

# **Pathways to Reading: A Study of Participant Pedagogical Content Knowledge**

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## **Acknowledgments**

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## Table of Contents

Abstract .....	1
Introduction.....	2
Pathways to Reading.....	2
Method.....	3
Sample .....	4
Data Collection .....	4
Results .....	6
Case Analyses .....	8
Consideration of Alternative Explanation.....	9
Conclusion.....	10
References.....	12
Appendix A.....	13
Appendix B.....	14

## Tables and Figures

Table 1. Pathways to Reading (PTR) Training.....	3
Table 2. Content Areas and Sample Items in the Test of Basic Skills for Teachers of Reading and Spelling (Cheesman, 2009).....	5
Table 3. Mean Content Area Scores on the Test of Basic Skills for Teachers of Reading and Spelling .....	6
Table 4. Mean Total Knowledge Scores by Level of PTR Participation .....	7
Table 5. Subsets of Groups with Similar Mean Total Knowledge Scores.....	7
Figure 1. Histograms of Total Knowledge Scores by Level of PTR Participation .....	8
Figure 2. Mean Knowledge Scores by Level of PTR Participation within Level of Experience .....	10
Figure B.1. Mean Total Knowledge Scores by Revised Level of PTR Participation .....	14
Figure B.2. Mean Counting Syllables Knowledge Scores by Revised Level of PTR Participation.....	15
Figure B.3. Mean Final Sound Matching Knowledge Scores by Revised Level of PTR Participation .....	16
Figure B.4. Mean Phoneme Segmentation Knowledge Scores by Revised Level of PTR Participation .....	17
Figure B.5. Mean Graphophonemic Segmentation Knowledge Scores by Revised Level of PTR Participation .....	18
Figure B.6. Mean Regular/Irregular (exception) Words Knowledge Scores by Revised Level of PTR Participation .....	19
Figure B.7. Mean Skills Instruction Knowledge Scores by Revised Level of PTR Participation .....	20

## **ABSTRACT**

The purpose of the study was to evaluate the potential of a professional development and training program for enhancing pedagogical content knowledge specifically related to preventing and remediating reading difficulties. The program, Pathways to Reading, involves beginner and more advanced training in the linguistic features of written and spoken language and their relationships, and guidance, support and mentoring in how to use this knowledge to structure instruction, materials, and activities, and differentiate instruction when students make errors and have difficulties. In this study, 265 teachers with varying levels of participation in the program, ranging from none to advanced training, completed the Test of Basic Skills for Teachers of Reading and Spelling (Cheesman, McGuire, Shankweiler, & Coyne, 2009). Results indicated a positive association between level of program participation and knowledge. Knowledge scores on the Test of Basic Skills for Teachers of Reading and Spelling trended upward with more advanced levels of program training. Limitations of the study and implications of the findings are discussed.

## INTRODUCTION

Pathways to Reading (PTR) is a teacher professional development training program and curriculum that addresses beginning reading instruction for teachers of grades K-2 and for teachers of struggling older readers. The PTR program is based on the assumption that teachers are vital in helping children who are learning to read. The program focuses on developing teacher understanding of the five scientifically validated components of the reading process, phonemic awareness, phonics, fluency, vocabulary, and comprehension (About Pathways Professional Development, 2010). Interested in feedback on the program, the developers of PTR sought an evaluation of its impact. The purpose of this study was to evaluate whether participation in PTR appears to make a difference in teachers' knowledge and skills as related to teaching beginning reading and spelling and preventing and remediating reading difficulties.

## PATHWAYS TO READING

The intended outcomes of PTR training are (a) teacher pedagogical content knowledge and (b) understanding and proficient use of assessment and differentiated instruction, as related to preventing and remediating reading difficulties. These goals are relevant in light of the perceived and measured lack of knowledge among teachers about what is necessary for beginning reading instruction (Brady et al., 2009; Moats, 1999). Toward achieving these goals, the PTR professional development training program offers beginner and intermediate Year 1 and Year 2 training in classroom instruction, and advanced training for becoming an in-district PTR trainer/mentor. Table 1 provides a description of the content of each of the PTR training offerings.

Research and development on what constitutes pedagogical content knowledge for preventing and remediating reading difficulties is emerging (Brady et al., 2009; Cheesman, McGuire, Shankweiler, & Coyne, 2009; Cunningham, Perry, Stanovich, & Stanovich, 2004; Moats, 1999). Defined by Shulman (1986), pedagogical content knowledge is knowing the most regularly taught topics, the most useful forms of representing ideas for each topic (e.g., examples, illustrations, explanations, analogies), what makes learning the particular ideas easy or difficult, and strategies for transforming learners' misconceptions and difficulties.

For preventing and remediating reading difficulties, the emerging research suggests that teachers need to know and understand the linguistic features of written and spoken language and their relationships, and how to use this knowledge to detect student errors and difficulties, and as a result differentiate instruction and provide appropriate feedback (Brady et al., 2009). As described, this pedagogical content knowledge appears to be covered by the end of the 2<sup>nd</sup> Year of PTR training, during the practicum (see, for example, the 2<sup>nd</sup> bullet for 2<sup>nd</sup> Year PTR: Practicum, "responding to student errors" in Table 1).

The PTR professional development and training program founder, Terry Clinefelter, believes that the teaching of reading *is* akin to *rocket science* and that teachers need specific assistance in understanding just where and how to effectively include research-based knowledge and professional wisdom into their instruction (Clinefelter, n.d.). Therefore, using knowledge gained from years of successful clinical practice and close attention to research, Clinefelter developed the content and scope of the PTR program as outlined in Table 1.

**Table 1. Pathways to Reading (PTR) Training**

PTR Training	Content
1 <sup>st</sup> Year 5-Day PTR Training <sup>a</sup> (Beginner: Option A)	<ul style="list-style-type: none"> <li>▪ Relationships between phonemic awareness and phonics and their role in the development of reading and spelling preventively and remedially</li> <li>▪ Systematic phonemic awareness and phonics instruction</li> <li>▪ Directions on how to address all five components of reading (phonemic awareness, phonics, fluency, vocabulary, and comprehension) when teaching, assessing, and planning instruction</li> </ul>
1 <sup>st</sup> Year 5-Day PTR Training plus Onsite PTR Support (Beginner: Option B)	<p>All of the above plus onsite</p> <ul style="list-style-type: none"> <li>▪ assistance integrating PTR into existing curriculum and analyzing data,</li> <li>▪ provision of modeling and coaching, and</li> <li>▪ identification of in-district trainers/mentors.</li> </ul>
2 <sup>nd</sup> Year PTR: Practicum (Intermediate)	<ul style="list-style-type: none"> <li>▪ PTR instructor models small-group instruction</li> <li>▪ Teachers practice and receive feedback on instructional strategies, assessment (observation note-taking; administration and interpretation of PTR assessments), responding to student errors, and pacing</li> <li>▪ Refining integration of PTR into existing curriculum</li> </ul>
PTR Trainer or Coach Certification (Advanced)	<ul style="list-style-type: none"> <li>▪ One or two staff per setting (identified with assistance from a PTR consultant) are provided additional training and materials to qualify them to provide ongoing in-district PTR training and support</li> </ul>

<sup>a</sup> In addition to training, participants are provided the teacher manuals for the PTR curriculum, with teacher kits (including manipulatives for large and small group instruction) available for additional purchase

The purpose of the present evaluation was to assess the pedagogical content knowledge of PTR participants in order to examine the potential of PTR for enhancing teacher knowledge about what is necessary for beginning reading instruction. Specifically, the evaluation was designed to answer the following question:

- To what extent and in what manner is teacher participation in PTR related to teacher knowledge and skills for preventing and remediating reading difficulties?

## Method

The descriptive study examines the relationship between PTR participation and knowledge and skills as related to phonemic awareness, phonics, and teaching beginning reading and spelling. The sample of schools was drawn from the PTR program participant list, including schools planning to but not yet participating in PTR. In spring 2010, teachers were surveyed about their level of participation in PTR and their pedagogical content knowledge using an adaptation of the Test of Basic Skills for Teachers of Reading and Spelling (Cheesman, 2009). Differences in performance between groups of teachers with different levels of PTR participation were examined. It was hypothesized that higher levels of PTR participation would be associated with higher performance on the Test of Basic Skills for Teachers of Reading and Spelling.

## **Sample**

The sample consisted of 265 teachers invited to participate through contacts at their schools. The list of school contacts was provided by the PTR developers and included prospective and previous PTR participants. Teachers from thirteen elementary schools across four states (Iowa, Kansas, Missouri, and Florida) participated in this study. The majority (83%) were general education teachers in kindergarten and first and second grade classrooms. The other participating teachers were reading specialists, reading coaches, Special Education teachers, or Title I teachers. Respondents were generally experienced teachers: 44% had taught for more than 15 years and 21% had taught for 10 to 15 years. The remaining teachers had taught for 7 to 9 years (12%), 4 to 6 years (15%) and 1 to 3 years (8%).

## **Data Collection**

To measure teacher knowledge and skills related to preventing and remediating reading difficulties, McREL researchers adapted the Test of Basic Skills for Teachers of Reading and Spelling (Cheesman, 2009). The Cheesman (2009) instrument was selected because this assessment addresses the knowledge and skills related to understanding phonemic awareness, phonics and their relationship to the development of reading and spelling. Adaptation of the assessment and the procedures and schedule used for its administration and scoring are explained below.

### *Instruments and Measures*

The Test of Basic Skills for Teachers of Reading and Spelling (Cheesman et al. 2009) was adapted for online administration. Items from the Test of Basic Skills for Teachers of Reading and Spelling were unchanged. The sequence of items was unchanged. McREL researchers made two adaptations to the instrument. First, the directions were clarified prior to administration; these clarifications were reviewed and approved by the author prior to survey administration. Second, a section was added to the survey to enable description of the respondents and gain perspective on professional development exposure. This additional section—appended to the end of the original instrument—specifically asked teachers about their participation in PTR training, other professional development related to reading instruction, and demographic characteristics (e.g., years of teaching experience).

The survey included 88 items with 69 items distributed across six content areas and 19 additional items in two other areas (10 professional development and training experience items and 9 demographic characteristic items). All items had multiple choice response formats. The 69 knowledge and skill items were scored correct or incorrect based on scoring criteria provided by the author. Table 2 presents the content and a sample item for each of the content areas.

**Table 2. Content Areas and Sample Items in the Test of Basic Skills for Teachers of Reading and Spelling (Cheesman, 2009)**

Content	Sample Item <sup>a</sup>	Total possible score
1. Counting syllables	Indicate the number of syllables in each word. picnic – 2	10
2. Final sound matching	The word with the same final sound as snack is: mice <b>milk</b> much	10
3. Phoneme segmentation	Say each word to yourself. Indicate the number (#) of sounds (phonemes) in each word. sand – 4	10
4. Graphophonemic segmentation	Type the letter or letter cluster for each sound (phoneme) and 4 (four) spaces between each sound (phoneme). chop – ch   o   p	10
5. Regular/Irregular (exception) words	Indicate R (regular) or E (exception) for each item: he – R      the - E	20
6. Skills Instruction	“Which set of words should a teacher select for a phoneme awareness activity to give children practice with segmentation of four phonemes in one-syllable words? a. <b>Thrill, sting</b> b. Shark, string c. Witch, dodge d. All of the above e. I’m not sure” (Brady et al (2009) Teacher Knowledge Survey item #2, Appendix 1, p. 448).	9
Total without Skills Instruction		60
Total with Skills Instruction		69

<sup>a</sup>The correct answer to each sample item is provided or is shaded.

### Level of PTR Participation

Levels of PTR participation were distinguished along a continuum of beginner to advanced training with “no PTR Participation” added as a level below the beginner level to characterize teachers in schools planning to participate but had not yet begun. Thus, there were five levels of PTR Participation, ranging from “none” to “advanced” as follows:

1. No PTR participation (None)
2. 1<sup>st</sup> Year 5-Day PTR Training (Beginner: option A)
3. 1<sup>st</sup> Year 5-Day PTR Training plus Onsite PTR Support (Beginner: option B)
4. 2<sup>nd</sup> Year PTR Practicum (Intermediate)
5. PTR Trainer or Coach (Advanced)



## Procedures

Prior to completion of the instrument, teachers were apprised of the study, the risks associated with participating, and asked for their consent to participate. Those who agreed to participate were then asked to complete the online Pathways to Reading – Survey of Knowledge and Skills Regarding Teaching Beginning Readers. Survey administration began in April 2010 and concluded in September 2010. Completion of the survey took approximately 30 minutes.

## Data Preparation and Analysis

Survey response data were downloaded, scored, and prepared for analysis. Assumptions of equal variances among groups were checked and choice of statistical analyses made accordingly. Analysis of variance was used to compare group mean performance on measures of knowledge and skills.

## Results

The overall mean total score on the Test of Basic Skills for Teachers of Reading and Spelling was 50.15 (SD = 8.11; n = 265), on average, this means that respondents answered approximately 73% of the items correctly. For the six content areas, on average overall, respondents answered 80% of the counting syllables and final sound matching items correctly and under 80% correct in the other four content areas. Descriptive statistics are provided for each content area in Table 3.

**Table 3. Mean Content Area Scores on the Test of Basic Skills for Teachers of Reading and Spelling**

Content	N	Mean	SD	Min - max	Total Possible Correct
1. Counting syllables	265	8.37	1.43	3 - 10	10
2. Final sound matching	265	8.14	1.71	2 - 10	10
3. Phoneme segmentation	265	6.24	2.05	0 - 10	10
4. Graphophonemic segmentation	265	7.09	1.87	0 - 10	10
5. Regular/Irregular words	265	14.67	2.45	6 - 18	20
6. Skills instruction	265	5.64	2.06	0 - 9	9

Among the 265 respondents, 32 reported no participation in PTR. The majority reported participating in 1<sup>st</sup> Year 5-Day PTR Training (n = 77) or 1<sup>st</sup> Year 5-Day PTR Training plus Onsite PTR Support (n = 123). Fewer reported participating in intermediate and advanced PTR (n = 16, and n = 17, respectively).

With regards to the knowledge of each of the five Level-of-PTR-Participation groups, overall performance on the Test of Basic Skills for Teachers of Reading and Spelling ranged between a low of 64% correct and a high of 79% correct. The total mean scores for each of the five Level-of-PTR-Participation groups ranged from 44.06 to 54.88 and are presented in Table 4. As indicated, there was a trend in which higher mean knowledge scores were associated with higher Levels of PTR Participation. In relation to a total possible score of 69, the mean scores corresponded with 64%, 71%, 74%, 78% and 79% correct, respectively for each of the five groups.

**Table 4. Mean Total Knowledge Scores by Level of PTR Participation**

	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Min - max</b>
No PTR Participation (None)	32	44.06	10.11	18 - 63
1 <sup>st</sup> Year 5-Day PTR Training (Beginner: option A)	77	49.08	7.77	21 - 67
1 <sup>st</sup> Year 5-Day PTR Training plus Onsite PTR Support (Beginner: option B)	123	51.24	7.12	30 - 65
2 <sup>nd</sup> Year PTR Practicum (Intermediate)	16	54.06	5.37	44 - 62
PTR Trainer or Coach (Advanced)	17	54.88	7.68	38 - 66
<b>Total</b>	<b>265</b>	<b>50.15</b>	<b>8.11</b>	<b>18 - 67</b>

The difference between the mean knowledge scores for the five Level-of-PTR-Participation groups was statistically significant,  $F(4, 260) = 8.68, p < .001$  (see Appendix A, Table A-1, for complete results of the analysis of variance). Post-hoc follow-up analyses were conducted to examine between which groups there were significant differences. The results of the post-hoc analyses indicated that there were three homogeneous subsets of groups; within each subset, the groups did not differ from each other, but the three subsets were significantly different from each other (see Table 5).

**Table 5. Subsets of Groups with Similar Mean Total Knowledge Scores**

<b>Level-of-PTR-Participation Groups</b>	<b>N</b>	<b>Mean Scores for Homogeneous Subsets according to Tukey HSD<sup>a,b,c</sup></b>		
		<b>1</b>	<b>2</b>	<b>3</b>
None	32	44.06		
5 days of PTR training (Beginner: Option A)	77	49.08	49.08	
5 PTR days plus onsite PTR support (Beginner: Option B)	123		51.24	51.24
PTR 2nd Year Practicum (Intermediate)	16		54.06	54.06
PTR Trainer or coach (Advanced)	17			54.88
<b>Sig.</b>		<b>.099</b>	<b>.102</b>	<b>.375</b>

<sup>a</sup>. Uses Harmonic Mean Sample Size = 28.787.

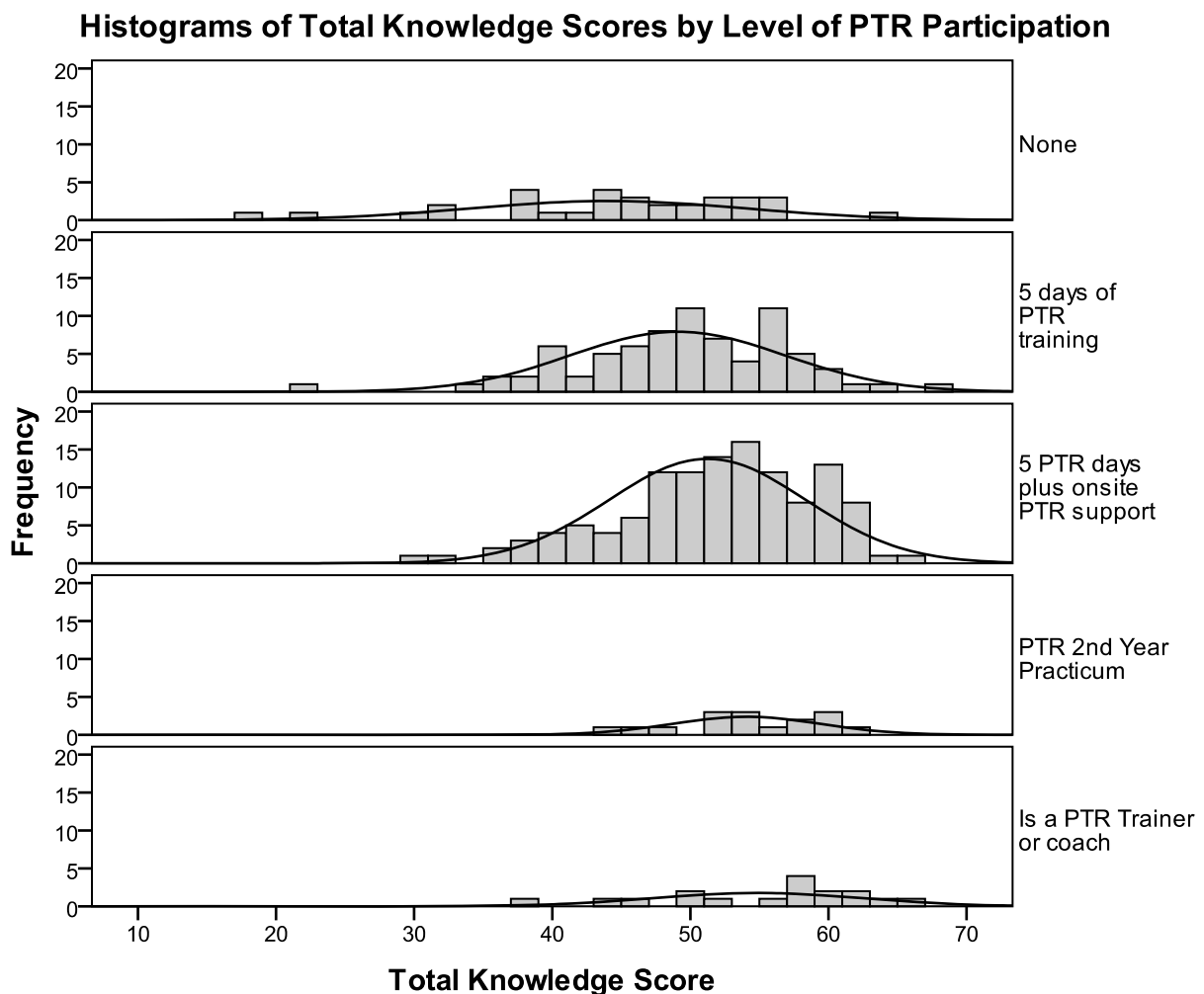
<sup>b</sup>. The group sizes are unequal. The harmonic mean of group sizes is used. Type I error levels are not guaranteed.

<sup>c</sup> alpha = 0.05

As shown in Table 5, the None and Beginner: Option A groups did not differ from each other, but performed significantly lower than the subset combining the Beginner and Intermediate groups. The Beginner and Intermediate groups did not differ from each other, but as a subset performed significantly lower than the combined subset of Beginner: Option B, Intermediate, and Advanced groups.

## Case Analyses

The frequency distributions of the five Level-of-PTR-Participation groups overlapped a great deal (see histograms presented in Figure 1). As shown in Figure 1, although the lowest knowledge scores were among teachers with no participation in PTR, this group also included teachers with relatively high knowledge scores. Teachers in this group may have developed knowledge in their teacher preparation programs, other PTR-like professional development, and/or from on-the-job professional learning. Although these individual teachers had not yet begun PTR training, one or more teachers in each of their schools were PTR-trained and could have influenced the non-trained teachers.



**Figure 1. Histograms of Total Knowledge Scores by Level of PTR Participation**

Also evident in Figure 1, the group with the lowest level of PTR-training (5-Days of PTR Training: Beginner: Option A) includes one low-scoring outlier. Nonetheless, after deleting this score, the difference between the means of this group and the non-trained group (None) was not statistically significant at the .05 level.

In addition, the group with the most advanced level of PTR participation includes teachers with relatively low knowledge scores (see “Is a PTR Trainer or Coach” histogram at the bottom of Figure 1). The score distribution in this group may be explained by the self-report source of the categorization. A list of and criteria for program-identified trainers were obtained from the PTR developers. Qualifying criteria for program-identified trainer included the following: had participated in Year 1 and 2 training; applied PTR for at least one year of teaching; demonstrated proficient classroom management; worked with several grade levels of students; provided on-site support in classroom visits and teacher meetings; observed and co-trained with PTR Founder/Master Trainer Terry Clinefelter; engaged in continued dialogue about research, PTR training materials, and application of PTR in classrooms; and attended at least one annual meeting with other PTR trainers.

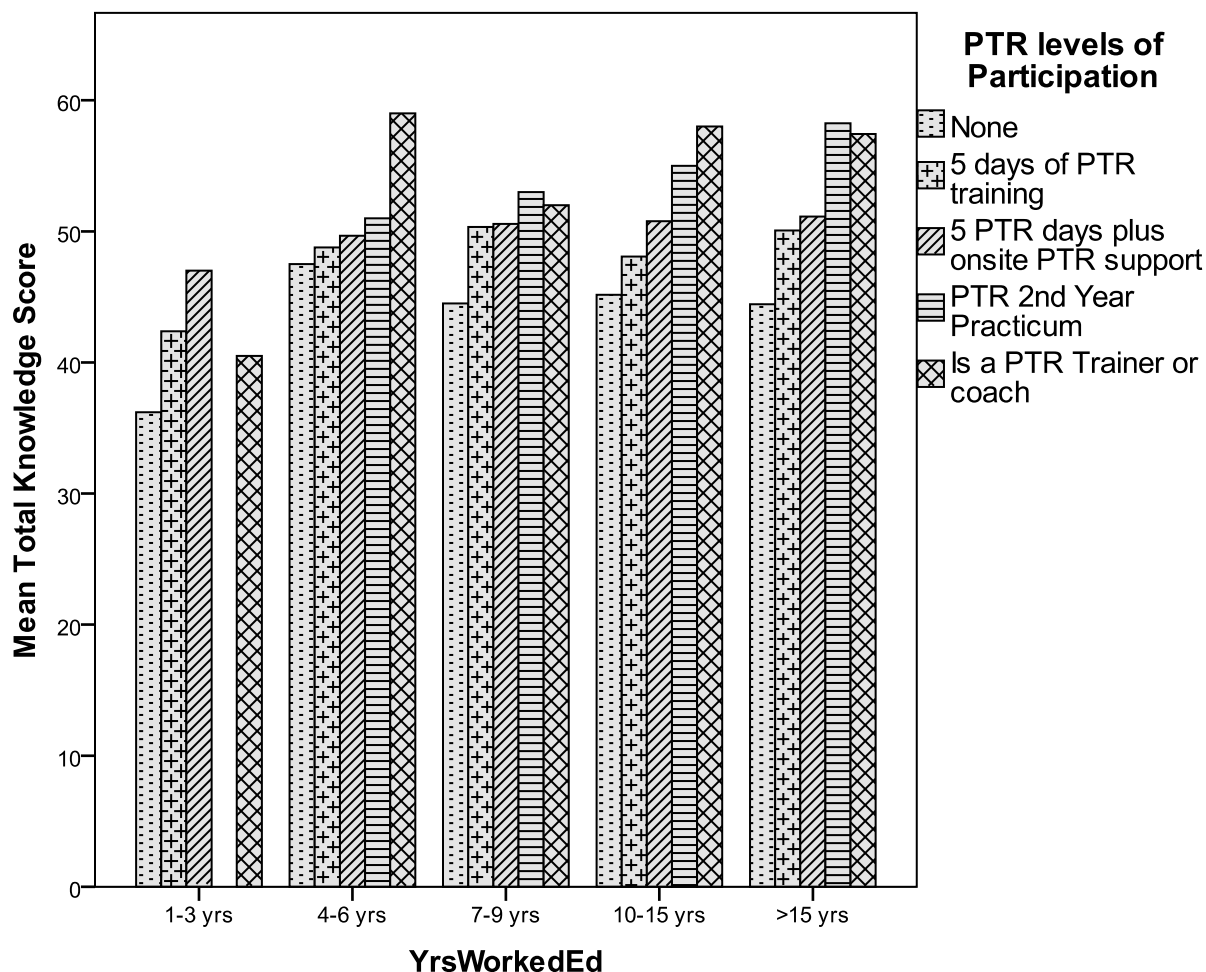
In the present sample of 265 teachers, four teachers were program-identified trainers and members of the most advanced PTR group (“Is a PTR Trainer or Coach”). When trainers were separated into program-identified versus self-identified subgroups, the program-identified trainers had significantly higher knowledge scores using the Independent Samples Median Test ( $p = .006$ ). For PTR-program-identified trainers:  $n = 4$ ; median = 62; mean = 62.25; SD = 2.99; for self-identified PTR Trainers:  $n = 13$ ; median = 56; mean = 52.62; SD = 7.26.

Mean total knowledge scores for each Level-of-PTR-Participation group revised, including distinct groups for the self-identified and program-identified trainers, are presented in Appendix B, Figure B-1. In addition, the mean total knowledge scores for each of the six content areas on the Test of Basic Skills for Teachers of Reading and Spelling are presented in Figures B-2 through B-7.

### **Consideration of Alternative Explanation**

Although not a statistically significant trend, knowledge scores trended upward with level of PTR participation. To examine an alternative explanation for this relationship, years of teaching experience was taken into account. Five levels of teaching experience were established from least to most experienced: (a) 1 to 3 years, (b) 4 to 6 years, (c) 7 to 9 years, (d) 10 to 15 years, and (e) more than 15 years. Knowledge scores also trended upward with level of teaching experience as indicated by mean total knowledge scores plotted in Figure 2 and by the significant F-value in an analysis of variance using experience as the between group factor (see Appendix A, Table A-2).

When holding level of teaching experience constant, expect among the least experienced teachers (with 1 to 3 years of experience), the relationship between knowledge and PTR participation generally held (see Figure 2). As shown in Figure 2, generally only the least experienced teachers had mean knowledge scores that did not follow an upward trend in association with level of PTR participation. Beyond three years of experience, within each level of experience, teachers with no PTR participation (“None”) had the lowest mean knowledge score and teachers with 2<sup>nd</sup> Year PTR Practicum or Trainer status had the highest mean knowledge score.



**Figure 2. Mean Knowledge Scores by Level of PTR Participation within Level of Experience**

## Conclusion

This study examined relationships between teacher pedagogical content knowledge and participation in the Pathways to Reading professional development and training program. In general, results indicated a linear and positive trend associating more advanced PTR training with higher performance on a test of relevant pedagogical content knowledge. Further, for teachers with four or more years of experience, the trend was the same. Regardless of whether their teaching experience was moderate (4-9 years) or extensive (10 or more years), teachers who had more advanced PTR training scored higher on the assessment of knowledge.

The main findings, which include 1) a positive association between the level of PTR training and knowledge, in general, and within groups of teachers with like number of years of experience, and 2) significantly higher knowledge scores of program-identified trainers compared with self-identified trainers, support the conclusion that PTR has promise for making a difference in teacher pedagogical content knowledge.

The practicum may have played a pivotal role in the present pattern of results. Practicum teacher knowledge was clearly more advanced than that of teachers with no participation in PTR. The practicum may provide teachers the important opportunity to see student progress when they put into practice newly acquired knowledge and skills. The value of the feedback gained from seeing student progress is well-documented in research on teacher learning in education (Brady et al, 2009; Goddard, Hoy, & Hoy, 2000; Stringfield, Reynolds & Schaffer, 2008) and lends support to the trend uncovered in the present study.

The study has limitations. Primarily, the analyses are correlational and thus preclude attributing teacher knowledge to participation in PTR training. Second, the nested nature of the data with teachers clustered in schools creates a source of influence on the outcomes that was not accounted for in the analysis. Without accounting for school effects, the differences in mean knowledge scores associated with levels of PTR participation may have been overestimated. Third, the knowledge measure used in the present study sampled only a portion of the knowledge that PTR is designed to develop. The measure sampled phonemic awareness, phonics, and their relationship to reading and spelling instruction. The present results do not provide any indication of PTR's potential in developing teachers' understanding of other components of reading. Future research would be necessary to explore such relationships.

The individual differences in and the range of knowledge among teachers has implications for practice. One implication supports the practice of assessing and responding to individual differences as part of professional development. Opportunities can be created for teachers to learn from each other in collegial environments where the focus is on improving student learning. The second implication is relevant to an observation that individuals who have the depth of knowledge and skills necessary to provide informed mentoring in preventing and remediating reading difficulties are hard to find (Brady et al., 2009). The present results suggest that Pathways to Reading participants who have completed the 2<sup>nd</sup> Year PTR Practicum or are credentialed PTR trainers are appropriate candidates for mentoring teachers in preventing and remediating reading difficulties.

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## APPENDIX A

**Table A.1. Analysis of Variance (ANOVA) in Total Knowledge Score with Level-of-PTR-Participation as the Between Groups Factor**

**Total with Skills Instruction Score**

	Sum of Squares	df	Mean Square	F	Sig.
Between Level-of-PTR-Participation Groups	2044.988	4	511.247	8.675	.000
Within Level-of-PTR-Participation Groups	15322.272	260	58.932		
Total	17367.260	264			

**Table A.2. Analysis of Variance (ANOVA) in Total Knowledge Score with Level of Experience as the Between Groups Factor**

**Total with Skills Instruction Score**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1472.677	4	368.169	5.768	.000
Within Groups	13211.941	207	63.826		
Total	14684.618	211			



## APPENDIX B

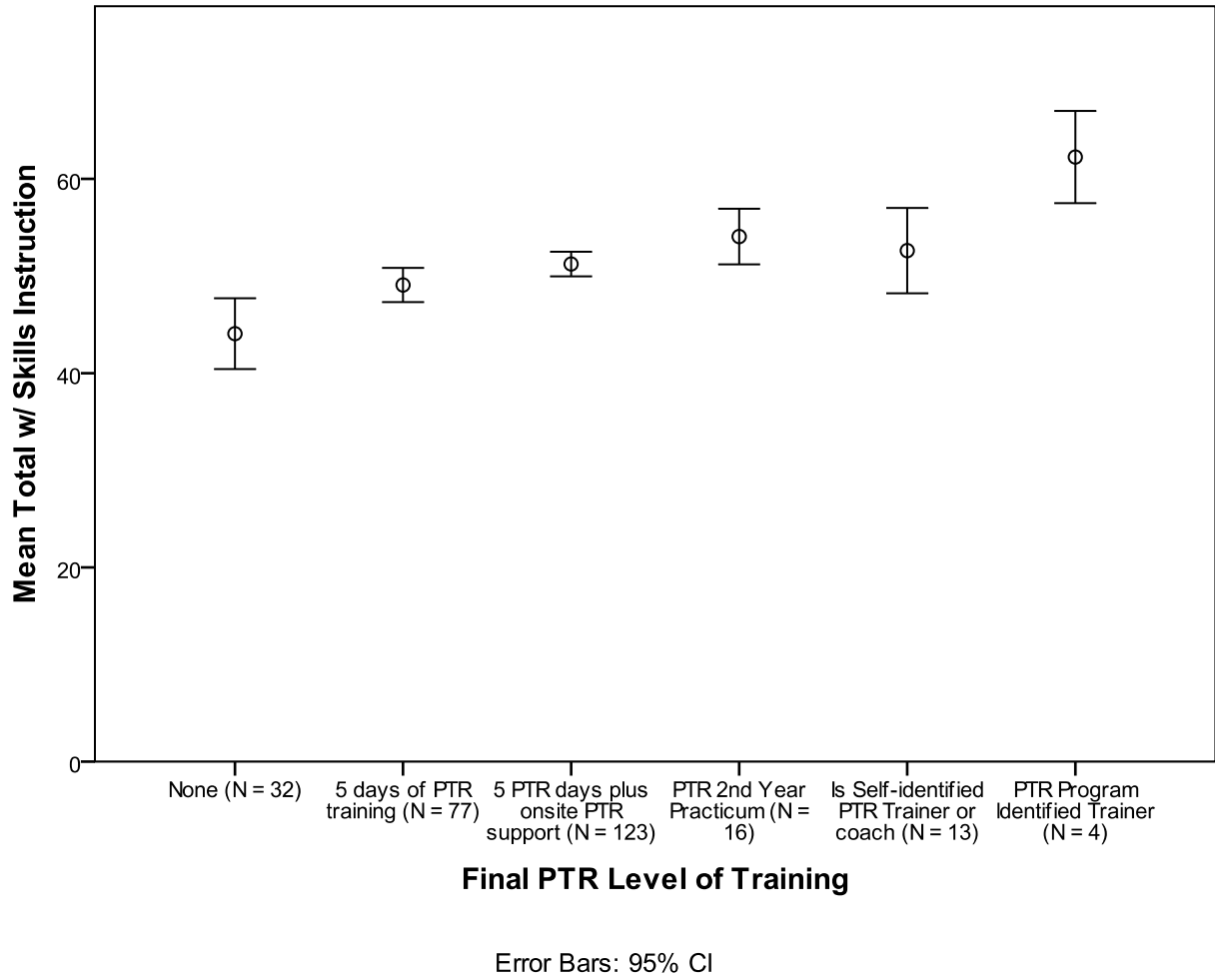
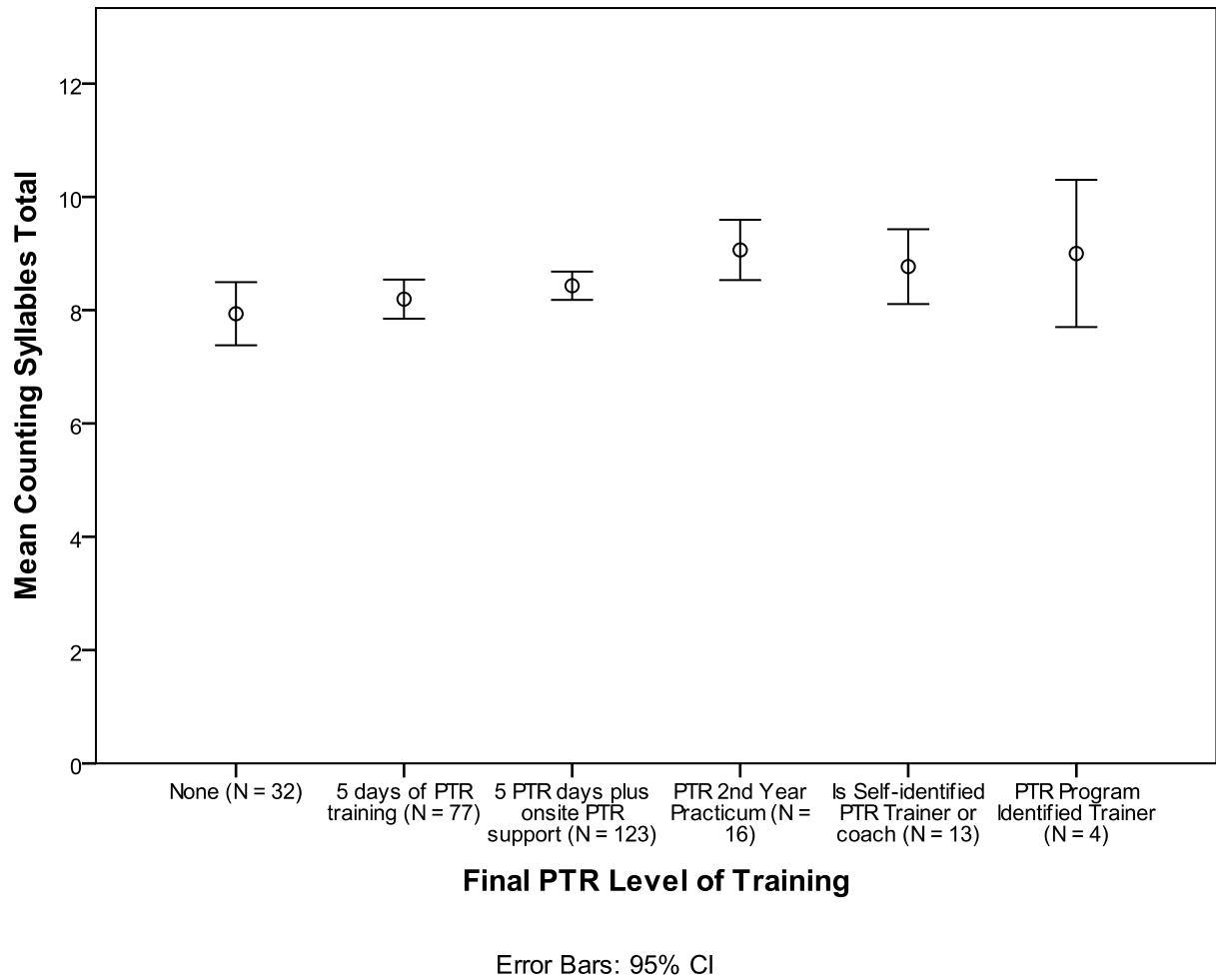
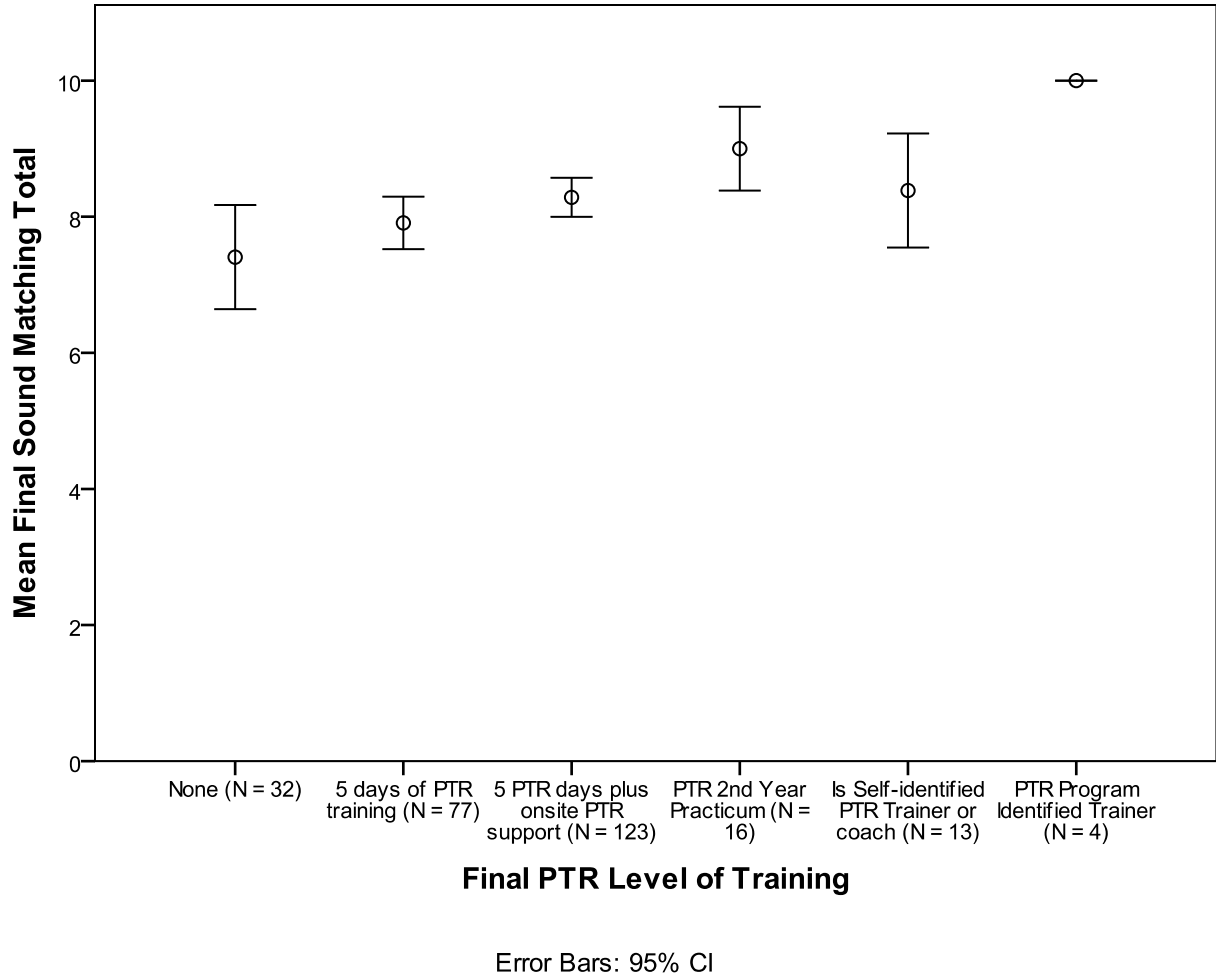


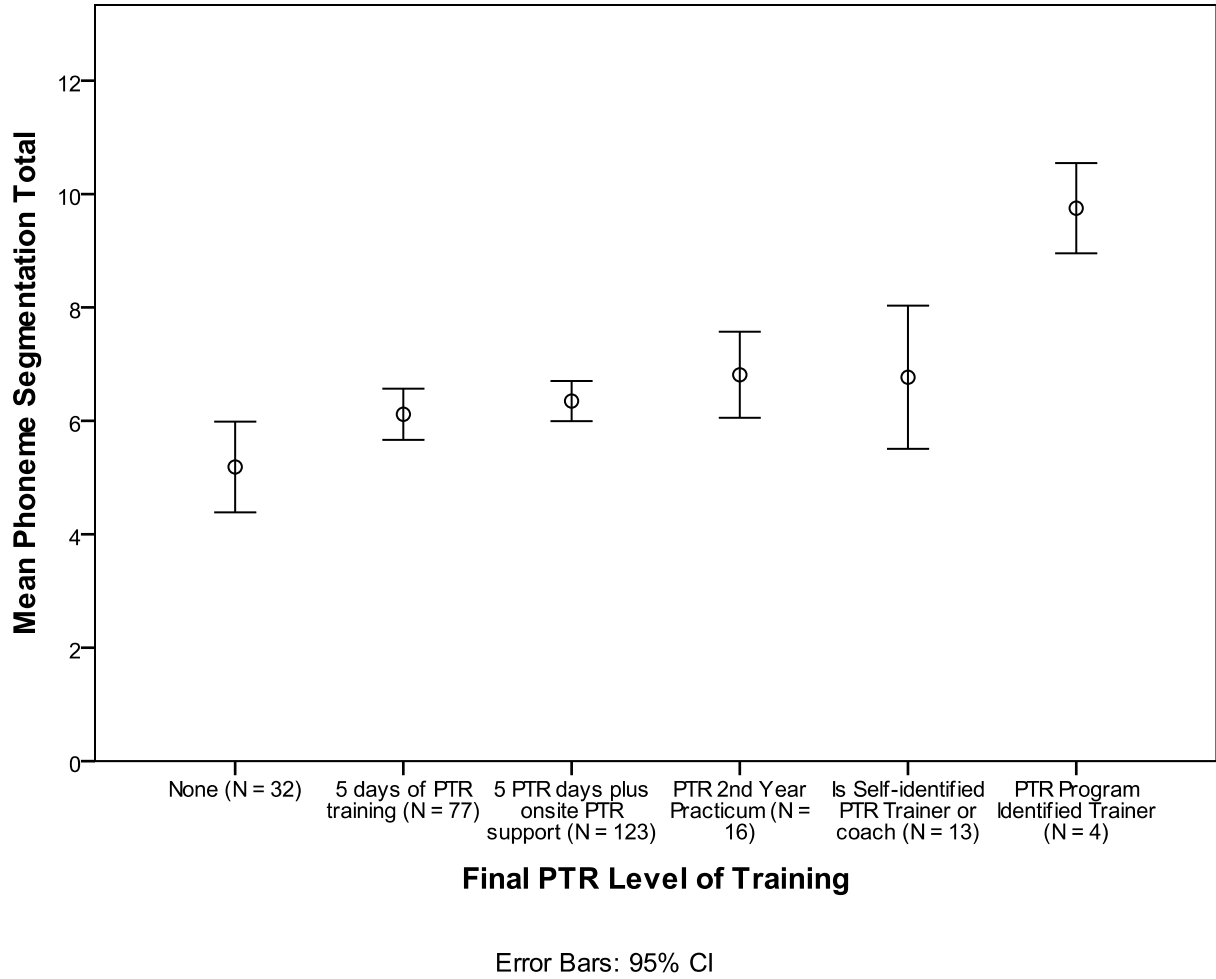
Figure B.1. Mean Total Knowledge Scores by Revised Level of PTR Participation



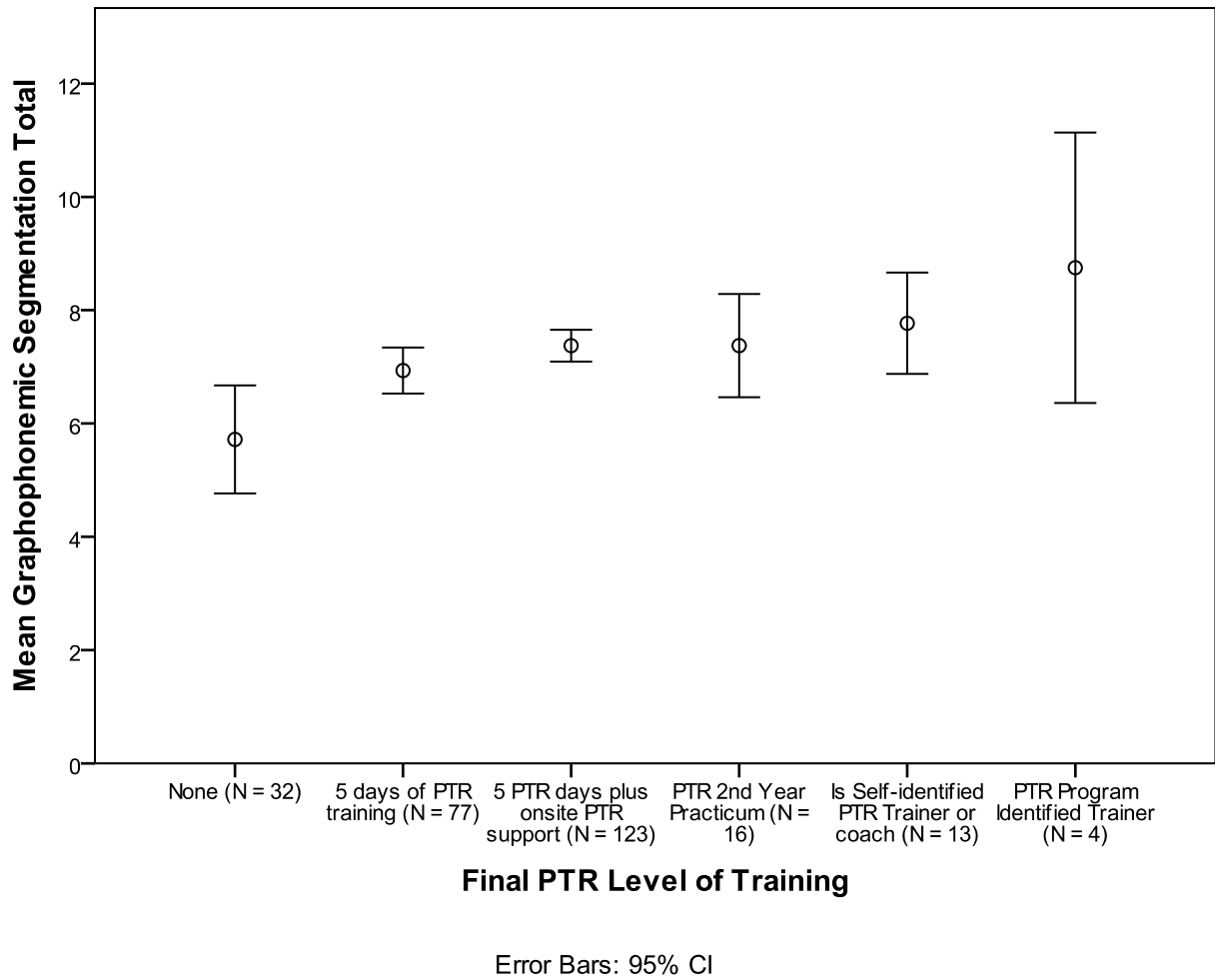
**Figure B.2. Mean Counting Syllables Knowledge Scores by Revised Level of PTR Participation**



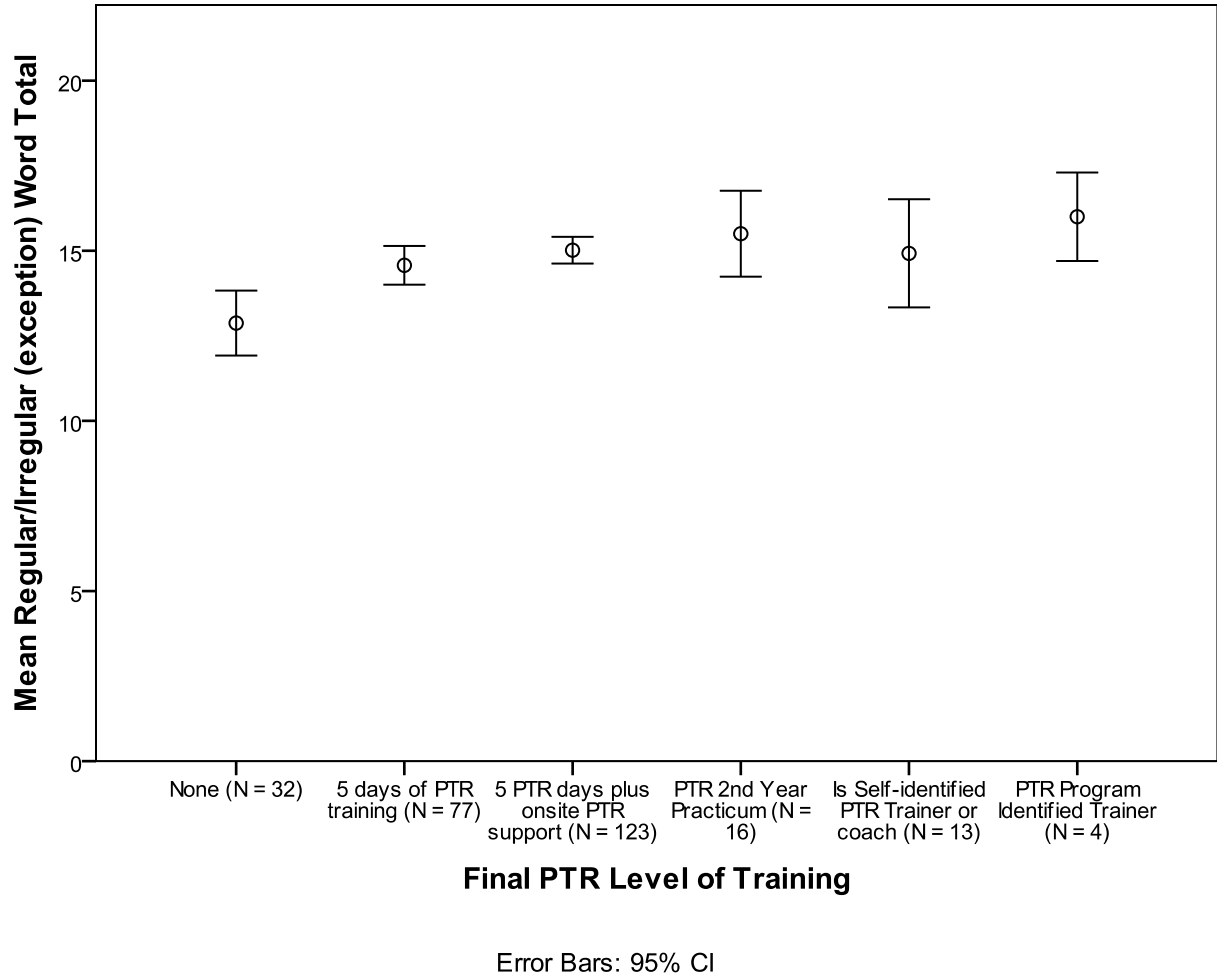
**Figure B.3. Mean Final Sound Matching Knowledge Scores by Revised Level of PTR Participation**



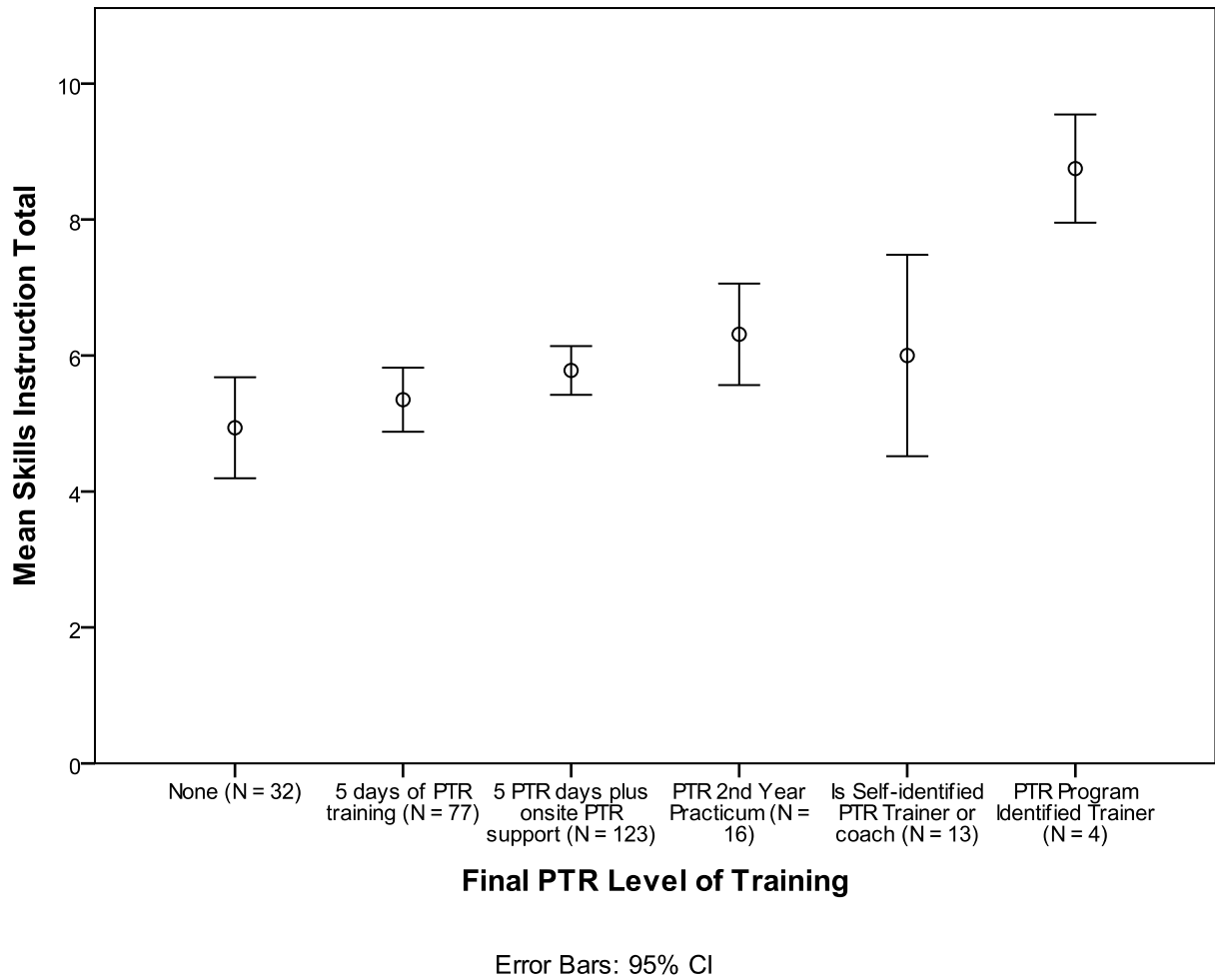
**Figure B.4. Mean Phoneme Segmentation Knowledge Scores by Revised Level of PTR Participation**



**Figure B.5. Mean Graphophonemic Segmentation Knowledge Scores by Revised Level of PTR Participation**



**Figure B.6. Mean Regular/Irregular (exception) Words Knowledge Scores by Revised Level of PTR Participation**



**Figure B.7. Mean Skills Instruction Knowledge Scores by Revised Level of PTR Participation**