

**READING  
APPRENTICESHIP:  
CLASSROOM-BASED RESEARCH  
SANTA ANA COLLEGE**

**Spring 2013**  
(Fall 2011- Spring 2013)

## Introduction

The following report describes the continued investigation of the effectiveness of Reading Apprenticeship strategies in the classroom at Santa Ana College. Initially this project began in the Spring of 2011. This report covers nine separate classroom-based studies conducted between Fall of 2011 to Spring of 2013 (see Table 1). The purpose of this research was to continue to investigate the impact of Reading Apprenticeship (RA) strategies on student learning. The faculty participation in this project was voluntary, although several faculty stipends were awarded for participation. This applied educational research falls under quasi-experimental design and so the terminology of the *intervention and non-intervention* groups or conditions will be used over the terms *control and experimental* groups or conditions since there is no true random selection or random assignment of participants. This ongoing project attempts to show evidence of the effectiveness of RA strategies on student learning.

Table 1

*The Class List Showing RA Strategy Used and Overall Effect*

Semester	Class	RA Strategy	RA Effect
1. Spring 2013	Anthropology 101	E/I Log	Mixed Results
2. Spring 2013	Counseling 116	Questions in the Round	Mixed Results
3. Spring 2013	Psychology 219	E/I Log	Positive Results
4. Fall 2012	Psychology 219	E/I Log	Positive Results
5. Fall 2012	Anthropology 101	E/I Log	Mixed Results
6. Fall 2012	Psychology 100	E/I Log	Mixed Results
7. Spring 2012	Psychology 219	E/I Log	Positive Results
8. Spring 2012	Chemistry 209	E/I Log	Mixed
9. Fall 2011	Psychology 219	E/I Log	Positive Results

## ***1. Anthropology 101 (Spring 2013)***

### **Method**

#### **Participants**

The participants were 84 Santa Ana College students enrolled in two sections of Anthropology 101 in the Spring semester of 2013. Both classes met two days a week, one on Monday and Wednesday at 11:30 a.m. and the other on Tuesday and Thursday at 11:30 a.m. The students participated in the study as part of the required course curriculum. The non-intervention class consisted of 42 students and the intervention class consisted of 46 students. The only participants excluded from the final comparative analysis were students who did not take the pretest or posttest due to class absence, which consisted of four students. No other students were excluded.

#### **Materials and Procedures**

In Anthropology 101, the instructor used the "Evidence and Interpretation" (E/I log) metacognitive reading log as the intervention. In this design, the instructor selected two sections of Anthropology 101 to investigate the effectiveness of the E/I log. Both classes were assessed on their reading of the two chapters of the course textbook. The instructor identified a set of ten questions to be used as the assessment tool. The first four questions were from one chapter and the last six questions were from the second chapter. For both classes, the instructor gave the same ten questions as a pretest and posttest. The pretest was administered after reading assignments but before any discussion in class. The posttest was performed approximately three weeks later for the non-intervention class and two weeks later for the intervention class. The intervention class was instructed on how to use the E/I log and

told to use the log with the two specific chapters in which the pretest and posttest were based. The questions from each chapter were given independently as a separate quiz. Both classes were made aware of the pretest and posttest and received the same instructions (e.g. that the pretest questions would be on the up-coming posttest). There were standard textbook reading assignments related to the assessment material before the pretest and a lecture/discussion of the correct answers for each question on the pretest was conducted immediately after it was completed. All the E/I logs were checked for completion by the instructor and all students from the intervention class completed the E/I log.

### Results

The results indicated that there was a significant difference in mean scores between the pretest ( $\bar{x}_{inter} = 3.17$ ;  $\bar{x}_{non} = 3.66$ ) and posttest ( $\bar{x}_{inter} = 6.56$ ;  $\bar{x}_{non} = 7.64$ ) assessments for both of the intervention and the non-intervention classes,  $t(45) = 9.81, p < .01$  and  $t(41) = 11.94, p < .01$ , respectively (see Figure 1). In other words, students scored significantly

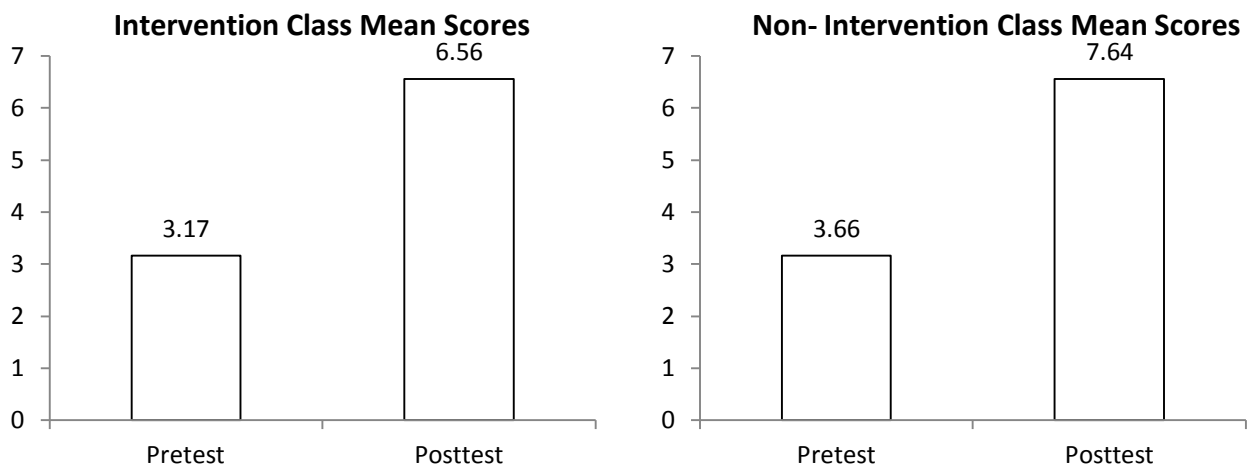


Figure 1. Mean scores of the pretest and posttest for both classes.

higher on the posttest compared to the pretest in both classes. In comparing the non-intervention class to the intervention on the posttest, the results indicated there was no significant difference on the test scores, meaning, both classes performed equally well regardless of the use of the E/I log in the intervention class.

### **Discussion**

In this study the E/I log appeared not to have an impact on student performance beyond what the other pedagogical strategies provided. This finding is inconsistent with previous studies of Reading Apprenticeship at Santa Ana College. In the present study, both classes (intervention and non-intervention) significantly improved performance from the pretest to the posttest. Several possible explanations may account for these results. First, the same test items were used on the pretest and posttest thereby creating a potential for *practice effects*. An increase in performance due to practice effects is usually attributed to repeated exposure to the same material rather than any intervention or any learning by traditional means (e.g. reading the textbook, taking notes, oral discussion, etc). The time period between the pretest and posttest was approximately three weeks and may have also been a factor. The assessment tools contained only ten questions and since students were aware of the repeated testing it may seem reasonable to conclude that the increase in student performance for both classes was due to practice effects. However, there are other possibilities to consider.

In the study, the instructor conducted an in-class review and discussion of the pretest questions immediately following the test, which gave students immediate feedback on the correct answers. Many educators propose that immediate feedback is a powerful tool that impacts student learning, comprehension and memory recall. So, these results could be explained by the effect of immediate feedback alone. In addition, the students were made

aware they would encounter these same test questions in the future thereby creating an external motivation to remember test items. If for a moment practice effects are not considered, then perhaps the power of immediate feedback involving discussion of the content lead to the increased student performance, although practice effects cannot be eliminated as a potential source of the increased performance due to how the study was carried out. Perhaps there are other aspects to consider with the use of immediate feedback.

Since the immediate feedback was conducted for both classes and both classes significantly improved at an equal rate, one conclusion is that immediate feedback does work to improve student learning and retention of the material (e.g. non-intervention class' performance). In addition, perhaps providing immediate feedback is equally effective as using the E/I log—although this was not directly addressed in this study. Interestingly, the RA strategy did not improve performance beyond what immediate feedback could provide assuming that providing immediate feedback was the source of the increased performance. In other words, there was no combined effect of immediate feedback plus an RA strategy that was above the effect of immediate feedback alone. Again, the study did not directly test the effect of immediate feedback against an RA strategy by itself, so no conclusions can be drawn concerning this type of comparison. The RA strategy alone could have also been just as effective. These results do not address whether providing immediate feedback on sample content or practice test items (e.g. providing immediate feedback on practice problems) will produce the same effect because in this study the immediate feedback was on the exact test items that students later encountered. Therefore, if educators are going to expose students to the same test items multiple times, then immediate feedback appears to work and the RA strategy does not add any extra benefit. However, it is unclear if this pattern will be

consistent where students have to apply the content in a critical thinking context rather than simply remembering an answer of a previously encountered test question. RA strategies may still be a more ideal form of study strategy since they usually are intended for students to use prior to any formal assessment.

## **2. *Counseling 116 (Spring 2013)***

### **Method**

#### **Participants**

The participants were 29 Santa Ana College students enrolled in one section of Counseling 116 in the Spring semester of 2013. This class met twice a week on Tuesday and Thursday at 8:00 a.m. The students participated in the study as part of the required course curriculum. The instructor assigned part of the class (10 students) as the intervention group and another part (19 students) as the non-intervention group. The group assignment was based on in-class seating (right side vs. left side).

#### **Materials and Procedures**

In Counseling 116, the instructor developed a study strategy based on “Questions in the Round” RA learning strategy, where students ask questions about the material. The intervention group was instructed to work in dyads for five minutes to answer the chapter review questions, which was a regular class assignment. The next step was to increase that group number to include two more classmates (so now a group of four) for another five minutes. Finally students worked with the entire group (which was up to 10 students) for the final five minutes. During each of the sessions, students were to compare their review with their partner or group, pose questions to each other, reread the text as necessary, and find

specific details as needed to answer the questions on the review. The non-intervention group studied independently and did not participate in the RA learning strategy. Three, 15-item quizzes (quizzes eight, nine, and ten) based on three chapters were given to the students. Both groups conducted these activities on the same day in the same class period immediately preceding the assessment. At the end of the study period, any remaining questions were then posed to the instructor to answer for both the intervention and non-intervention group.

### Results

The results indicated that there was a significant difference in mean quiz scores between the intervention and non-intervention groups for quizzes eight ( $\bar{x}_{inter} = 12.50$ ;  $\bar{x}_{non} = 7.12$ ) and nine ( $\bar{x}_{inter} = 18.60$ ;  $\bar{x}_{non} = 11.72$ ),  $t(32) = 2.66, p = .01$  and  $t(33) = 2.53, p = .01$ , respectively (see Figure 2).

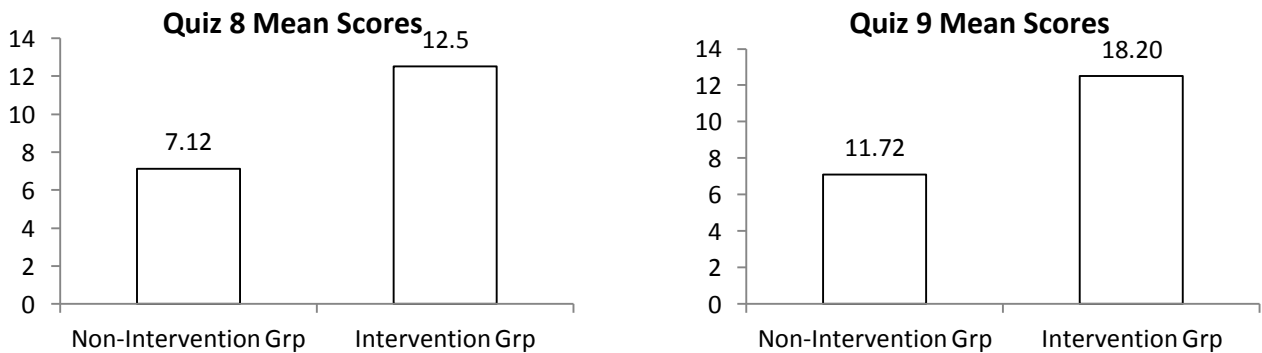


Figure 2. Mean scores of quiz eight and nine for the intervention and non-intervention groups.

In other words, students in the intervention group scored significantly higher on the quizzes compared to the students in the non-intervention group. There was no difference in mean



quiz scores between the intervention and non-intervention group for the chapter ten quiz ( $\bar{x}_{inter} = 10.70$ ;  $\bar{x}_{non} = 10.35$ ).

### **Discussion**

In this study, the results indicate that the RA discussion strategy does improve student performance as evidenced by the first two quizzes. In the first two quizzes the intervention group outperformed the non-intervention group; however this did not hold true for the third quiz. If the RA strategy is effective there should have been a similar pattern on the third quiz. Perhaps the content for the final quiz was somehow different than the previous two quizzes not lending itself for this type of study strategy or perhaps containing more difficult content. Given that this study all took place at one time period, perhaps the students were so fatigued by the two previous study sessions that by the third session students perhaps found it difficult to focus and concentrate. The pattern of scores for the intervention group on the three consecutive quiz scores may be indicative of such an explanation based on the relationship between arousal and performance (see Figure 3). The famous u-shaped pattern between arousal and performance (Yerkes and Dodson, 1908) suggests that initially performance increases as arousal increases until an optimum level is reached. Once the optimum level is reached, if arousal continues to increase, performance begins to decrease. The intervention group seems to model this pattern; therefore, perhaps this indicates as the class discussion progressed students became overwhelmed with all the content they were discussing and learning.

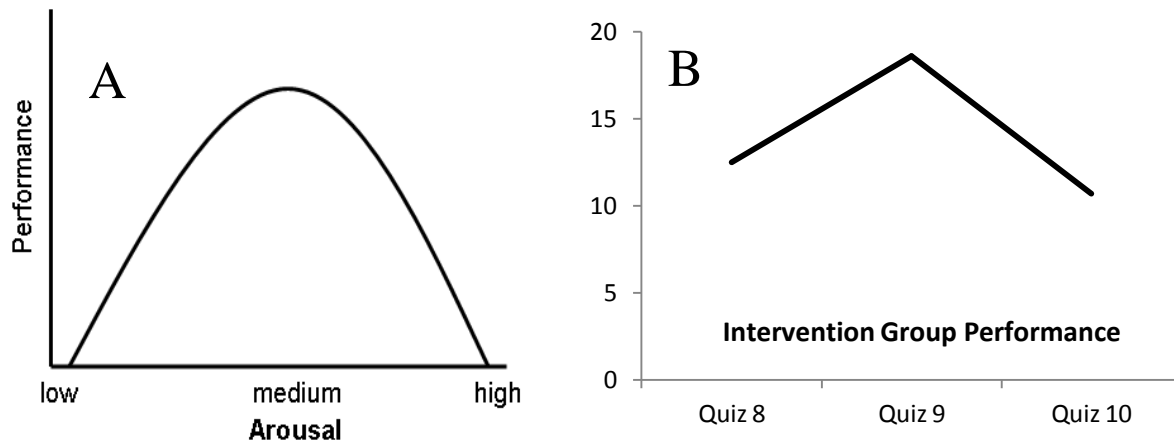


Figure 3. Graph A illustrates the Yerkes-Dodson Law (1908) between arousal and performance. Graph B depicts the intervention group performance across the three quizzes.

### 3. *Psychology 219 (Spring 2013)*

#### Method

##### Participants

The participants were 26 Santa Ana College students in enrolled in two sections of Psychology 219 in the Spring 2013 semester. This class met twice a week on Tuesday and Thursday at 11:30 a.m. The students participated in the study as part of the required course curriculum. All students participated in a within-subject design; therefore, all the students took part in both the intervention and non-intervention conditions.

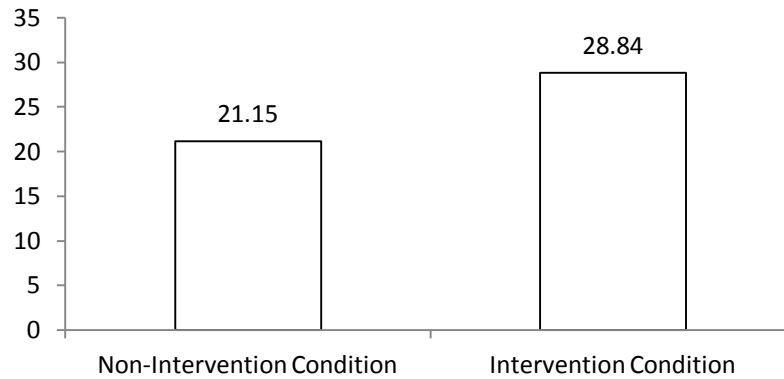
##### Materials and Procedures

Student quiz scores were compared before and after an intervention given on the same day in class. Students were given a passage to read and then given a 5-item quiz about the passage without the use of an RA strategy (non-intervention condition). Students were then given an alternate passage with instructions on how to use the RA strategy (E/I log) while reading this second passage (intervention condition). The instructor demonstrated how to use

the E/I log. After, students were given a second 5-item quiz relating to this passage (see appendix B for quizzes). Both passages, “Attachment Styles” and “Parenting Types,” were approximately a page and half of text and were taken from an introductory psychology textbook. Students in Psychology 219 would have a high likelihood of being exposed to this material in previous semesters because the course Introduction to Psychology is a prerequisite to Psychology 219. Each quiz was designed with the same type questions, two multiple choice, two open-ended, and one cloze or fill-in the blank question. Three of the questions had in depth answers with several components. The total possible score on each quiz was 30 points and each was designed so that the questions would elicit similar types of responses based on similar content structure. For example, there are three distinct attachment patterns ( e.g. secure, avoidant, and ambivalent/resistant) and four distinct parenting styles (e.g. authoritative, authoritarian, permissive, and uninvolved). Each quiz had one item dealing with identifying the main types of attachment or parenting styles.

### **Results**

The mean quiz scores were compared for the non-intervention condition ( $\bar{x}_{\text{non}} = 21.15$ ) and intervention condition ( $\bar{x}_{\text{inter}} = 28.84$ ) using a t-test and the results indicated a significant difference  $t(25) = 4.34, p < .001$  (see Figure 4). In other words, the RA strategy significantly increased student quiz scores compared to when no strategy was used.



*Figure 4.* Mean quiz scores for each condition.

## **Discussion**

The results indicated a significant improvement in student scores with an RA strategy was used. These results are consistent with previous studies using the same strategy. The replication of these results over several semesters with different student cohorts does add significant evidence to the effectiveness of some RA strategies.

### ***4. Psychology 219 (Fall 2012)***

## **Method**

### **Participants**

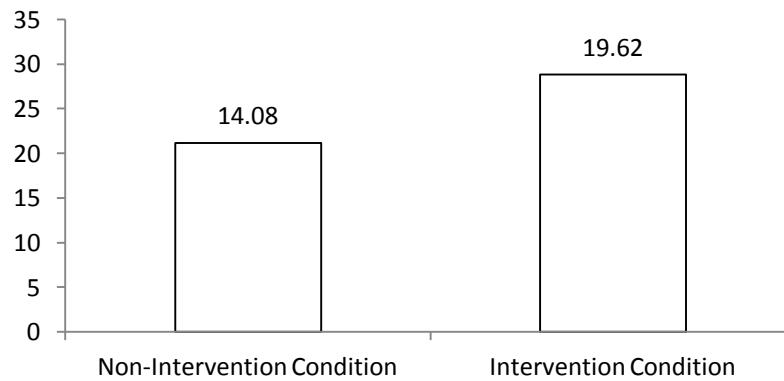
The participants were 24 Santa Ana College students enrolled in two sections of Psychology 219 in the Fall 2012 semester. This class met twice a week on Tuesday and Thursday at 12:00 p.m. The students participated in the study as part of the required course curriculum. All students participated in a within-subject design and, therefore, took part in both the intervention and non-intervention conditions.

### **Materials and Procedures**

The same methods and procedures were used in this study at in Psychology 219 in the Spring of 2013 (see previous study 3).

### Results

The mean quiz scores were compared for the non-intervention condition ( $\bar{x}_{\text{non}} = 14.08$ ) and intervention condition ( $\bar{x}_{\text{inter}} = 19.62$ ) using a t-test and the results indicated a significant difference  $t(24) = 4.05, p < .001$  (see Figure 5). In other words, the RA strategy significantly increased student quiz scores compared to when no strategy was used.



*Figure 5.* Mean quiz scores for each condition.

### Discussion

The results indicated a significant improvement in student scores with an RA strategy was used. These results are consistent with previous studies using the same strategy. The replication of these results over several semesters with different student cohorts does add significant evidence to the effectiveness of some RA strategies.

## **5. Anthropology 101 (Fall 2012)**

### **Method**

#### **Participants**

The participants were 79 Santa Ana College students in enrolled in two sections of Anthropology 101 in the Fall 2012 semester. Both classes met twice a week, one on Monday and Wednesday at 9:45 a.m., and the other on Tuesday and Thursday at 11:30 a.m. The students participated in the study as part of the required course curriculum. The non-intervention class consisted of 38 students and the intervention class consisted of 41 students. The only participants excluded from the final analysis were students who did not take the tests due to class absence. No other students were excluded.

#### **Materials and Procedures**

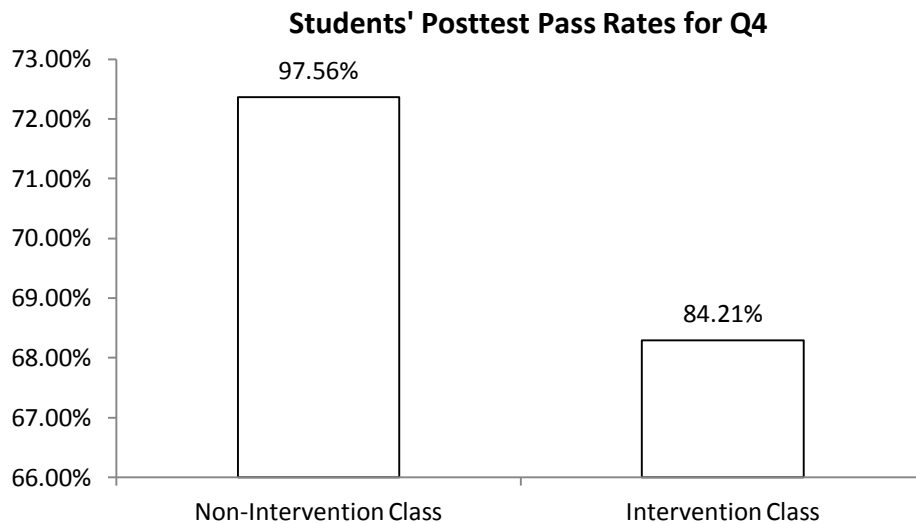
The instructor selected two different course sections of Anthropology 101 and chose one class to serve as the intervention class and the other as the non-intervention class. The instructor selected a specific section of the textbook on “behavioral differences and descriptions of later hominids” as the content for this study. The instructor gave a pretest in the form of a four-item quiz to both classes prior to any intervention on the topic. Then both classes took a posttest in the form of a final exam that contained the four items from the pretest. The items on the quiz and exam covered the same concepts and content, but were reworded from pretest to posttest. For the intervention class, the instructor demonstrated how to use the E/I log to study and students were instructed to use this strategy for the previously mentioned topic. The instructor structured the content for the E//I log which included four specific interpretations, and students were instructed to gather evidence from the textbook to support those interpretations. The intervention class completed the E/I log after the pretest

and before the posttest. The E/I log was assigned as homework and students were expected to complete this on their own. However, the instructor verified that all students in the intervention class completed this task. The time between the pretest and posttest was approximately four weeks.

## Results

Students' pass rates on four quiz items (pretest) and four selected questions on an exam (posttest) were compared between the class that did not use the RA strategy (non-intervention group) and the class that did use the RA strategy (intervention group). First, a z-test analysis of proportions was conducted on the pretest items between the intervention class and the non-intervention class to establish any inherent differences among the two classes prior to any introduction of a study strategy. There were no significant differences in the number of students who answered correctly on question one, two, and three between the two classes. However, for question four there was a significant difference in the number of students who answered correctly between the intervention class (44.73%) and the non-intervention class (18.91%),  $z = 2.47, p = .0136$ .

Using the same procedure, an analysis of the posttest between the two classes revealed one significant difference between the two classes. On question one, 84.21% of students in the non-intervention class answered correctly compared to 97.56% of students in the intervention class and this was significantly different,  $z = 2.06, p = .03$  (see Figure 6). For posttest questions two and three there were no differences between the two classes. As in the pretest, question four elicited a significant difference between the intervention class (14.63%) and the non-intervention class (42.10%) in the number of students who answered correctly,  $z = 2.78, p = .005$ .



*Figure 6.* Posttests pass rates for students in the both classes for question four.

### **Discussion**

The results in this study were mixed and inconclusive. Both classes appeared to perform similarly on pretest questions one, two, and three, which perhaps indicates no inherent differences between these classes. This pattern held true for the posttest questions two and three, which was not expected. In addition, question four of the pretest assessment indicated some possible differences in performance between the two classes— more students answered question four correctly in the intervention class. However, this was prior to any intervention so perhaps more students had previous knowledge of subject matter in this class or studied more effectively compared to the other class. In addition, the posttest assessment revealed similar inconsistencies on question four, however, now in the opposite direction. Initially, the



intervention class performed better on the pretest question four, and then the non-intervention class out-performed the intervention class on this same question. In attempting to explain these inconsistencies, the instructor noted that perhaps question four presented more difficulty because of the choice of terms the textbook author used in addressing specific interpretations that seemed somewhat skewed and unclear.

Furthermore, posttest questions two and three did not reveal an effect in the RA strategy as expected. In contrast, posttest question one did show an effect. Taken together these mixed findings are difficult to explain. Perhaps the narrow focus that these four questions had not provided the student enough context to answer correctly. As the instructor noted, these questions represented theoretical interpretations with several different viewpoints tied to a vast body of evidence. Consequently, these questions may have been very confusing for the student and perhaps not the best selection of questions to make clear connections between study strategies and student learning outcomes. In addition, even though the instructor verified that the RA strategy was completed, the RA strategy was not corrected for accurate interpretations, nor was any feedback given. Another fact that may contribute to these results was that the final assessment took place a month after the intervention was given. So the time lapse also may have contributed to the lack of significant findings.

## **6. *Psychology 100 (Fall 2012)***

### **Method**

#### **Participants**

The participants were 61 Santa Ana College students in enrolled in two sections of Psychology 100 in the Fall 2012 semester. The students participated in the study as part of

the required course curriculum. The instructor selected one class to serve as the intervention class ( $n = 20$ ) and one class as the non-intervention class ( $n = 41$ ). Both classes met on Monday and Wednesday, one at 11:30 a.m. and the other at 1:15 p.m.

### **Materials and Procedures**

The instructor chose to use the *Evidence/Interpretation log* (E/I log) as the RA strategy to test. The intervention class used the RA strategy with two course topics (anxiety disorders and psychotherapies). Both classes were presented with this content in the usual lecture style format; however, the intervention class was instructed to use the E/I log during the presentation of the material. The instructor demonstrated how to use the E/I log for the intervention class. Both classes were presented with the material a week before the assessment (final exam) and there were four total exam questions used to assess the first topic (anxiety disorders) and eleven total exam questions were used to assess the second topic (psychotherapies). The instructor verified the completion of the E/I log.

### **Results**

An independent t-test was used to analyze both assessments. For the first topic (anxiety), the mean scores for the intervention class ( $\bar{x}_{\text{inter}} = 5.15$ ) and non-intervention class ( $\bar{x}_{\text{non}} = 4.24$ ) were not significantly different. For the second topic (psychotherapies), the mean scores for the intervention class ( $\bar{x}_{\text{inter}} = 7.10$ ) and non-intervention class ( $\bar{x}_{\text{non}} = 6.10$ ) were significantly different,  $t(59) = 2.02$ ,  $p = .048$  (see Figure 7). The results indicated that the RA strategy had no effect for the first topic (Anxiety), but did increase student scores for the second topic (Psychotherapies).

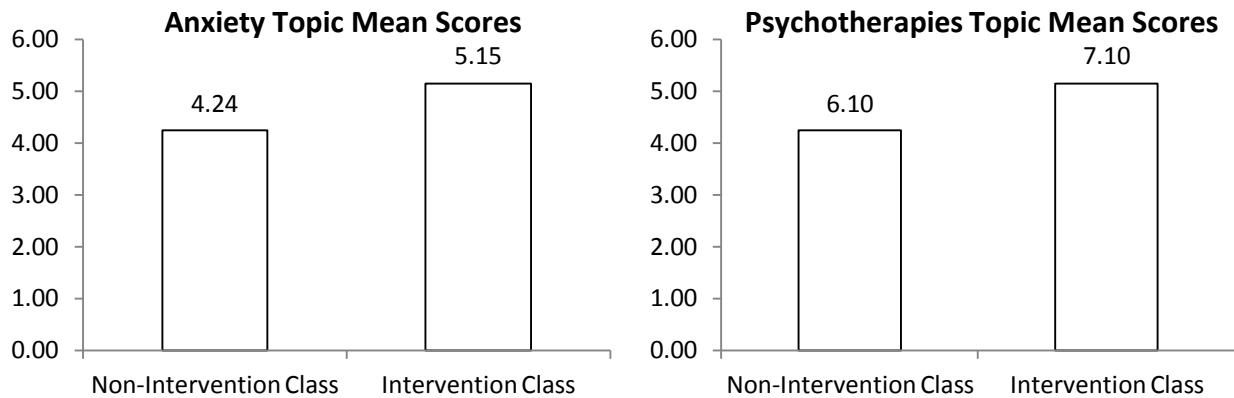


Figure 7. Both graphs show the comparison of the intervention class to the non-intervention class for each topic.

### Discussion

The effectiveness of RA strategies is unclear in this study; one result showed positive results while the other did not. One possible explanation for the discrepancy in effectiveness between the two topics could be the number of assessment questions used. Only four questions were used to test student knowledge of the first topic compared to eleven questions for the second topic. The restricted range in the number of question may explain the lack of significant results. In other words, perhaps students did not have a wide range of opportunity to demonstrate their knowledge on the topic of anxiety, in which only four questions were used. In contrast, the topic of psychotherapies contained eleven questions which students could answer.

### 7. Psychology 219 (Spring 2012)

#### Method

##### Participants

The participants were 27 Santa Ana College students enrolled in two sections of

Psychology 219 in the Spring 2012 semester. This class met twice a week on Tuesdays and Thursdays at 11:30 a.m. The students participated in the study as part of the required course curriculum. All students participated in a within-subject design and, therefore, took part in both the intervention and non-intervention conditions.

### Materials and Procedures

The same methods and procedures were used in this study at in Psychology 219 in the Spring of 2013 (see previous study 3).

### Results

The mean quiz scores were compared for the non-intervention condition ( $\bar{x}_{\text{non}} = 16.43$ ) and intervention condition ( $\bar{x}_{\text{inter}} = 18.53$ ) using a t-test and the results indicated a significant difference  $t(26) = 2.09, p = .047$  (see Figure 8). In other words, the RA strategy significantly increased student quiz scores compared to when no strategy was used.

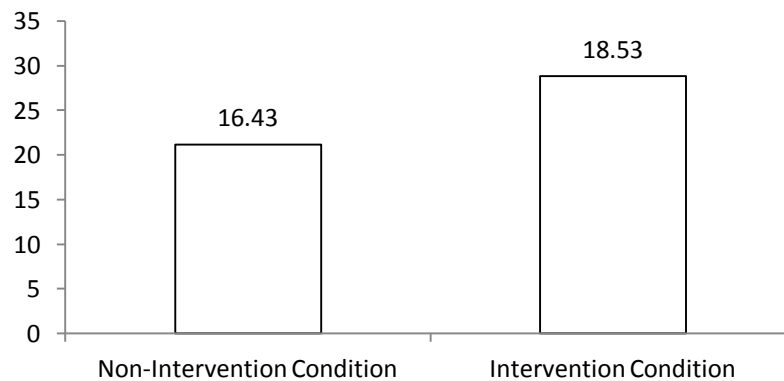


Figure 8. Mean quiz scores for each condition.

### Discussion

The results indicated a significant improvement in student scores with an RA strategy was used. These results are consistent with previous studies using the same strategy. The replication of these results over several semesters with different student cohorts adds significant evidence to the effectiveness of the E/I log strategy.

## **8. Chemistry 209 (Spring 2012)**

### **Method**

#### **Participants**

The participants were 67 Santa Ana College students enrolled in two sections of Chemistry 209 in the Spring 2012 semester. Both classes met twice a week, one on Monday and Wednesday at 11:00 a.m. and the other on Tuesday and Thursday at 3:00 p.m. The students participated in the study as part of the required course curriculum. One class was selected as the intervention class ( $n = 32$ ) and the other as the non-intervention class ( $n = 35$ ).

#### **Materials and Procedures**

The non-intervention class studied the topic of the *scientific method* through several delivery methods: traditional lecture, homework readings, and a two-minute music video on the topic. The intervention class also studied the topic through same methods but had to use the E/I log during each of the delivery methods. The instructor demonstrated how to use the E/I log. After completing the E/I logs students were instructed to form small groups and discuss their logs. Both classes spent approximately a half hour of class time discussing and learning the topic—the scientific method. Three assessments were administered. The first pretest (PreT1) for both classes was administered after students were assigned the reading

and homework but before any class discussing took place concerning the topic and before any intervention was established. This PreT1 was unannounced and consisted of ten items about the scientific method. The PreT1 assessment was used to establish any inherent difference in performance between the intervention and non-intervention classes. Then for the intervention class, the instructor introduced the E/I log and instructed students to use it with the various delivery methods. After the use the E/I log for the intervention class and a more thorough class discussion on the topic for both classes, a second assessment was employed, the first posttest (PosT1). This assessment was the first measure of the effectiveness of the RA strategy. Finally, the instructor administered third posttest (PosT2) three weeks after PosT1. PosT2 was an unannounced quiz. Table 2 illustrates the overall design of the study.

Table 2

*Chemistry 209 Study Design and Testing Sequence*

	PreT1	E/I log	PosT1	PosT2 (3wks later)
Intervention Class	O	X	O	O
Non-Intervention Class	O		O	O

O = indicates a time of assessment X = indicates the introduction of an intervention

### Results

Several comparisons were made between the two classes. A t-test analysis was used to assess four main comparisons. The first comparison was between the control group and experimental group on the PreT1-- the baseline pretest measure. No significant differences were found between the intervention class ( $\bar{x}_{inter} = 4.58$ ) and the non-intervention class ( $\bar{x}_{non}$

= 4.63) on the pretest,  $t(62) = .15, p = .88$ . In other words, the two classes did not differ in performance on the pretest (PreT1). The second comparison was between the non-intervention class and the intervention class on the first posttest (PosT1). There were no significant differences found between the intervention class ( $\bar{x}_{inter} = 6.87$ ) and the non-intervention class ( $\bar{x}_{non} = 6.17$ ) on PosT1,  $t(65) = -1.78, p = .08$ . The third comparison was for the non-intervention class only on PreT1 ( $\bar{x}_{non} = 4.63$ ) and PosT1 ( $\bar{x}_{non} = 6.17$ ); a significant mean difference was found between these two assessments,  $t(66) = -4.18, p < .001$ , meaning, the non-intervention class improved in performance without the use of an RA strategy. Due to some statistical limitations a comparison of the intervention class on PreT1 and PosT1 was not conducted; however, given the similar values it appears the intervention class also improved in performance with the same magnitude. The last comparison was between the non-intervention class and intervention class on the second posttest (PosT2); a significant mean difference was found  $t(62) = -3.63, p = .001$  between the two classes ( $\bar{x}_{non} = 5.63; \bar{x}_{inter} = 6.90$ ). In other words, the intervention class performed better than the non-intervention class three weeks later (see Table 3).

Table 3

*Chemistry 209 Class Scores For Each Testing Sequence*

	PreT1	PosT1	PosT2 (3wks later)
Intervention Class	4.58	6.87	6.90*
Non-Intervention Class	4.63	6.17	5.63*

\*a significant difference found between the two class on the final assessment

## Discussion

So it appears the E/I log had the same impact for the intervention class as the traditional pedagogy did for the non-intervention classes. In other words, traditional teaching methods seemed just as effective as using the RA strategy on the first posttest, and that impact was statistically significant at improving test scores from the pretest. This significant increase from the pretest to posttest performance was true for both classes. Both classes improved from the pretest to the first posttest with similar increases in scores. This would seem to suggest that the RA strategy did not add any more benefit beyond that of those other delivery methods the instructor assigned (reading textbook, completing homework, watching a music video, and discussing the content in class), at least initially. However, the retention of the content was greater, statistically, for students who used the E/I log. In the final posttest, students who used the E/I log performed better three weeks later compared to those students who did not engage in the RA strategy. So perhaps the use of the RA strategy is more effective in long-term retention, in this case three weeks, than no use of the strategy. The design of this study did not directly compare the effectiveness the use of the RA strategy to that of those other delivery methods (reading, discussion, and media). So no conclusions can be drawn concerning that arrangement.

## ***9. Psychology 219 (Fall 2011)***

### **Method**

#### **Participants**

The participants were 27 Santa Ana College students in enrolled in two sections of Psychology 219 in Fall 2011 semester. This class met twice a week on Tuesdays and Thursdays at 12:00 p.m. The students participated in the study as part of the required course



curriculum. All students participated in a within-subject design and, therefore, took part in both the intervention and non-intervention conditions.

### Materials and Procedures

The same methods and procedures were used in this study at in Psychology 219 in the Spring of 2013 (see previous study 3).

### Results

The mean percentage quiz scores were compared for the non-intervention condition ( $\bar{x}_{\text{non}} = 45.00\%$ ) and intervention condition ( $\bar{x}_{\text{inter}} = 69.12\%$ ) using a t-test analysis and the results indicated a significant difference  $t(26) = 4.38, p < .01$  (see Figure 9). In other words, the RA strategy significantly increased student performance compared to when no strategy was used.

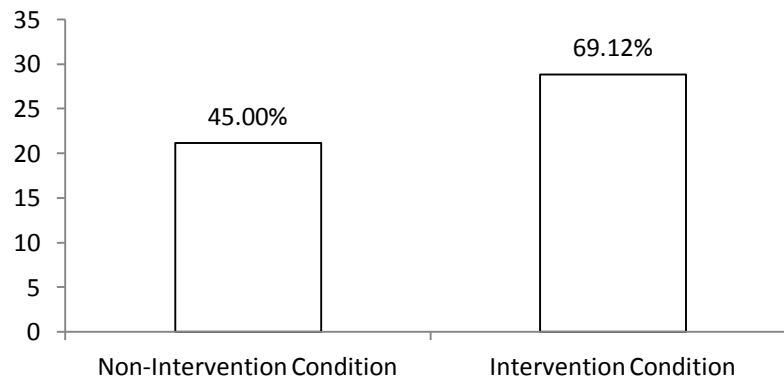


Figure 9. Percent correct for quizzes for each condition.

## **Discussion**

The results indicated a significant improvement in student scores when the RA strategy was used. These results are consistent with previous studies using the same strategy. The replication of these results over several semesters with different student cohorts adds significant evidence to the effectiveness of some RA strategies.

## General Discussion

The current investigation spanning four semesters over two years highlights some important aspects of classroom-based research with Reading Apprenticeship (RA). Over the course of several semesters of research, specific patterns emerged in the implementation of research in the classroom. First, being able to empirically show the effectiveness of RA strategies seems to be contingent on how these strategies are implemented in the classroom. In several studies with four different student cohorts, RA strategies have been shown consistently to enhance student performance. Whether the designs involve students in different classes (between-subject designs) or students in the same class going through different conditions (within-subjects designs) the result is the same—an increase in student performance. When the research design is simple and attempts to isolate the effects of the RA strategy and control for extraneous variables, the results are robust and consistent. However, conducting studies in this manner may not fit in with flow of the course curriculum and may create some artificiality in the typical classroom dynamic. On the other side of the spectrum, when RA strategies are used more loosely in conjunction with course curriculum, the effects are not clearly seen, and are sometimes lost altogether. This is not to imply that the RA strategies do not work, but the effects are clouded in the context of other class activities and instructional pedagogy. So in order to maintain a clear student learning outcome (SLO) assessment and evaluation model there needs to be a middle ground in the implementation of these strategies between classroom-based research to document student success and the instructional practices.

The Spring of 2011 marked the first semester of Santa Ana College classroom-based research (Spring, 2011). In this initial phase of the research, four studies were conducted in which each was designed to minimize any extraneous variables that may cloud the effects of

the RA strategy. All four studies produced consistent results indicating that RA strategies do have a positive effect on student performance. In the following years, one study (PSY 219) consistently replicated the results of these first four studies. These replication studies provided convincing evidence that RA strategies work. However, these effects may only clearly be seen when the methods of implementation closely resemble a strict research design. For example, in the Psychology 219 class (see Chemistry 209 as another example), the instructor was able to show positive results of an RA strategy when students were instructed to read a passage and complete a follow-up quiz for both the intervention and non-intervention conditions within a span of approximately thirty minutes. This very simple design eliminated variables of testing over different time periods and incorporating the use of other pedagogical strategies (e.g. in class discussion). Hence, this approach maximized the potential to show positive results, and did so on every occasion in the last two years. The drawback is that this method may not match the typical classroom setting in which instructors conduct their classes.

In contrast, in the study involving Anthropology 101 in Spring of 2013, a more practical implementation of the RA strategy emerged where the instructor also incorporated oral discussion, the use of immediate feedback, testing over several weeks, and assigning the RA strategy as homework so the students completed the RA strategy independently (compared to the controlled setting of the classroom during testing time). In this case, many more variables were present in this design and may have contributed to the findings— there were no clear effects of the RA strategy on student performance. So finding a middle ground in implementing RA into the classroom is one main concern for further sustainable research of SLOs. Perhaps one example of this middle ground took place in Psychology 100 in the Fall of 2012. The instructor implemented an RA strategy during a traditional lecture style delivery on

*Psychotherapies* for one class, but not the comparison class. The measure of effectiveness of the RA strategy came on a final exam one week later. In this design, the instructor did not modify the normal delivery method of the content nor create or change the assessment, but only introduced the RA strategy and found an increase in student performance. In this case, there seemed to be the right combination of course content, assessment items, and elapsed time between intervention and posttest to show significant increases in student performance, keeping any extraneous noise at a minimum. There is still much assessment and evaluation needed in this area to continue to discover the practical and effective methods of implementing research into the classroom.

### **Limitations**

Given the non-randomized nature of the quasi-experimental design which all of these studies represent, there are several limitations that should be mentioned. Students cannot be randomly selected by the very nature of these designs; therefore, creating equivalent comparison groups is not possible. Some classes or groups of students may inherently have some differences that may have impacted the findings. In addition, all the students consisted of students attending classes during the daytime and may not represent other Santa Ana College students. Some of the other limitations relate to how the RA strategy was implemented. In each study, the quality of the student work produced with the RA strategy was not assessed. Although clear instructions and demonstrations were given to students on how to complete the RA strategy, these studies do not address the quality of the work. If such work had been done, perhaps clearer evidence of the effectiveness of RA strategies may have surfaced across more studies. In reference to the phrase *student performance/success*, the success measured in many of these studies, if not all, relates to success on a single quiz, exam, or even a single test item.

Increases in overall course success rates because of these RA strategies cannot be addressed. There has not yet been an attempt to incorporate these RA strategies into a course curriculum more thoroughly and frequently so as to attempt to affect long term course success. In addition, non-equivalent reading materials were used in several studies, although the more difficult passage was assigned to the intervention condition, making it more difficult to find an effect. Finally, these studies did not attempt to directly compare RA strategies to other study skill strategies. Instructors use many different strategies that may be as effective as well.

### **Implications**

These studies continue to highlight the effectiveness of RA strategies and the challenges of embedding research into the classroom. On one hand, there is clear evidence that RA strategies are beneficial to students but there needs to be a well thought out approach to embedding research into the classroom. The importance of maintaining academic freedom for instructors, yet being able to clearly measure SLOs is crucial. The need for a model showing the integration of RA strategies, or any other successful strategies, into the course curriculum to affect overall course success rates is needed. Finally, this research confirms that the continued RA professional development as a "best-practice" is justified, but that there are certain pitfalls that can be avoided when implementing these strategies. For example, if the in-class research is designed to assess RA strategies then alternative study strategies should not be introduced into the lesson until the data for RA is gathered.

### **Recommendations**

Given some of the limitations to the current study, classroom-based research should continue to further substantiate and clarify specific implementation procedures as successful or not. The continued use of RA strategies is warranted although a pilot study focusing a

redesigned class that incorporates RA strategies throughout the curriculum would be a possible next step. This could begin to address the overall goal of student course success rates.

Continued faculty collaboration and discussion are needed along with institutionalized incentives for faculty participation. An institutional researcher with more resources is needed to carry out large-scale, long-term research studies on SLOs in the classroom. The Reading Apprenticeship paradigm appears to work and continued integration of RA practices into the classroom along with identifying the range of successful strategies would be beneficial. Given that instructors use many strategies unrelated to RA, perhaps an interesting study would investigate different types of strategies on student learning.

Appendix A

**E/I Chart**

Title: \_\_\_\_\_

Possible Topics: \_\_\_\_\_

<b>EVIDENCE:</b> Facts, details, specific examples, data, statistics, etc.	<b>INTERPRETATION:</b> Reactions, questions, judgments, thoughts about the evidence.



## Appendix B

### Attachment Quiz

1. How many types of attachment have been identified?  
A) 2   B) 3   C) 4   D) 5   E) 7   F) Not sure
2. List the types of attachment and define them?
3. How many phases of attachment have been identified?  
A) 3   B) 4   C) 6   D) 7   E) 10   F) Not sure
4. List the phases of attachment and define them.
5. Children that have a \_\_\_\_\_ attachment have less behavior problems than children that have a \_\_\_\_\_ attachment?

### Parenting Quiz

1. How many parenting styles have been identified?  
A) 2   B) 3   C) 4   D) 5   E) 7   F) Not sure
2. List the types of Parenting Styles and define them?
3. These parenting styles are based on how many aspects of parental behavior?  
A) 3   B) 4   C) 6   D) 7   E) 10   F) Not sure
4. List as many of the aspects of parental behavior as you can:
5. Children of \_\_\_\_\_ parents are more socially competent than children with \_\_\_\_\_ parents?