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Evaluating the Effects of Guided Notes and Response Cards in Student Performance

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Evaluating the Effects of Guided Notes and Response Cards in Student Performance

by

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A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts
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Keywords: Performance, teaching, quiz, on-task behavior, academic behavior, participation.

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Dedication

I dedicate this manuscript to my parents. Their support and encouragement as well as their lessons in discipline and work ethic made it possible to complete this thesis. I am grateful to them always.
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Abstract

Guided notes and response cards have individually been found effective at increasing student performance and active participation, however, no known studies have compared the effects of response cards with the effects of guided notes to determine if one is more effective than the other at increasing student performance and on-task behavior. In order to evaluate the efficacy of these two teaching methods, two different teaching conditions were examined: guided notes and response cards for in-lecture review. An alternating treatments design was used to evaluate the effects of these two conditions on post-lecture quiz scores, competing academic behaviors and academic responding in two university level behavior analysis courses. The results of this research demonstrated that both guided notes and response cards were effective at maintaining high student academic performance. Guided notes appeared to be more effective at decreasing student’s competing academic behaviors while response cards were more preferred by both students and teachers.
Chapter One: Introduction

College students are encouraged and expected to apply knowledge and information obtained during lectures to exams and quizzes as a way to assess their proficiency with the material and performance in a course. It has been said that students retain more information if they are actively engaged in the learning process (Barbetta & Skaruppa, 1995). However, attending to the lecture and gathering notes simultaneously can be difficult, and students could focus more on one task than the other (e.g. focus more on the spoken lecture than taking notes) and this could affect performance in the course (Austin, Gilbert, Thiebealt, Carr & Bailey, 2002).

Heward (1994) found that a good way to increase student’s academic performance is to increase levels of active student responding. As students participate actively in class, they are more likely to recall information and perform better. Active student responding is a process by which students are encouraged to participate in class by asking and answering questions, and actively taking notes (Heward, 1994). Traditionally, in the education setting, this is done when the instructor asks one question to the class and one student is given the opportunity to respond to the question after raising his hand. A limitation of the traditional method of active responding is that it reduces opportunities for participation to one student at a time, thus making all other students passive participants (Narayan, Heward, Gardner, Courson & Omness, 1990).
Methods that provide all students with many opportunities to respond during traditional lectures include choral responding, times trials, guided notes and response cards (Blackwell & McLaughlin, 2005; Narayan et al., 1990). Guided notes are a highly used method of instruction in elementary and secondary classrooms. The purpose of guided notes is to increase student responding during class and overall performance.

Guided notes involve the use of a lecture handout consisting of blanks replacing the key points mentioned during the lecture. These lecture handouts serve as a guide for identifying the key points of the lecture by providing cues (i.e. blanks) and an opportunity for students to fill in the key points (Austin et al., 2002; Heward, 1994). Some advantages of guided notes are increased opportunities for student participation in lecture and increases in the quality of note-taking and in-class questions. Furthermore, guided notes provide students with specific information to focus on when studying for exams (Barbetta & Skaruppa, 1995).

Research on instruction methods and academic performance has shown that higher rates in the ability to recall information and perform well academically occur in students who take notes versus students who do not take notes (Austin, 2000; Austin et al., 2002; Konrad et al., 2009). Austin et al. (2002) compared guided notes with no guided notes on the effects of immediate recall with short answer quizzes in undergraduate students. Students were exposed to each instructional method and given time to take notes during lecture using either guided notes or taking their own notes. Although there were no statistically significant differences between conditions, the authors found a difference when looking at trends across conditions, which showed that guided notes were superior to no notes and that the guided notes condition did enhance
immediate recall over time (Austin et al., 2002). Researchers also found that students participated more during sessions that included the guided notes condition, and reportedly preferred guided notes to no notes; stating that they had more time to actively participate in class during this condition.

As a systematic replication of Austin and colleagues (2002), Neef, McCord and Ferreri (2006) compared guided notes and full notes (handouts with completed lecture notes printed). Students were asked to complete quizzes one week after the lecture took place. Quizzes included a variety of questions (i.e. knowledge, comprehension, application, analysis) and were administered during the first 15 min of the lecture. As a measure of social validity, students were asked to rate how each of the note taking formats helped them follow the lecture, study and review the material, and learn effective note taking skills. Results of Neef et al. (2006) were similar to the results of Austin and colleagues (2002) in that across both conditions (guided notes and full notes) there were no differences found between conditions when looking at quiz performance, and also found that students reported a preference for guided notes over full notes.

Konrad et al. (2009) conducted a meta analysis of guided notes and found a limited number of studies that evaluated the use of guided notes as an instruction method in post-secondary settings. The analysis of this small sample uncovered inconclusive findings due to a wide variation of data collection procedures, methods, and comparisons employed by the researchers. In general, when compared to traditional instruction methods, the effects of guided notes were positive and associated with an increased accuracy of note taking. It was also noted that short form guided notes (3-5 blanks per
slide) produced more accuracy of note taking than long form guided notes (5 or more blanks per slide).

Guided notes have been identified as an effective tool for teaching and for increasing student’s academic performance. Although, the note taking process in guided notes has shown to produce more accurate notes, students may focus more on filling in the missing components and miss out on other aspects of the lecture. For example, if the student is filling in missing blanks, they may not attend to what the instructor is saying in that moment. In addition, some students may only attend to the lecture when information that is needed to fill in the blank is provided and engage in off task behavior the rest of the lecture thereby missing parts of the lecture.

Another effective method of increasing student’s active student responding is response cards, which have been shown to increase not only student’s academic performance, but also participation in class and on-task behavior. Early studies on the effects of response cards focused on the academic performance of elementary or high school students and found them to be an effective way of increasing student performance. Furthermore, response cards were shown to increase participation and accuracy of responses in science and social studies classes when compared to hand raising (Cavanaugh, Heward & Donelson, 1996; Gardner, Heward & Grossi, 1994; Narayan et al., 1990).

Response cards are blank or pre-printed cards that students hold up simultaneously to respond to a question or problem presented to the class by the instructor or another person in the room (Blackwell & McLaughlin, 2005; Heward, 1994; Narayan et al. 1990). Narayan and colleagues (2005) found that by using response cards,
instructors were able to cover more material in a lecture and, because students were simultaneously responding to all questions, students performed better on quizzes.

Kellum, Carr, and Dozier (2001) were the first to evaluate the use of response cards in a post-secondary setting by working with students enrolled in an Exceptional Children course at a community college. Using pre-printed response cards with the words “A, True” on a green background on one side and the words “B, False” on a red background on the other side, instructors presented review questions using an overhead projector. Following the review questions, students were given post-lecture quizzes and were asked to recall information that was covered during the lecture. Researchers found that at the end of the semester, a higher percentage of students earned an “A” as a score for the quiz when response cards were used over traditional lecture without response cards, and that more students responded to the review questions during the response card condition than during the traditional lecture condition; thereby demonstrating that the application of response cards to college level courses obtained similar results as the application to elementary and high school classes. Furthermore, they found that response cards could improve student’s participation and performance in a college classroom.

Shabani and Carr (2004) replicated the findings of Kellum et al. (2001) and attempted to extend the research by selecting a university level population and testing the effects of response cards during two experiments. The first experiment was to test the effects of response cards on long-term recall by applying response cards to unit exams, and the second experiment was to test the effects of response cards on short term recall by applying the response cards to end of class quizzes. Although there were no statistically significant differences between the effects of response cards or traditional
lecture for long-term recall during unit exams, students scored higher on end of the lecture quizzes during response cards conditions than during traditional lectures. Further research was conducted by Clayton and Woodard, (2007); Malanga and Sweeney, (2008); and Marmolejo, Wilder, and Bradley (2004) to evaluate the use of response cards in college classrooms using post-lecture quizzes as the dependent variable. The results of these three studies found that response cards were more effective at increasing post-lecture quiz scores than traditional lectures.

Previous research showing the effectiveness of guided notes and response cards at increasing student’s performance and participation suggests that combining the two methods of instruction could be a more effective way of increasing student participation and performance simultaneously. Musti-Rao, Kroeger, and Schumacher-Dyke (2008) conducted the first study that combined guided notes and response cards as an instructional package to assess the academic performance and in-class participation of undergraduate students. They selected undergraduate students enrolled in a special education course and presented students with a pre-lecture quiz composed of 7 to 10 multiple choice and true/false questions about the information presented in the previous class, followed by a lecture with audio visual aids (presented using Microsoft PowerPoint®), an academic exercise, and 8 to 10 review questions over the concepts presented during that day’s lecture. The research utilized an ABCBC design in which students were presented with traditional lecture, guided notes alone, and guided notes combined with response cards.

During the baseline condition, instructors followed the procedures outlined as the components of the lecture, but did not use guided notes or response cards. During the
guided notes condition, students were provided with handouts of the lecture slides prior to the start of the class. These handouts included guided notes created following Heward’s guidelines for constructing guided notes (Heward, 2001), identifying key concepts from the lecture and creating slides with blanks for the students to complete. Researchers also inserted a set of symbols in the notes as cues for the students to know when and what to write. During this condition, students could choose to answer the instructor’s questions by raising their hand and waiting to be called upon, as in the traditional lecture method (Musti-Rao et al., 2008).

During the response cards and guided notes condition, students were given guided notes handouts as described in the above condition along with white dry-erase boards and markers at the beginning of the lecture. At different times throughout the lecture, students were presented with questions by the instructor and required to respond using the boards, giving them 5 s to write down the answer, then students were cued to raise their boards and reveal their answers simultaneously (Musti-Rao et al., 2008).

In addition to evaluating the effects of guided notes and response cards on student performance, Musti-Rao et al. (2008) looked at the effect of these teaching methods on student participation by collecting frequency counts of each student’s academic responses. Academic responses were defined as an answer to a specific question posed by the instructor related to the course content (Musti-Rao et al., 2008); number of academic responses included student hand raising (even if not selected by instructor), overt verbal response, and written responses on response cards. The results of this study showed that guided notes were effective at increasing student’s performance when used alone, and student’s performance increased slightly or remained the same when combined with
response cards, which the authors attributed to the use of multiple instructional strategies and a ceiling effect during the baseline condition. The results also showed that the use of guided notes did not increase student participation, except when combined with response cards.

Although guided notes and response cards have been found to be effective ways of increasing student performance when evaluated individually, only one study has looked at the effects of combining them into an instructional package, and no previous studies have looked at the effects of these techniques on the on-task behavior of students (i.e. student note taking, attention to instructor or materials, and/or asking lecture-related questions). With the technological advances of this time and the different academic demands, college students are presented with multiple competing contingencies such as immediate interaction with peers through social networking sites (either through handheld devices or personal computers), preparation for other courses, assignments, and exams that compete with focusing on the material presented in lectures. It is important to look at the effects of these instructional techniques on student on-task behavior to assess if the reinforcing effects of increased academic performance and reduced response effort in note taking are strong enough to keep students engaged throughout the entire lecture.

Some limitations of the research conducted by Musti-Rao et al. (2008) include the inconsistent rate of opportunities for use of response cards, absence of lecture quizzes during some lecture sessions and differences in instructional strategies, yielding conflicting results and evidence that the use of guided notes may interfere with the effectiveness of response cards when used together.
No known studies have compared the effects of guided notes and response cards as individual teaching strategies to identify if one teaching strategy is superior to the other, and the study that evaluated the effects of combining guided notes and response cards presented concerns that guided notes may hamper the ability of students to attend to lecture material. Therefore, the present study evaluated and compared the effects of guided notes and response cards on student performance, competing academic behaviors, and academic responses to determine if one instructional method was more effective than the other at increasing student performance, academic responding, and reducing competing academic responses. Social validity data was also collected to determine which instructional method was most preferred by students and teachers.
Chapter Two: Method

Participants and Setting

The research was conducted during an academic semester (12 weeks for class one and eight weeks for class two) across two courses. Research sessions took place during regularly scheduled class meetings and were approximately 75 min long. Participants in both courses were students enrolled in a master’s level program in Applied Behavior Analysis. Both classes were taught over the fall session of the 2012-2013 academic year, had the same cohort of students enrolled, and were taught on Tuesdays. The total number of students enrolled in these classes was 22.

Both classes were taught in a medium size classroom with capacity for up to 50 students. Students sat at desks facing the instructor and the instructor presented the material at the front of the class. All classrooms were equipped with a screen, projector and a laptop to be used for presentation of the audio-visual part of the lecture using Microsoft PowerPoint© or other similar systems of projecting visual slides on a screen (e.g. Mac Keynote©). Instructors had the option of connecting their personal laptop to the projector if they preferred to use their own equipment, but for all lectures the instructors opted to use the equipment provided by the university. Students had the option of using their laptops for note taking; however, power sources were not guaranteed for each student.
Participant Selection

Participating instructors were two Ph.D. level faculty members with board certification in behavior analysis who both taught in the Applied Behavior Analysis Master’s program at the university where the research took place. These instructors were full time professors and faculty members who taught each of these courses regularly. The researcher spoke with each of the instructors prior to the start of the semester to obtain their support in the research, the use of their classes as a research site and recruit them as implementers/participants. This was done by making initial contact with the instructors via email and/or personal contact, explaining the research and answering any questions that the instructor had.

It was explained to the instructor during all meetings that the course must follow the procedures outlined in the research protocol in order to be eligible for the research study. Each instructor was also told that they could withdraw their participation in the research at any time during the study. The researcher also acted as a teaching assistant for the courses used for research in this study and recruitment of participants was done within this role.

Students were selected for data collection in the study based on their enrollment and regular attendance in one (or both) of the classes used for research. Since both classes had the same cohort of students involved, the same students were observed for both classes. Out of the total number of students enrolled in the course, five students were selected for observation throughout the semester. These students were selected based on ease of visibility to the observers (researcher and research assistant) from the back of the room and their consent to participate in the study by signing an informed consent.
document at the start of the semester. The students selected for data collection in the study were five first year students in the Applied Behavior Analysis Master’s program at the university where the research took place.

Data collection in the study excluded students who had not signed an informed consent, withdrew consent from participation in the study, or had a seating position in the classroom that made it difficult to observe their behavior throughout the entire duration of the class from a seat in the back of the room.

The researcher explained the research to all potential participants on the first day of class as part of the informed consent process and asked students to voluntarily consent to participate in the study. Students were told that as part of the course format, all students enrolled in the course were subject to both teaching methodologies used in the class as well as the lecture quizzes and that data on the class performance of those that agreed to participate would be used for research purposes (i.e. improving teaching practices and informing the teaching community about best teaching practices). Data on dependent variables were only collected for the five students selected for participation in the study based on the above-mentioned criteria.

To control for reactivity (Kazdin, 1979) and changes in student behavior due to observation, students were informed that there was research taking place in the course in which the instructor was testing out two different teaching methods (guided notes and response cards), and that data would be collected on their class performance through lecture quizzes and that the researcher and a research assistant would be observing the classes for this reason. Students were informed that the scores obtained on the quizzes would not be part of their final grade in the course, and they were also informed that even
if they chose not to participate in the study, they would be subject to the teaching methods and lecture quizzes as a regular part of the course, but data on their performance would not be collected for research purposes. This information was also relayed to the students verbally (see Appendix E).

A debriefing session was held with the entire class at the end of the final class session of the semester. During the debriefing session, the researcher shared preliminary results of the study with the students; indicated which condition was more effective, and which condition students preferred (see Appendix F). The researcher informed students about the desire to publish and present these data at state and national conferences in order to inform the community about best teaching practice and reminded the students that they had the option to withdraw their permission to use their data at that time.

**Dependent Variables and Data Collection**

**Academic Responses (AR).** Academic responses served as the primary dependent measure, and in accordance with Musti-Rao et al. (2008), were defined as any time that a student provided an answer (vocal, written, or signed) to a specific question posed by the instructor related to the course content during a class session and included student hand raising (even if not selected by instructor) as well as answers written on response cards. Completed GN blanks during the GN condition were excluded as AR due to the potential for reactivity and the effects that this could have on other dependent variables. Data on AR were collected by counting the number of responses for each student during each observation and were reported as a frequency measure.

**Opportunity for Academic Responses (OAR).** Data for instructor behavior was collected and labeled as opportunities for academic responses. This was defined as any
time that an instructor presented a question to the class either verbally, signed or on the slides. This included each of the review questions posed during the RC condition, but excluded the blanks in the GN materials due to the potential for reactivity and its effects on other dependent variables. In both conditions (GN and RC), the Instructor was told to present questions to the class as a whole so that all students received an opportunity to respond. In the RC condition, all students used RC to answer the review questions as a group; however, for all other questions posed during the lecture, and in the GN condition, the instructor selected a student to answer the question.

Data on OAR were collected by counting the number of opportunities for academic responses given by the instructor (in the form of questions to the class presented either verbally or from the slides) and was reported as a frequency measure. Observations and data collection for this dependent variable were conducted during moments in which the instructor was lecturing to the class and not during times in which students were participating in practical exercises or in class activities where students did not have an opportunity to participate in academic responses.

**Competing Academic Behaviors (CAB).** Competing academic behaviors served as a second primary dependent measure and were defined as any time that a student engaged in behaviors that could presumably take his or her attention away from the lecture material, such as typing or texting on hand-held devices, playing games, accessing social networking sites, surfing the internet, engaging in video chat or written chat (on hand-held devices or personal computers) talking to classmates, completing assignments not related to class and doodling or drawing on paper, hand-held devices or personal computers.
Data on CAB were collected for the five selected students using momentary time sampling, a process by which observers record whether the target behavior occurred at the moment that each time interval ended (Cooper, Heron and Heward, 2007). To do this, lectures were split into 15 s intervals, giving approximately 30 observation opportunities per student for each 75 min lecture session. Two observers sat at the back of the classroom. At the end of each interval, these observers looked up for 2 s and recorded if the student was engaging in CAB or not, then they looked around the classroom for 3 s and pretended to record notes about other students. This was done to avoid inadvertently revealing which students were being observed at each particular interval. Observations were conducted in this manner looking at one student per interval until all five students had been observed and repeated for the entire 75-min lecture session (i.e. first interval looked at student one; second interval looked at student two and so on). Each new class, observations started with the next student in the roster to ensure that all participants were observed equally and no patterns of behavior were missed (i.e. class one started with student one, class two with student two, and so on).

As stated earlier, observations and data collection were conducted only during intervals in which the instructor was lecturing to the class and not during intervals in which students were participating in practical exercises or in-class activities where students did not have an opportunity to be on-task.

At the end of each session, the percentage of intervals of CAB was calculated for each student by taking the number of intervals with competing academic behaviors and dividing them by the total number of intervals and multiplying by 100.
Lecture Quiz Scores. Lecture quiz scores served as the secondary dependent measure and covered the material presented in the daily lecture. Lecture quiz questions were taken directly from the GN blanks or from the slides used for active student responding during the RC condition, and consisted of 20 multiple-choice questions. GN blanks and RC questions were numbered for each lecture and 20 questions for the corresponding quiz were randomly selected by drawing slips of paper that corresponded with the GN blanks or RC question numbers. A total of 12 quizzes were administered over the course of the study for class one and a total of eight quizzes were administered for class two.

Quizzes were administered at the end of each class, and were graded by the researcher/teaching assistant using an answer key. Quiz scores were determined by counting the total number of correct answers and dividing the total number of correct answers by the total number of questions (20) and multiplying by 100, resulting in a percentage score. Quiz scores did not affect a student’s final grade in the course and there was no feedback provided to students on the results of these quizzes after they were graded by the researcher.

Interobserver Agreement

Interobserver agreement (IOA) for CAB, OAR and AR was assessed for 84% of the observation sessions across all conditions. IOA was determined by comparing data collected during lectures by two independent observers. An agreement occurred when both observers agreed that the dependent variable did or did not occur. An IOA score for each session was calculated by dividing agreements by agreements plus disagreements and multiplying by 100. At the end of the semester, adding all of the IOA scores together
and dividing that number by the total number of sessions calculated the mean IOA for each of the dependent variables. This was done for each class separately. The mean IOA scores in class one were 85% for CAB (range 75%-93%), 95% for OAR (range 83%-100%), and 90% for AR (range 75%-100%). Class two had mean IOA scores of 92% for CAB, ranging between 84% and 99%; 94% for OAR (range 84%-100%) and 88% for AR (range 50%-100%).

**Experimental Design and Procedures**

An alternating treatments design was used to evaluate quiz performance, CAB, and AR across two conditions: Guided notes (GN) and response cards (RC). These conditions were alternated across class sessions over the semester in a quasi-random order. The order of conditions was determined based on drawing slips of paper with one of the conditions labeled on it for each class period. Before the start of the semester, pieces of paper with the condition names were placed in a plastic bag (12 RC and 12 GN for class one; eight RC and eight GN for class two). A paper was drawn from the bag to assign a condition to each of the scheduled class dates as outlined in the course syllabi. Each time a slip was drawn, it was removed from the drawing. Each condition took place no more than two consecutive times. If the same condition was drawn more than twice in a row, the third slip was replaced and drawn again.

**Class Format.** Both classes followed a similar format of didactic lecture using visual aids created with Microsoft PowerPoint®. Every class concluded with a research quiz that included material specific to the lecture. Approximately 10 minutes was left at the end of each class to complete this quiz. To eliminate possible confounding variables,
on exam days or days in which guest speakers were present in class, conditions were not conducted.

**Guided Notes Condition (GN).** During the GN condition, students were given printed packets at the beginning of the class. These packets included information adapted from the full notes presented in class with key information removed and replaced by blanks. The type of information to go in each blank was signaled by a specific symbol next to each blank, which prompted students to fill in the blanks with the same words or phrases shown in the audio visual (PowerPoint©) presentation during class in order to have the full lecture content. Students were not asked to elaborate on their notes with examples or otherwise for this condition. Short form GN (i.e., three to five blanks per slide) was utilized due to its empirical support in note taking accuracy (Konrad et al., 2009). In order to calculate the response effort involved in preparing lectures for each condition, the researcher recorded the time spent in the development of GN material for each class.

At the beginning of the semester, the researcher provided students with a key to the GN symbols, and they were taught how to interpret the keys and fill in the blanks. GN packets handed out at the beginning of each subsequent class did not include the key, nor did the researcher or instructor provide an explanation on the key at any subsequent class meeting.

At the beginning of each class, the instructor suggested that students take notes on the printed packets by saying that they may use the packets to complete the notes for the class and fill in the blanks, but note taking was voluntary. The audio visual (PowerPoint©) slides presented in class did not emphasize or draw attention to the blanks;
instead, the audio visual (PowerPoint©) presentation showed the material as full notes without blanks, and instructors were instructed to carry on the lecture as they would any other typical lecture, without drawing attention to specific blanks or symbols.

**Response Cards Condition (RC).** During this condition, at the beginning of each class, students received printed packets that included the full content of the material being presented in the audio visual (PowerPoint©) slides that day (excluding the slides used during review segments to present RC questions), blank dry erase boards to use as RC, and markers to write their answers when prompted. Some students opted to bring their own boards, as they were required for use in other class activities on a weekly basis. At the beginning of the semester, the researcher modeled for students how to use the RC (instructor asked a question, then wrote the answer on the board and showed it to the class). In order to calculate the response effort involved in preparing lectures for each condition, the researcher recorded the time spent in the development of RC material for each class.

Intermittently throughout the lecture, after the instructor covered several key concepts, a review segment took place during which, the instructor presented RC slides with questions over those concepts. The instructor provided time for students to write their answer on their white board and prompted them to look to the front of the class when they had written their answer. After the last student had written his answer on the white board, the instructor prompted students to present their answers simultaneously by saying, “show your answers,” and provided feedback to the class after every RC opportunity. This was done three to four times during each review segment. Review segments were inserted throughout different parts of the lecture at random to control for
developing of patterns that could prompt students to attend to the lecture at specific times.

Students were allowed to look at each other’s boards while writing their answers and there were no criteria for providing corrective feedback to students after their answers were revealed.

To prevent students from preparing for each condition prior to class, or students not using GN during lecture, no lecture slides were posted to the class website until the week prior to an exam, and the material made available was limited to previously covered material to be included in the upcoming exam after the lectures had been completed and GN or RC conditions were completed for that week.
Chapter Three: Results

Academic Responding (AR) and Opportunity for Academic Responding (OAR).

Figure 1 shows the results for OAR and AR levels in class one and class two respectively. There were similar results across both classes, with a decreasing trend as the semester went on and higher levels in the RC condition over the GN condition. Because OAR data in the GN condition did not include the blanks in the GN packets, the levels of AR in this condition remained stable near zero throughout the semester. Table 1 and 2 show individual OAR and AR scores for each of the five selected students in class one and two.

Competing Academic Behaviors (CAB).

Figures 2 through 4 show mean scores for class one and class two as well as the results for CAB for the five individual students. When looking at the effects of RC and GN on the CAB of students, mean data for all participating students across both classes showed variability in the levels of CAB during the RC condition and data for individual students showed overlap across both conditions and variability between classes. CAB levels for class one showed increasing trends across both conditions, with slightly lower levels in the GN condition over the RC condition. CAB levels for class two show a slight increasing trend across both conditions, with slightly lower levels of CAB in the GN condition over the RC condition.
Figure 1 indicates the mean scores of opportunities for academic responses (OAR) and academic responses (AR) for both classes. The open circles represent AR for the response card (RC) condition, and the open triangles represent the OAR for the RC condition. Closed diamonds represent the OAR for the guided notes (GN) condition, and closed squares represent the AR for the GN condition.
Table 1. Individual OAR and AR Scores for Individual Students in Class One

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<th>OAR GN</th>
<th>AR GN</th>
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Table 2. Individual OAR and AR Scores for Individual Students in Class Two

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<th>Condition</th>
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Figure 2 indicates the mean scores of competing academic behaviors (CAB) for both classes. The closed squares represent the response card (RC) condition, and the closed diamonds represent the guided notes (GN) condition. The symbol on the data point for session five in class one represents a change in the order of the slides between the printed GN packets and the presentation slides.
Figure 3. Individual CAB Scores per Student for Class One

Figure 3 indicates the individual student scores for competing academic behaviors (CAB) in class one. The closed squares represent the response card (RC) condition, and the closed diamonds represent the guided notes (GN) condition. The symbol on the data point for session five represents a change in the order of the slides between the printed GN packets and the presentation slides.
Figure 4. Individual CAB Scores per Student for Class Two

Figure 4 indicates the individual student scores for competing academic behaviors (CAB) in class two. The closed squares represent the response card (RC) condition, and the closed diamonds represent the guided notes (GN) condition.
Lecture Quiz Scores. Figures 5 through 7 show mean lecture quiz scores for class one and class two as well as individual student scores for each class. Mean quiz scores in each class showed overlap between conditions throughout the semester, as did individual quiz scores for each participating student across both conditions and classes. For the GN condition, the mean academic performance scores were 77% and for the RC condition, mean academic performance scores were 80% in class one. Class two had mean academic scores of 76% in the GN condition and 82% in the RC condition. These mean percentages indicate that neither GN nor RC was more effective at increasing student academic performance.

There was a session during class one in which the order of the slides presented in the lecture and the order of the slides in the printed packets provided to students was different. This did not seem to affect the mean performance of students or their engaging in CAB or AR, however, there did seem to be an effect for some individual students. This session is identified in figures 1 through 7 by an asterisk.

Figure 5 below indicates the mean academic performance scores for all students in both classes.
Figure 5 indicates the mean academic performance scores for both classes. The closed squares represent the response card (RC) condition, and the closed diamonds represent the guided notes (GN) condition. The symbol on the data point for session five represents a change in the order of the slides between the printed GN packets and the presentation slides.
Figure 6 indicates the individual academic performance scores for students in class one. The closed squares represent the response card (RC) condition, and the closed diamonds represent the guided notes (GN) condition. The symbol on the data point for session five represents a change in the order of the slides between the printed GN packets and the presentation slides.
Figure 7. Individual Academic Performance Scores per Student for Class Two

Figure 7 indicates the individual academic performance scores for students in class two. The closed squares represent the response card (RC) condition, and the closed diamonds represent the guided notes (GN) condition.
Social Validity

At the end of the semester, all students and instructors participating in the study were given a social validity questionnaire. Students and instructors were asked to rate 10 different questions on a five point Likert scale (See Appendix C and Appendix D for specific questions on both questionnaires). This questionnaire was used as a way to measure opinions with regard to the different lecture formats used during the semester, how valuable they found each type of instructional format, and which format was preferred.

All of the students present during the last class of the semester and instructors in both classes completed the social validity questionnaire. Student opinions on the teaching procedures were mixed. Table 3 reports mean scores for student responses to each of the 10 questions for each class.

Higher levels of agreement occurred with the statements that rated RC as the preferred lecture method, the method more likely to encourage active participation, and whether they would use RC again. Scores were divided when students were asked which method helped them prepare for quizzes and exams better and which method helped them stay focused in class. In class one, there was higher agreement in favor of GN, and class two had higher agreement in favor of RC for preparing for exams, but GN for staying focused on the lecture.

The instructors for both classes reported a preference for RC over GN, stating that RC allowed them to receive immediate feedback on how students were grasping the material and adjust their teaching methods in vivo. Instructors also reported that they felt that RC helped students be more focused on the lecture than GN and that students seemed
to participate more during the RC conditions. Both instructors also reported that they would like to use RC again in the future. Results for instructor social validity data can be seen in Table 4.

Table 3. Mean Student Social Validity Scores per Question for Class One and Class Two

<table>
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<tr>
<th>Question</th>
<th>Class One</th>
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<tr>
<td>Prefer GN to RC</td>
<td>2.8</td>
<td>2.6</td>
</tr>
<tr>
<td>Prefer RC to GN</td>
<td>3.5</td>
<td>3.4</td>
</tr>
<tr>
<td>GN helped prepare for quiz and exams</td>
<td>3.6</td>
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</tr>
<tr>
<td>RC helped prepare for quiz and exams</td>
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<td>3.3</td>
</tr>
<tr>
<td>GN helped stay focused on lecture</td>
<td>3.6</td>
<td>3.2</td>
</tr>
<tr>
<td>RC helped stay focused on lecture</td>
<td>3.0</td>
<td>3.1</td>
</tr>
<tr>
<td>GN allowed active participation in class</td>
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<tr>
<td>RC allowed active participation in class</td>
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<td>4.0</td>
</tr>
<tr>
<td>Like to use GN again</td>
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<td>3.0</td>
</tr>
<tr>
<td>Like to use RC again</td>
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### Table 4. Instructor Social Validity Data

Frequency of Instructor Answers to Social Validity Questionnaire

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<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
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<td>GN give immediate feedback</td>
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<td>RC give immediate feedback</td>
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<td>GN helped student focus</td>
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<td>Would like to use GN in the future</td>
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<td>RC allowed to adjust teaching in vivo</td>
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Chapter Four: Discussion and Limitations

The primary purpose of this study was to evaluate and compare the effects of GN and RC on student performance, competing academic behaviors (CAB), and academic responses (AR). The results obtained in this study were mixed, indicating no favorable effects of one teaching method over the other at improving academic performance or increasing academic responses, however, it appears that GN were more effective than RC at reducing CAB, perhaps because students were required to engage in competing responses of writing on their notes packets, which reduced the opportunity to engage in CAB during the GN condition.

The levels of CAB and AR were higher in the RC condition than the GN condition. Also, during the GN condition, the levels of CAB were high and the levels of AR were low. A possible explanation for this could be that expectations for student participation were set at the start of the semester to respond during the RC condition by holding up the white boards, and therefore students were more aware of the opportunities to respond. On the other hand, in the GN condition, students may have been more focused on completing their note packets and therefore less aware of the opportunities to respond or participate in class and conversely, since there were fewer opportunities to respond during the GN condition, students had more opportunity to engage in CAB without expectations to participate in class.
Additional limitations arose in the current study. There were several barriers to direct observation. One reason why there were fewer OAR in the GN condition was the decision not to count the GN blanks as an OAR. In order to record the GN blanks, observers would have needed to walk around the classroom and observe students filling in the blanks. This may have resulted in a high level of reactivity, since the setup of the classrooms was not conducive for observers to walk around without making students aware of their behavior being observed and the risk of affecting other dependent variables such as CAB.

On several occasions, it was difficult to assess if students were engaging in CAB or actually taking notes when they were using an iPad, this was partly because this device could be laid flat on the desk and the screen could not be seen, so it was uncertain if the student was using a note taking program or another application. Additionally, students using a laptop computer sometimes darkened the contrast on their screens, making observation and data collection challenging. A final barrier to direct observation was the ability of students to conceal their cellular telephones during the class, which may have allowed them to potentially engage in CAB and not be seen by the instructor or observers.

Student absences also posed a potential threat as they affected both their mean individual academic performance scores as well as the class average academic performance scores. Student four was absent two times in class one and once in class two; and student three was absent once in class two. These absences affected the number of data points available for analysis at the individual level, therefore making it more difficult to determine which teaching method was more effective.
Another limitation to the current study was the lack of contingencies in place to ensure that students would engage in the interventions throughout the semester or completed the research quizzes with fidelity on every class. Because research quizzes were not part of the student’s final grade for the course, it is possible that students did not have a strong enough motivation to complete the research quizzes at the end of class and were rushing through to have access to other activities. It is also possible that throughout the second half of the semester, if students knew they had a passing grade in the course they were not as strongly motivated as earlier in the semester to participate in class or attend to the material presented in the lecture.

It is also likely that students were not engaging in the interventions throughout the second half of the semester because there was no feedback provided to students when they completed the GN blanks as it was provided when they used RC. Students received some type of feedback each time they used RC by providing an answer to the review questions, but this type of feedback was lacking when students completed the GN blanks, and therefore students did not see the value in completing the materials or participating in the GN condition as they did in the RC condition.

The levels of the dependent variables observed in this study may have been affected by the instructor and the type of class. It is possible that the material being presented in each class, and the way that the instructor engaged the class to present the topic made it more likely for students to engage in CAB or AR. If the material generated more interest in the students and evoked discussion in the class, it could be less likely for the students to engage in CAB, and therefore become more active in participating in the class. It is also possible that the pace at which the instructor lectured the class affected
student academic participation. By keeping the pace of the class active, students might be more encouraged to engage in discussion and participate in class and less likely to seek out competing academic behaviors to keep themselves occupied.

This was the first study to evaluate social validity in a comparison study. Given that both RC and GN resulted in similar levels of academic performance, it was important to determine which procedure was more preferred and why. Both instructors and students reported a preference for the RC method. Instructors appeared to prefer RC because it provided immediate feedback and allowed them to adjust their teaching in vivo, and students preferred RC and reported that it encouraged more active participation in class, although students reported that GN made it easier to remain focused on the lecture. An added benefit of these findings is that with the use of RC and the immediate feedback that it provides to instructors, if instructors could tell that students were engaging in CAB because of their reduced academic responding, then they could implement activities and initiate discussion to engage the students and reduce the number of students engaging in CAB.

Additionally, the researcher found that the mean time spent in preparation of the lecture materials for the GN condition was 120 minutes, versus 80 minutes for the RC condition. This could be another factor why instructors may prefer RC to GN as a teaching strategy. Although this was not evaluated at this time, the shorter time to create material could allow the instructor time to engage with students outside of the classroom if needed to aid in the learning process. One benefit of creating GN and RC materials, however, is that once the materials are created, the permanent products can be used in future sections of the course without a need for revisions until the materials used in the
course (textbooks or research literature) are updated, thus limiting the response effort from instructors in the creation of the course materials each semester.

The following are some recommendations to assist future research on GN and RC. As technology progresses and social media becomes an active part of student’s lives, it would be beneficial to include these devices as a way to encourage active participation from students. By incorporating these devices in the lecture as tools for interactive active student responding, or real-time discussion boards, through websites such as www.pollanywhere.com and other sites that allow real time polling and discussion, and polling devices such as clickers, the probability of students engaging in competing academic behaviors might be decreased.

It may also be useful to implement a contingency for participation in the intervention by having the research quiz scores be part of the student’s final course grade, as well as providing feedback on these quizzes to the students after the scores are obtained. It is also important to ensure that students are participating in the completion of the GN packets and provide feedback on this behavior. Although this can be challenging due to the potential reactivity that this can cause, one possible way to do this without intrusion could be to use a database that allows students to log in and complete the notes electronically. This would allow the student to have future access to the permanent product, and the instructor to provide feedback to the student.

Another recommendation is to further evaluate the use of GN and RC with the post secondary population. Most of the previous research in the area has evaluated these techniques and found them effective when applied in the elementary and special
education fields, however, it is still uncertain if their effects carry over to a higher 
education setting.

The findings of this study suggest that, both RC and GN have similar effects in academic 
student performance, but RC is a more preferred teaching method among students and 
instructors. It is also important to mention that although there may be benefits to the use 
of RC or GN at the individual student level, the effects vary from student to student and 
do not appear to provide an advantage when used in the classroom.
References


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Appendices
Appendix A

Competing Academic Behaviors Partial Interval Recording Sheet

Class: _____________ Date: ______________ Time: ___________________

Collected by: _____________________

Record whether or not (Y/N) student was engaging in competing academic behaviors at the end of the observation interval.

**Competing academic behaviors (CAB):** Any time that a student engages in behaviors that could presumably take his or her attention away from the lecture material, such as typing or texting on hand-held devices, playing games, accessing social networking sites, surfing the internet, engaging in video chat or written chat (on hand-held devices or personal computers) talking to classmates, completing assignments not related to class and doodling or drawing on paper, hand-held devices or personal computers.

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Appendix B

Academic Responses Frequency Count

Class: ___________ Date: ___________ Time Start: ___________ Time End: ___________

Collected by: _____________________

**Academic Responses (AR):** Any time that a student provides an answer to a specific question posed by the instructor related to the course content during a research session. Include student hand raising (even if not selected by instructor) and written responses on response cards.

**Opportunity for academic responses (OAR):** Any time that an instructor presents a question to the class either verbally, signed or on the slides. In both conditions (GN and RC), the Instructor will be told to present questions to the class as a whole so that all students receive an opportunity to respond. The instructor may then select a student to answer the question.

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Appendix C

Student Social Validity Questionnaire

Class: _________________________

Student Social Validity Questionnaire
Circle the answer that represents your opinion for each question.

1. I prefer using guided notes than response cards.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree

2. I prefer using response cards than guided notes.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree

3. Guided notes helped me prepare for quizzes and exams.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree

4. Response cards helped me prepare for quizzes and exams.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree

5. Guided notes helped me stay focused on the lecture.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree

6. Response cards helped me stay focused on the lecture.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree

7. Guided notes allowed me to actively participate in the lecture.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree

8. Response cards allowed me to actively participate in the lecture.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree

9. I would like to use guided notes in future classes.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree

10. I would like to use response cards in future classes.
   
   Strongly Agree     Agree     Neutral     Disagree     Strongly Disagree
Appendix D

Instructor Social Validity Questionnaire

Class: _______________________

**Instructor Social Validity Questionnaire (Page 1 of 2)**

Circle the answer that represents your opinion for each question.

1. I prefer using guided notes than response cards in my lectures.
   - Strongly Agree    Agree    Neutral    Disagree    Strongly Disagree

2. I prefer using response cards than guided notes in my lectures.
   - Strongly Agree    Agree    Neutral    Disagree    Strongly Disagree

3. With guided notes, I received immediate feedback on how all students were grasping the material during lecture.
   - Strongly Agree    Agree    Neutral    Disagree    Strongly Disagree

4. With response cards, I received immediate feedback on how all students were grasping the material during lecture.
   - Strongly Agree    Agree    Neutral    Disagree    Strongly Disagree

5. Response cards helped my students be more focused on the lecture and participate more in class.
   - Strongly Agree    Agree    Neutral    Disagree    Strongly Disagree

6. Guided notes helped my students be more focused on the lecture and participate more in class.
   - Strongly Agree    Agree    Neutral    Disagree    Strongly Disagree

7. I would like to use guided notes in future classes.
   - Strongly Agree    Agree    Neutral    Disagree    Strongly Disagree

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Instructor Social Validity Questionnaire (Page 2 of 2)

Circle the answer that represents your opinion for each question.

8. I would like to use response cards in future classes.

   Strongly Agree  Agree  Neutral  Disagree  Strongly Disagree

9. Guided notes allowed me to immediately adjust my teaching in vivo if students seemed to not grasp the material.

   Strongly Agree  Agree  Neutral  Disagree  Strongly Disagree

10. Response cards allowed me to immediately adjust my teaching in vivo if students seemed to not grasp the material.

   Strongly Agree  Agree  Neutral  Disagree  Strongly Disagree
Appendix E

Recruiting Statement

“Good morning students. As a part of this class, we will be conducting research evaluating two different teaching methods: guided notes and response cards, and we will be alternating these throughout the semester to determine if one instructional method is more effective than the other.

I have handed you two copies of an informed consent document and will go over it with you now. Please read it carefully and let me know if you have any questions. You may keep one copy for your records and return one to me if you chose to participate in the research (Read informed consent document).

You will have the opportunity to think about whether or not you want to participate in this research until the next class. If you decide to participate in the research, simply sign the consent form and return it to me either at the end of class today or the beginning of the next class.

Thank you.”
Appendix F

Debriefing Statement

“As you know, we have been conducting research throughout the semester to test the effects of guided notes and response cards. Another purpose of this study that we did not mention to you was to evaluate the effects of these teaching methods on your behavior regarding participation in the class. In order to do this, we conducted observations by looking at the times that you participated in class by asking or answering questions and the times that you were engaged in activities not related to class such as using electronic devices or engaging in other activities.

The reason why you were not informed of the observations taking place was that we wanted to make sure that your behavior would not change when we told you what we were looking at. We needed to ensure that your behavior would not change as a result of the observations in order to evaluate these conditions effectively.

We have also looked at how each condition affects your performance in the class by looking at the scores for the end of class quizzes. The information obtained during this study was analyzed and we found that (Guided notes/response cards) was more effective than (guided notes/response cards), and your opinions indicated that you, as students prefer (guided notes/response cards) over (guided notes/response cards).

In order to educate the teaching community about these findings and best teaching practices, we would like to present these data in conferences, both local and national, as well as publish the findings in a peer-reviewed journal. This means that the data that we have gathered will be made public by more than one method and it will be disseminated to expand the literature.
The data that we have obtained during this research and that we will report are not identifiable, and neither the name of the class nor your names will be disclosed at any time. Instead, we will assign pseudonyms to all participants whose data we report in order to protect your confidentiality.

At this time, you have the option to withdraw your consent and this will not allow us to use your data or report it in any way. You can do this by talking to me at the end of class, calling my number listed on your consent form, or sending me an email.

Thank you for taking part in this research.”
Appendix G

IRB Approval

July 12, 2012

Viviana Gonzalez
ABA-Applied Behavior Analysis
5621 16th Lane NE
Saint Petersburg, FL 33703

RE: Full Board Approval for Initial Application
IRB#: Pro00008648
Title: Evaluating the Effects of Guided Notes and Response Cards in Student Performance
Study Approval Period: 6/15/2012 to 6/15/2013

Dear Ms. Gonzalez,

On 6/15/2012 the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents outlined below. Please note that your approval for this study will expire on 6/15/2013.

Approved Items:
Protocol Document(s):
Effects of GN and RC Protocol 7/7/12

Consent/Assent Document(s)
Effects of GN and RC Informed Consent.pdf 7/12/2012 8:08 AM 0.01

Please note, if applicable, the informed consent/assent documents are valid during the period indicated by the official, IRB-Approval stamp located on the form. You are to use only the watermarked/stamped consent forms found under the “Attachment Tab” in the recruitment of participants. Make copies from the original.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.
We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

John Schinka, PhD, Chairperson
USF Institutional Review Board