean for correct answers on the Pre-test was 87.09 with a standard deviation of 10.78. For the final examination, the mean increased to 97.78, an average increase of 10.69 points, however with a standard deviation of 16.39. The t-value of 3.6 was significant at the 0.0 alpha level which demonstrates that participants' scores significantly improved on the final examination.

Table 1. Participants' Performance on the Pre-test and Final Examination (n = 32).

	Pre-test	Final	Difference
Mean	87.09	97.78	+10.69
SD	10.78	16.39	

t = 3.6 df = 31 p = 0.00

After adjusting for equivalency, a t-test analysis was conducted on the mean scores for the adjusted Pre-test and the Praxis. As depicted in Table 2, the mean of scores for the Pre-test was 69.73 with a standard deviation of 7.39.

Scores on the Praxis increased by 3.3 points to a mean of 73.03 with a standard deviation of 8.18. The t-value of 2.3 was significance at p =.01. Thus, a significant increase in scores on the Praxis was evidenced by the analysis.

Table 2. Participants' Performance on the Adjusted Pre-test and Praxis (n = 32).

	Adjusted Pre-test	Praxis	Difference
Mean	69.73	73.03	+3.30
SD	7.39	8.18	

t = 2.3 df = 31 p = .01

A two-way Chi-Square analysis was conducted to determine if there was a significant difference in the pass/fail rates. Table 3 presents the pass/fail frequencies and results of this analysis. As evidenced in Table 3, for the adjusted Pre-test, nine participants passed, and 24 participants failed. Yet for the Praxis, 31 participants passed and two failed. The Chi-Square value of 30.71 was significant at an alpha level less than .05 establishing that there was a significant increase in the pass rate for the Praxis.

Also noted in the data of Table 3, while two participants failed the Praxis, 17 passed both the adjusted Pre-test and Praxis, and none failed both. This means that of the 24 participants who had previously failed the adjusted Pre-test, 14 went on to pass the Praxis.

Table 3. Pass/Fail Frequencies for Adjusted Pre-test and Praxis (n = 33).

	Pass	Fail
Pre-test	9	24
Praxis	31	2
Both	17	0

x^2 = 30.71 df = 1 p = .00

Further analysis focused on the gain in score points from the Pre-test for participants who passed the Praxis. The data of Table 4 show a gain of 3.58 questions correct with a corresponding gain in the scaled score of 9.52 points. The mean of correct answers on the adjusted Pre-test and Praxis was 69.74 and 73.32 respectively. The mean scaled score for the adjusted Pre-test was 159.83 which increased to 169.35 for the Praxis

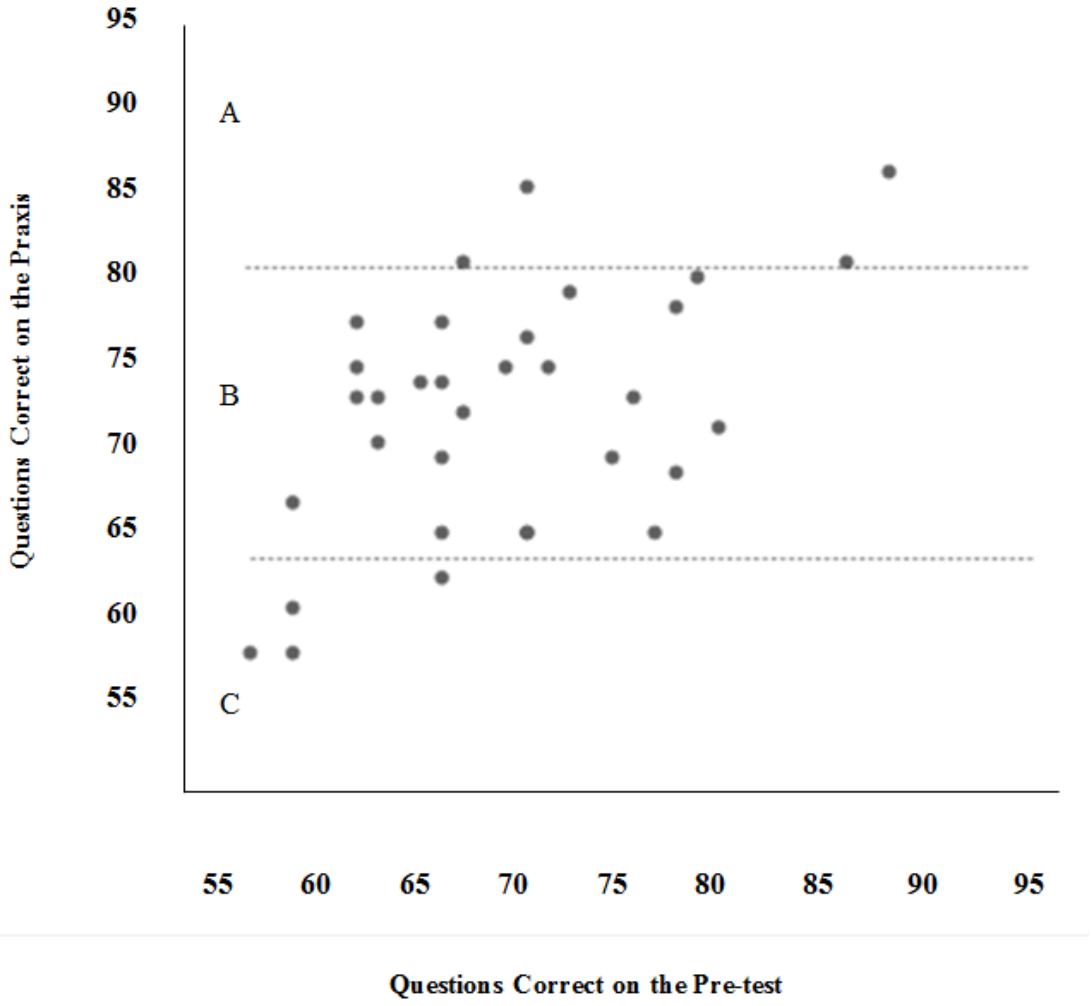
Table 4. Gain in Questions Correct and Score Points for the Praxis (n = 31).

	Adjusted Pre-test	Praxis	Difference
Mean Correct	69.74	73.32	+3.58
Mean Scaled Score	159.83	169.35	+9.52

These data provide additional clarity to the results previously observed wherein participants' performance improved for the Praxis. However, scaled scores for the adjusted Pre-test should be interpreted with caution since these scores represent only the best estimate after recalibrating the Pre-test for equivalency to the Praxis.

Figure 1 presents a scatterplot depicting the Pearson correlation for scores on the adjusted Pre-test and Praxis. Correlational analysis revealed a moderate positive correlation ($r = .51$; $r^2 = .26$; $p = .00$). Since the course was designed to improve scores from the adjusted Pre-test, the observed moderate positive correlation demonstrates that scores on the adjusted Pre-test and Praxis increased in a mild positive direction. It should be noted that due to the standardization process which adjusts scores to fit the normal distribution, most test-takers score within a moderate range (171-185). Hence, few test-takers score extremely high or extremely low. Thus, the finding of a moderate positive correlation was not surprising.

Figure 1. Pearson Correlation Between Adjusted Pre-test and Praxis Scores (n= 33).



Closer analysis focused on the outlying scores. Areas A, B and C of Figure 1 mark the division of scores categorized as High, Moderate and Low, respectively. Area A contains the four highest scores and Area C contains the four lowest scores for both measures taken together. As depicted in Area A, only two participants scored high on both the adjusted Pre-test and the Praxis. Area C shows that four participants who scored low on the adjusted Pre-test similarly scored low on the Praxis. However, as depicted in Area A, two participants who had scored low on the adjusted Pre-test went on to score high on the Praxis.

Given that some participants might have scored high on the Praxis without the course, a final Spearman rank-order correlation was conducted to reveal whether the same participants who scored highest on the adjusted Pre-test similarly scored highest on the Praxis, and similarly for the lowest scoring participants. The Spearman analysis yielded a moderate association ($R = .43$; $R^2 = .18$) which was nonetheless significant ($p < .05$). The results of the Spearman correlation support the previous analyses that demonstrated an increase of scores on the Praxis.

DISCUSSION

Although the present SoTL methodology did not utilize a control group, the results of this investigation were confirmed through multiple analyses. Each analysis yielded significant results to support the conclusion that participants' scores improved after taking the SLP Praxis course.

Improved performance on the final examination confirm that participants learned the course content as marked by an increase of more than 10 score points. Yet, in the absence of a control group, it might be argued that it was the exposure afforded by the Pre-test which accounted for the increase.

Future SoTL investigations must examine such claim by assessing the impact of exposure to the examination in the absence of instruction. However, the wisdom afforded by years of pedagogy supports the notion that strategic instruction promotes increased student learning outcomes. Therefore, the findings of this investigation support the logical conclusion that it was the participants learning of the course content that led to improved performance on the Praxis.

Analysis of performance on the Praxis also showed significant improvement, although after adjusting for equivalence of the Pre-test and Praxis, the observed increase was not impressive but nevertheless significant. The authors acknowledge that the adjustment may have failed to achieve exact equivalence; or the small increase may be a mathematical artifact since both means were lower due to fewer questions on the examinations. Since analysis using the mean obscures data from individual participants, observation of the raw data was useful. Inspection of the raw data revealed that, although several participants' Praxis scores decreased minimally, most participants realized positive gains of up to 17 points.

To derive a meaningful picture of the data relative to the Praxis, it was necessary to examine the pass/fail rates. Again, exact equivalence of the Pre-test and the Praxis may not have been accomplished; however a significant Chi-square analysis revealed that, while some participants passed both, a large number who failed the adjusted Pre-test subsequently passed the Praxis. Indeed, the number of participants passing the Praxis was more than triple those passing the adjusted Pre-test.

As observed, only two participants failed the Praxis. Therefore, further analysis was warranted on the scores of those who passed. The focus of this analysis was the gain in score points. Consistent with previous analyses, there was a slight difference in the mean of correct answers on the adjusted Pre-test and Praxis, but a sizeable gain for the Praxis scaled score. The lower adjusted Pre-test scaled score reflected the high frequency of participants who failed. Yet,

the Praxis scaled score exhibited a gain of approximately nine points which was seven points higher than the minimum score required for passing. This indicates that while the numerical gains were moderate, they nonetheless translated into passing scores.

The present SoTL investigation revealed that low scores on the adjusted Pre-test equated with slightly higher scores on the Praxis. This finding was consistent with those of the previous analyses, as well as the Spearman correlational analysis wherein a moderate positive correlation was similarly observed demonstrating that most participants who were low scorers on the adjusted Pre-test tended to score moderately high on the Praxis. Nonetheless, as previously observed, this moderate increase translated to a passing score for the Praxis. Evidence from correlation alone is insufficient to conclude that the course was the cause of improved scores on the Praxis. Yet together, the multiple analyses of this investigation allow the reasonable conclusion that the Praxis preparation course was effective in increasing scores on the Praxis.

CONCLUSION

While this investigation confirmed that an online independent study preparation course was effective in increasing scores on the SLP Praxis, the larger question was whether test preparation skills could be learned online in an independent study format. Two major features characterized the SLP Praxis course including: 1) its subject content focusing on the specific test-taking skills relevant to Praxis questions, and 2) multiple opportunities to apply and practice these skills. Secondary to the course content, the online presentation allowed continuous and repeated access to the contents of the course.

The Praxis is a high-stakes, high stress examination. The SLP Praxis course represented a low-stress preparation environment. The Test-taking Skills Modules, Pre-test, final examination and Discussion Board were mandatory activities, however the participants' final grade depended not on achieving a high score on the final examination but on having completed the course activities. Thus, the online presentation provided students with a sense of autonomy and control in their learning since passing the Praxis, as opposed to passing the Pre-test and final examination was their motivation. While students were required to take the final examination, passing was not the objective as much as practicing the test-taking skills. Performance on the Pre-test was another motivator, as performance on the Pre-test indicated the amount of effort needed for learning the course material.

Naturally, further empirical research is needed to confirm these assertions and generalize findings beyond the SLP Praxis course including replication using a control group. The findings of this investigation also invite further research to examine which components of the SLP Praxis Course were most effective; the relationship between hours of usage, and repeated exposure to the activities on Praxis scores; as well as qualitative exploration of students' experiences while taking the course. The conclusion of this SoTL investigation is that a multiple component, online interactive preparation course focused on test-taking skills can conceivably be an effective study tool and provide the learning environment for improving performance on the Praxis.

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APPENDIX A

Components of the SLP Praxis Course

Continuous asynchronous access

Course components could be accessed on any electronic device whenever and repeatedly as needed within the 9-week course duration.

Test-taking Skills Modules

Eight modules narrated in voice-over PowerPoint format with printable handouts and scripts. Topics included Nature and Types of Multiple Choice Questions; Critical Thinking Skills; Question Strategies; General Strategy & Timing; Myths & Facts; Reading Speed; Guessing Strategy and Test Anxiety.

Course Reviews

16 1-hour undergraduate and graduate courses with printable lecture notes including Linguistics; Language Acquisition; Phonetics; Articulation Disorders; Neuroanatomy/ Neurophysiology; Aphasia; Traumatic Brain Injury; Swallowing Disorders; Language Disorders; Voice Disorders; Clinical Methods; Differential Diagnosis; AAC; Audiology; Research; and Multicultural Awareness.

Praxis Pre-test and Final Examination

Multiple access opportunities to online Praxis simulations featuring 132 Praxis-type questions, immediate scoring, and explanations to the correct and incorrect answers.

Reading Assignments

Units from "How to Prepare for the Praxis Examination in Speech-Language Pathology" (Payne, 2001) corresponding to Test-taking Skills Modules.

Podcasts

Audible summaries of the Units from "How to Prepare for the Praxis Examination in Speech-Language Pathology" (Payne, 2001) corresponding to the Reading Assignments.

Discussion Board

Required interaction with instructor and other students for the Test-taking Skills Modules. Participants posted one or two questions from each module and reading assignment.

APPENDIX B

Learner Outcomes for Test-taking Skills Modules

Unit 1 Nature and Types of Multiple Choice Questions
1) Recognize the components of a multiple-choice question
2) Distinguish between Praxis questions and classroom examinations
3) Explain why Praxis questions are perceived as more difficult than classroom examinations

Unit 2 Critical Thinking Skills
1) Identify the stages of Bloom's Taxonomy of Educational Objectives
2) Relate the stages of Bloom's Taxonomy to difficulty levels of Praxis questions
3) Relate Bloom's Taxonomy to the cognitive processes needed for Praxis questions

Unit 3 Question Strategies
1) Define reasoning skills as related to the requirements of Praxis questions
2) Identify the specific reasoning skill as presented in a typical Praxis question
3) Practice specific reasoning skills as demonstrated within Praxis questions

Unit 4 General Strategy and Timing
1) Identify a general approach to taking the Praxis
2) Identify strategies for pacing and time utilization
3) Identify timing strategies for various types of Praxis questions

Unit 5 Myths and Facts
1) Distinguish myths and realities concerning the Praxis
2) Discuss how myths can be detrimental to performance

Unit 6 Reading Speed
1) Discover personal reading speed for typical Praxis questions
2) Discover strategies to increase reading speed

Unit 7 Guessing Strategy
1) Identify situations where guessing may be used to optimize performance
2) Identify guessing strategies for specific Praxis-type questions

Unit 8 Test Anxiety
1) Identify symptoms of test anxiety
2) Identify personal strategies to combat and cope with test anxiety