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EFFECTS OF RESPONSE CARD COLOR AND ACCURACY RATES ON SPEED AND ACCURACY OF TEACHER INSTRUCTIONAL DECISIONS

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ABSTRACT

Unison responding incorporating response card formats is an instructional method that affords students greater opportunities to respond and teachers greater opportunities to make instructional decisions. Design of unison response card formats as well as number of students correctly responding in a group may impact accuracy of teachers' decisions regarding the next instructional step. This study investigated the effects of color or white response cards on pre-service teachers' selection of the next instructionally appropriate step in a lesson. In addition, this study examined the effects of different student accuracy response rates on pre-service teachers' ability to correctly choose relevant instructional decisions. Latency data were also collected on pre-service teachers' decisions about the correct instructional step. Participants watched video clips of varying color or white response card trials with different group response accuracy rates and selected the next instructional step after each clip. Statistically significant differences were found between color and black/white response cards and response accuracy rates that may be explained by Signal Detection Theory principles. This research suggests that teacher accuracy in instructional decision making in large groups may be enhanced by using color coded response cards rather than white response cards.

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Chapter 1

INTRODUCTION

Much has changed in the past 19 years for students with special needs in the United States. In 1989 only 32% of students with disabilities received special education services in a regular school in a general education classroom. By 2005, over 54% of all students receiving special education services were placed in general education settings (U.S. Department of Education, 2006). While placement of students with special needs has significantly changed since 1989, the challenge of providing effective instruction for all students has increased. Teachers in this era of inclusion and response to intervention (RTI) need effective and efficient instructional strategies and skills that help all students gain positive, measurable academic outcomes

One critical skill for teachers is instructional decision making during lessons. Teachers must be able to monitor student progress and adjust instruction accordingly. If a teacher makes an error in determining the next instructional step to take, students' rate of learning may be adversely affected because they are inappropriately held back from advancing or moved ahead prematurely. In order for teachers to make effective instructional decisions, they need to have access to relevant student outcome data (Bushell & Baer, 1994). One method used to monitor student progress within the framework of an instructional lesson is elicitation of active student responding (ASR). Active student responding has been linked to increased student academic achievement and has the benefit of providing students extra practice of relevant skills and knowledge (Heward, et al, 1996). In addition, ASR provides teachers immediate information regarding student acquisition of critical course content. This student assessment information can help teachers make better decisions about lesson pacing and content coverage.

Unlike other variables that also impact student learning (e.g., socioeconomic status or parent involvement) but are more difficult to change, ASR procedures are an alterable variable that teachers can implement within their classroom (Bloom, 1980). Heward et al. (1996) offered suggestions on effective feedback and instructional decision making when using ASR procedures. They recommend providing feedback for the "majority" response. For example, if almost all students are correct, teachers may state "Good" and move on, and if most students answer incorrectly, that particular concept may need to be retaught and then reviewed again later.

In the context of the classroom, teachers need to make rapid decisions in the course of a school day. Inadequate or slow decision making may impede lesson pacing and allow students to search for competing reinforcement such as peer attention. Unfortunately, when using ASR, there may be factors that impede teachers' accurate assessment of student progress and consequent decision making, such as class response accuracy. Teacher decisions are made based on information provided by the students, which in Signal Detection Theory (SDT) represent the 'signal'. For example, when confronted with multiple students each providing a response in unison, teachers must process individual responses or 'signals' as a whole to determine the teacher's next action. Problems arise when the information or signal is not clear or distinct, which in SDT is referred to as "noise" and is processed inaccurately (Green & Swets, 1966). Along with class response accuracy, density of responses may provide 'noise', impacting rate or accuracy of teacher decisions. Applying Signal Detection Theory to such situations may explain what is occurring within the teacher decision making process and may account for teacher information processing problems.

Today both general and special educators may work in a variety of educational settings that can include large group instruction. Identifying interventions that work well within these parameters and potentially reduce “noise” could be beneficial for teachers and students alike.

A large research base supporting use of active student responding (and more specifically, unison responding) for students with and without disabilities has been developed over the past few decades. Unfortunately many questions in terms of specific implementation procedures remain unanswered (Hamlin, Lee, & Ruhl, 2008). For example, results of the Hamlin et al. meta-analysis failed to provide suggestions for which question format is most effective to improve academics and behavior. Interestingly, many aspects of implementation of unison responding that had to be classified as “not specified” had significant statistical differences, but omission of critical information in the reviewed articles prevented further implementation guidelines. Additionally, results of the meta-analysis indicated that research has focused primarily on student outcomes while no research has been conducted on implementation issues such as teacher speed and accuracy of decision making in the unison responding process. Results of a recent study by Hamlin, Ruhl, and Lee (2008) which investigated class size and student response accuracy and their effects on teacher decision making, suggest that for accurate teacher decision making, unison responding may be best implemented with small (e.g., <6) to medium (e.g.,7-16) class sizes or with material that students have mastered. However, data from the U.S. Department of Education (2000) indicate that the average size of an elementary class is 21 students. This suggests that identifying ways to implement unison responding so that teachers can make accurate instructional decisions in large classes would be beneficial for students and teachers. One option that may be beneficial in addressing the need for better unison responding procedures would be to use color response cards. Using color response cards may provide a stronger visual signal that helps teachers make more accurate instructional decisions. Thus, this study examined the relationship between response card color and accuracy and latency of teacher decision making. Broadly, this investigation addressed the following two research questions:

1. What are the effects of color coded or white response cards on accuracy of teacher decision making?
2. What are the effects of color coded or white response cards on latency of teacher decision making?

Chapter 2

REVIEW OF RELATED LITERATURE

More than a dozen years have passed since school districts across the United States have widely embraced inclusion for educating students with disabilities (National Center on Educational Restructuring and Inclusion [NCERI], 1995). General education and special education teachers are required to work together on a more cohesive basis to implement accommodations to support the wide variety of student needs that occur in the general education setting (Katsiyannis, Conderman, & Franks, 1995). However, effects of the inclusion model on students with disabilities' academic achievement have been mixed (Rea, McLaughlin, & Walther-Thomas, 2002; Schumm, Moody, & Vaughn, 2000). Consequently, methods to increase academic behaviors that lead to greater learning are of concern to educators serving populations that are disabled and non-disabled (Hamlin, Lee, & Ruhl, 2008). In addition, the current era of accountability (i.e. No Child Left Behind and "adequately yearly progress") has placed a public spotlight on teachers, scientifically-based practices, and achievement for all students.

General educators are thought to be more willing to implement specialized techniques when the method or intervention does not unduly advantage children with special needs. Indeed, it has been suggested that the most effective collaborations occur when general educators share their content knowledge skills and special educators share pedagogical skills so that all students benefit (Smith, Polloway, Patton, & Dowdy, 2008). In this context it is important to understand several areas related to instructional design and delivery. This chapter presents a comprehensive review of the current research on active student responding and teacher instructional decision making. Three areas of research are relevant to this dissertation: (a) active student responding, specifically unison responding, (b) teacher instructional decision making, and (c) signal detection theory.

Active Student Responding

More than ninety years have passed since Dewey (1916) suggested that students learn better by 'doing' than by sitting passively and being lectured to. A substantial body of research on 'active student responding' or ASR has since been developed (Fisher & Berliner, 1985). Stanley and Greenwood (1983) interpreted ASR behaviorally as an 'opportunity to respond'. Different forms of ASR noted in the literature include guided notes (Lazarus, 1996) and different forms of unison responding (Heward, 1997; Pratton & Hales, 1986). Active student responding has been found to increase student academic achievement as well as increase student on-task behavior (Greenwood, Delquadri, & Hall, 1984; Lambert, Cartledge, Heward, & Lo, 2006). ASR has the additional benefit of being a variable within control of teachers, unlike socioeconomic status or parental involvement (Bloom, 1980). Within the scope of ASR one research-based method of keeping students engaged is unison responding.

Unison Responding

Unison responding has been used effectively for three purposes. First, it has been used to increase student academic achievement in several content areas (i.e. math, science, and English). Researchers (Gardner, Heward, & Grossi, 1994; Johnson, Schuster, & Bell, 1996; Sindelar, Bursuck, & Halle, 1986) have found that when students use unison responding in the content classroom, test and quiz scores improved. Second, unison responding has been used to increase rates of active student responding (Sainato, Strain, & Lyon, 1987; Wolery & Ault, 1992). Last, unison responding has been implemented in classrooms with the purpose of increasing on-task behavior (Armendariz & Umbreit, 1999; Cavanaugh, Heward, & Donelson, 1996; Heward, et al., 1996). A majority of the studies that have investigated use of unison responding as an intervention found that student on-task behavior increased dramatically, and in some cases off-task behavior rates decreased to zero (Christle & Schuster, 2003; Davis & O'Neill, 2004; Kamps, Dugan, Leonard, & Dauost, 1994).

From a behavioral perspective, unison responding should be successful because it offers students more opportunities for reinforcement. In fact, over the course of a school year implementing unison responding could provide students with thousands more opportunities to respond (Gardner, et al., 1994) and earn reinforcement. Applying Herrnstein's (1961) matching law, when students are given the choice between two behaviors, they will engage in the behavior that will result in higher rates of reinforcement. Thus, when a teacher asks one student to respond, that student may be the only one offered the teacher's positive verbal comment. Peer's behaviors are not reinforced concurrently by the teacher, so they may be more likely to engage in off-task behaviors that contain competing reinforcers such as self-stimulation or peer attention. However, when all students are responding, they all have an opportunity to receive reinforcement in the form of teacher feedback and potential praise.

In addition to more opportunities for reinforcement for appropriate behavior ASR affords more opportunities for academic reinforcement. When students respond more frequently to appropriate instructional tasks, they are benefiting from practice that is occurring through the increased learning trials. Academic improvements have been linked to increased learning trials; this suggests ASR is beneficial for both behavioral and academic outcomes.

Formats. Unison responding has been implemented in a variety of formats. Researchers have used choral responding (Godfrey, Grisham-Brown, Schuster, & Hemmeter, 2003; Johnson, et al., 1996; Sainato, et al., 1987; Wolery & Ault, 1992) as well as pre-printed (Kellum, et al., 2001; Shabani & Carr, 2004) and write-on response boards (Armendariz & Umbreit, 1999; Cavanaugh, et al., 1996; Christle & Schuster, 2003; Davis & O'Neill, 2004; Gardner, et al., 1994; Narayan, Heward, Gardner, Courson, & Omness, 1990).

Different unison response formats, oral or physical, have specific advantages and disadvantages. For example, choral responding is frequently used with younger students, and may be appropriate for sight word acquisition, fluency building, and series saying. One potential drawback to choral responding is that it may be difficult for the teacher to distinguish individual responses and therefore implement appropriate error correction procedures (Heward, 1997). When requesting student choral responses teachers must use clear prompts, give adequate wait time, and ensure questions require one specific answer that is very short, preferably one to three words long.

Physical unison responding typically involves some form of response card. Two of the more common forms of response cards are the write-on and pre-printed varieties (Heward, et al., 1996). Response cards can be standard, commercially available white-boards (e.g., Boone Boards) where students write short answers, or they can be pre-printed with specific key terms, true/false, yes/no, or colored cards (e.g., index cards), with an 'A', 'B', 'C', or 'D' printed on them. Response cards have been used with a variety of questions such as; open ended, dichotomous, and multiple choice. Typically after some type of verbal prompt from the instructor, such as “cards up”, students either write on a board or pick a pre-printed card and hold it up simultaneously with the rest of the class. Both response cards and choral responding have been used to build student fluency in such areas as sight words and vocabulary, or to discriminate amongst concepts (Hamlin, Lee, & Ruhl, 2008). A potential drawback to write–on boards is the need to keep answers short. For more content-dense areas (i.e. trigonometry, chemistry) using pre-printed cards may be more beneficial in that they allow for longer or more complex answers such as charts, graphs, or diagrams.

Effectiveness of Unison Responding for Students with and without Disabilities. According to Heward (1997), unison responding is a “validated” instructional procedure. Unison responding has been used successfully with a variety of student populations including non-disabled students (Armendariz & Umbreit, 1999; Cavanaugh et al., 1996; Christle & Schuster, 2003), students with learning disabilities (Davis & O’Neill, 2004), students with autism (Kamps, et al., 1994), students who are English language learners (Davis & O’Neill, 2004; Vargas, Grskovic, Belfiore, & Halbert-Ayala, 1997), students who have attention problems (Godfrey, et al., 2003), and students with mental retardation (Johnson, et al., 1996; Sainato, et al., 1987) have benefited from unison responding procedures.

Essential Instructional Elements. For students, effectiveness of unison responding is enhanced when it is implemented using two essential instructional components (Hamlin, Lee, & Ruhl, 2008). Meta-analysis results indicate that unison responding questions that were massed together in a lesson instead of distributed throughout a class session and implemented with primary and secondary level students rather than college age were more effective at increasing ASR, academic achievement, and on-task behaviors.

Additionally, for teachers, a recent study (Hamlin, Ruhl, & Lee, 2008) endeavored to look at the effects of class size and student response accuracy on teacher instructional decision making. Initial results suggest that class size can play a pivotal role in teacher ability to choose appropriate instructional steps. Teacher accuracy is highest when student groups are responding at 90% accuracy, but when students respond at lower accuracy levels (50% and 75%) accuracy is reduced.

Teacher Instructional Decision Making

Teachers make several instructional decisions every day (e.g., planning instruction, implementing instruction, nature of feedback to provide). It has been recommended that teachers use some form of direct daily measurement to guide instructional decision making to increase student academic achievement (Heward, 2008). Unlike summative evaluations which are not as sensitive to day-to-day student progress, formative daily evaluations are crucial for modifying instruction. Using information from daily measurements provides teachers two advantages; teachers receive information regarding their students' performance on the targeted skill or concept and, with a steady stream of daily information, teachers can modify instruction based on data rather than intuition (Bushell & Baer, 1994). Data also help teachers design more effective instruction that can help students with and without disabilities (Kame'enui, Carnine, Dixon, Simmons, & Coyne, 2002).

The rapid-fire nature of teacher and student interactions – especially in group teaching situations, warrants attention/focus from researchers because of its effect on teacher decision making. Teacher feedback plays a powerful role in student achievement (Van Houten, 1984). Specific, ‘instructive’ feedback can increase efficiency of student learning for students with a variety of disabilities (Werts, Caldwell, & Wolery, 2003) as well as those without disabilities. This feedback is usually categorized into two main groups; positive reinforcement for correct answers, and error correction for incorrect responses. Instructive feedback may also include additional information to clarify or support concepts that were taught (i.e. “Yes, the answer is lobster, lobsters are crustaceans”). Immediate error correction is necessary so that students do not practice errors. It is imperative that teachers use feedback properly due to its significant effect on student learning (Konold, Miller, & Konold, 2004).

ASR is one instructional method that can benefit students and help teachers make efficient decisions. However, in a recent study by Hamlin, Ruhl, and Lee (2008), teachers had difficulty distinguishing student unison responses in certain situations. When students responded with 75% accuracy, or when large classes of over 20 students were responding in unison, teachers had difficulty discriminating the students’ responses. Participant difficulties may have been the result of variables that contributed to poor visual information processing, such as the variety of responses that are provided, the use of one color for response card format, or the number of responses the teacher has to process.

Signal Detection Theory

Signal Detection Theory (SDT) is a model frequently used to explain cognitive capacities or processes including visual processing, that affect decision making (Macho, 2007). As such, SDT is relevant to understanding teacher decision making relative to UR. When using unison responding procedures, teachers are looking for a signal (i.e. the number of students with correct answers) to help decide the pace and content of the lesson. For example, teachers will pose a question, give students wait time to respond, signal a response, then scan student responses and make an instructional decision. If almost all students are answering correctly the teacher can simply state “that is correct” and quickly move on to the next question. If many students answer incorrectly, the teacher needs to clarify the correct answer and may need to reteach the concept. Many factors such as class size or student accuracy levels might affect teachers’ abilities to correctly identify relevant signals.

Signal detection theory states that factors that impede processing of correct information from signals are called ‘noise’ (Green & Swets, 1966). In unison responding situations, variables such as class size (i.e. the number of responses to process) or response accuracy (i.e. majority of correct responses or mixed results) may function as noise. Noise can impact teacher decision making and may make unison responding procedures less effective. To reduce the negative impacts of noise, it is recommended that the discriminability of the signal be increased (Coren, Ward, & Enns, 1994). This factor is referred to as the discriminability index (d’).

Both Macho (2007) and Wixted (2007) suggest that signal detection is affected by ‘features’ (i.e. color) and recognition or familiarity of the signal. One of the very first steps in visual information processing is photo-chemicals triggering responses in the eye allowing photoreceptor cones to focus on features such as color (Anderson, 2005). If this is indeed the case, color may increase the discriminability (d') of the unison responding procedure. In visual information processing Biederman (1987) suggested that color may be a 'pre-attentive' discrimination that is made early in the visual information processing routine. In a study conducted by Irani and Ware (2000), subjects could more rapidly and accurately identify colored shapes than other representations. Relative to UR, using familiar features such as color in the response card design could affect teacher processing.

Typically, response cards have letters (e.g., A, B, C) on them and students hold up the appropriate card. Teachers "receiving" this signal must make quick visual discriminations among or between the letters which may take time. Use of color coded response cards may help provide teachers a stronger discriminable signal that is easier to process information from than white response cards. Color may add a second feature that may attract participants' attention which can play an important role in the accuracy of the decision making process (Macho, 2007; Wixted, 2007).

Summary and Hypotheses

Overall, results for unison responding have been positive; however, there are still many areas to be clarified especially as they relate to teacher decision making. Teacher accuracy and latency at assessing unison student responses have been investigated in only one recent study (Hamlin, Ruhl, & Lee, 2008). Results indicated that teachers were better at discriminating students' responses using response card format when UR was implemented in small or medium instructional groups, or when students responded with high levels of accuracy. Teachers encountered more difficulty discriminating answers with large groups. Consequently, researchers should identify ways to implement unison responding procedures resulting in accurate teacher decision making within a large class format. It is hypothesized that when using response card format the use of colored cards will help teachers make rapid, accurate instructional decisions.

The aim of this current study was to make a direct comparison of color-coded and white response cards and their effects on teacher instructional decision making. First, data were collected on teacher accuracy on choosing the next instructional step when student responses were presented on either white or colored 3 x 5 index cards. Second, data were collected on teacher response latency to the aforementioned student unison responses.

Chapter 3

METHODOLOGY

Overview

The purpose of this study was to ascertain if different response card formats have differential effects on pre-service teachers' accuracy in assessing students' unison responses, and consequent determination of the next appropriate instructional step. To address the research questions, participants viewed videotaped simulations of large classes responding with varied accuracy rates using either white or color coded response cards. Data were collected on participant accuracy and time required to make instructional decisions. Detailed descriptions of the materials and methods used to answer the questions, what effects response card color had on teacher accuracy and speed of instructional decision making, follows.

Materials

Video Segments: Unison Responding Assessment Video (URAV). A unison responding assessment video was developed to serve as an independent variable to prompt pre-service teachers to discriminate student responding using two different 3 x 5 response card formats. This URAV consisted of counter-balanced video clips each showing a class of 22 students answering a (off screen) teacher's multiple choice question using either a colored 3 x 5 card (blue, pink, yellow, or green – depending on student's chosen answer) or a white 3 x 5 card. Both formats had the letters A, B, C, or D written in block print. Cards were made from regular card stock (i.e. index cards). Letters were written with a permanent black marker with a "wide" .25 inch nib. Letter height was 10cm - five times the height of the letter size for a 40 foot distance on a Snellen eye chart. Using larger letters helped eliminate any potential confounds for participants who may have had reduced vision.

When creating the video, students in the simulated classroom were provided a script specifying exact procedures to follow to provide class-wide correct answers at levels of 50%, 75%, and 90%. For viewers, prior to each clip the correct answer was displayed at the middle of the screen to ensure participants would know the correct response to look for. As the clip began, the question screen appeared prompting the participant to assess students' responses and answer the question in Figure 1. In the video clip, an unseen teacher gave a verbal prompt "cards up", and students held up cards for exactly 10 seconds. Participants viewed the clip and when ready, circled the answer on the form before them. After participants answered the question, the next video clip began and the cycle repeated until each participant had four trials under each accuracy level with both response card formats, resulting in 24 different clips.

The children who participated in the creation of the mock classroom video clips were predominately non-disabled. However, four of the students reported receiving special services in their local schools, two for ADHD, one for speech impairments and one for learning disabilities.

Survey. Demographic data were collected with a paper-pencil survey. Questions in the demographic survey were presented in multiple-choice formats and required participants to circle the correct response. See Appendix C for demographic questionnaire.

Participant Response Booklet. Each participant was given an answer booklet that had six 'trials' or questions per page. Participants were required to label the top of the page with the letters of the corresponding video clip (i.e. A, B, C, D…). When the set of clips began, participants circled their chosen answers on the page starting with trial 1 from set A. Participants then watched four different sets of clips and circled answers in the booklets.

Subjects

A power analysis was conducted to determine the necessary sample size. The alpha was set at .05. Participant levels exceeded the required amount indicated (n = 23) by the power analysis (Faul, Erdfelder, Lang, & Buchner, 2007). The sample for this study was 39 undergraduate students enrolled in teacher preparation courses at a large mid-Atlantic university. Of the 39 pre-service teachers, most were female (n = 37) and the majority (n = 22) were in their junior or senior year of college. Participants ranged in age from 20 to 44 years old. Final analyses were conducted using all 39 participants working toward teacher certification in either special education (n = 23) or dual certification in special and elementary education (n = 16). Pre-service teachers were selected to participate in the study to control for history effects. According to Signal Detection Theory, more experienced teachers may be better at discriminating signals. So to tease out effects and test discriminability, a naïve population was used. See Table 1 for additional demographic information.

Table 1.

Demographic and Background Information

Demographic	n = 39	%
Gender		
Female	37	95
Male	2	5
Age		
20	8	20
21	22	56
22	4	10
25	2	5
30 or older	3	9
Ethnicity		
Anglo	36	92
Hispanic	2	5
Combination	1	3
Education Courses Completed		
4-6	7	18
7-10	12	31
>10	20	51

Participation in the study was voluntary and full participation of all eligible students was sought. Participants were recruited through classroom presentations and flyers that were distributed to students enrolled in appropriate majors. Participants' course grades were not affected by participation; however, participants received a cash incentive of $10 after completion of the study. Informed consent documents were signed by the participants and a copy of the form was given to participants. No participants withdrew prior to completing the study. See Appendix A for Informed Consent Form approved by the Office of Research Protections. See Appendix B for Recruitment Flyer.

Setting

Participants completed the study in small groups of approximately five in an on-campus conference room that was approximately 13 x 10 meters. Along the back wall of the room used in the study was a large projection screen. During the study, participants sat at a desk and watched selected video segments on the projection screen.

Procedures

Upon arrival for the study session, participants were screened by the researcher for color-blindness using models of the pastel colored 3 x 5 cards used in the study. All participants successfully discriminated the four colors. They were next asked to complete a demographic survey that contained five multiple choice questions answered by circling the correct responses.

When asked all participants reported, by raising their hands, having been trained in instructional decision making rules in prior course content; however, to ensure their mastery of recommended decision making guidelines, a 10 minute review of critical content was delivered by the researcher before the start of the assessment video. The review consisted of modeling correct decision making, followed by a power point presentation with sample questions for review. To check for mastery, all students had to accurately answer three questions regarding different feedback responses. After completion of the review, participants were trained on correct study procedures using sample video clips. For purposes of training, videos similar to those used in the data collection part of the study were used. Researchers modeled correct procedures for two trials. Next, participants viewed sample clips to practice appropriate responding. Researchers observed correct responses on three trials from all participants before the official trials began. After the training trials were completed, participants were given the opportunity to ask questions regarding procedures. During training all participants were asked if they could see the letters on the screen and all responded affirmatively. After participants demonstrated understanding of procedures, they were instructed to watch for the start of the video presentation on the screen in front of them.

Question:
What is the next instructional step?

A. Affirm correct answer and proceed to next question.
B. Provide correct answer, give brief rationale, and proceed to next question.
C. Reteach concept.

Figure 1. Unison responding instructional decision question for participants.

The participants then watched an approximately 15-minute video containing 24 different clips. Participants watched this video in small groups, with the researcher sitting in the back of the room (approximately two meters from the participants) to address any technical difficulties or participant questions, and collect latency data. After each clip, participants subsequently answered the question from Figure 1 above regarding instructional decision making.

Experimental Design

This study used a within subject repeated measures design. All participants were exposed to each of the variables under both response card formats. Presentation of video clips was counterbalanced to control for potential order effects.

(See Figure 2).

Class Size Held Constant

	50%	75%	90%
Color ABCD	A1, B2, C3	A2, B1, C4	A4, B5, C6
White ABCD	A3, B4, C2	A5, B3, C1	A6, B6, C5

A1- Group A, clip 1 - A2- Group A, clip 2 etc.
B1 - Group B, clip 1, etc.
C1 - Group C

Figure 2. Unison Responding Assessment Video – Sample of Counterbalancing Methods Grid

Dependent Variables

All participants were assessed using the unison responding video module. Numbers of correct responses (i.e. decisions) marked on the response booklet were calculated from participants' responses to the multiple video clips. Results were compared intra-subject to determine if participants were more accurate in assessing student responses under either the color coded response card format or the white response card format. Additionally, answers were compared at the three different group accuracy levels to determine if the participant was more successful at discriminating student answers when they were at a certain accuracy level regardless of response card color. Finally, latency data (in the form of time it took for participants to write an answer) was collected to determine if one of the response card formats had more efficient rates of participant responding.

Data Analysis

Inter-observer Reliability. Six trained observers collected inter-observer reliability data on participant latency for every trial for 22% of the participants. Observers were graduate students and faculty members who had previous experience with data collection procedures. In order to establish inter-observer reliability, all observers were trained in an 11 step process with an accompanying checklist to verify mastery. (See Appendix D for checklist). Inter-observer reliability was high, with inter-observer agreement of 95.2%. Agreement between observers indicated accurate observations for assessing latency of responses of pre-service teachers.

Inter-rater Reliability. Inter-rater agreement for accuracy scores was established by having a trained second scorer independently score 15% of the accuracy data. Inter-rater agreement was calculated using point-by-point agreement (Hawkins & Dotson, 1975); specifically agreements were divided by agreements plus disagreements then multiplied by 100. Inter-rater agreement was 98% for the accuracy scores. Inter-rater reliability checks were also conducted for 20% of the demographic surveys to check for accurate scoring. Inter-rater reliability was 100%.

Procedural Integrity. Procedural integrity data were collected for 20% of the participant sessions to check for correct participant completion of the survey and study questions. Additionally, procedural integrity data were collected on the URAV. The training segment was also targeted for procedural integrity. Additionally, 100% of the video clips were analyzed by a second reviewer to determine accuracy of mock classroom procedures and responses. Separate checklists were developed to evaluate the materials and participant sessions. An independent observer checked the experimental procedures during 20% of the sessions. (See Appendix E for check list). Using a checklist, the independent observer marked with a check if the appropriate step was followed and left the line blank if the appropriate procedure was not followed.

Chapter 4

RESULTS

Overview

This study was an investigation of the effects of color versus white response card formats and student response accuracy on teacher instructional decision making. This chapter contains descriptive and inferential statistical results. Two sections are used to organize the results derived from this study: 1) effects of color and different student response accuracy rates on participant accuracy of next instructional step and 2) effects of color and different student response accuracy rates on participant latency of instructional decision making.

Pre-Analysis Procedures. Each dependent measure was examined for accuracy of data and missing values prior to analysis. Preliminary testing was conducted to verify the appropriate implementation of analysis of variance. SPSS for Windows version 13.0 was used for all analyses.

Missing Data. Upon completion of the study, it was determined that some data points were missing from some components of dependent measures (i.e. speed of response to answer trial) used for analysis. In each instance only one data point was missing from a participant. Further analyses were possible due to collapsing and averaging of data points across trials.

Assumptions Underlying Statistics

Percentages were calculated for all survey data. Video assessment data were calculated using percentages and analyzed further with a repeated measures ANOVA. Participants were randomly assigned to groups that were shown different orders of video segments to control for order effects and data independence. Using a repeated measure design, the following assumptions must be met; normality, homogeneity of within-treatment variances, and independence (Keppel, 1991). Additionally, the test for sphericity was conducted using Mauchley's test for sphericity. Adjusted Greenhouse-Geisser F scores were reported in the results section. Follow-up post hoc tests were conducted testing the omnibus *F*.

Results of Analyses

Results of the accuracy assessment trials and latency of pre-service teacher responses were analyzed using analysis of variance (ANOVA). Main effects were followed up using Tukey's HSD with an alpha set at .05 which helped to limit comparison-wise Type 1 error.

Standardized mean differences (d) were calculated using pooled standard deviations of the groups being compared (Olejnik & Algina, 2000). The following terms for evaluating values of d: small effect = .20, medium effect = .50, and large effect = .80 were suggested by Cohen (1988).

Accuracy Results. An ANOVA yielded a Color Format x Student Response Accuracy interaction, $F(2,37) = 17.53$, $p = .001$. Analysis of simple effects of this interaction indicated that student response accuracy levels were the primary effect driving the interaction. When students responded with 90% accuracy, participant accuracy at selecting appropriate instructional steps was greater than when student response levels were below mastery level (i.e. <90%) across formats. (See Table 2 for specific mean and standard deviation data and Figure 3 for graphed accuracy results). Follow-up inferential analysis yielded results that suggested white response card format with class size responding with 90% accuracy was more discriminable for participants in accurately choosing the next instructional step than white response card format with 50% accuracy (d = .962), white response card format with 75% accuracy (d = .771), color response card format with 50% accuracy (d = .387), and color response card format with 75% accuracy (d = .436).

Table 2.

Accuracy Means and Standard Deviations

Response Card Format Class Response Accuracy	Mean* n = 39	% Correct n = 39	Standard Deviation n = 39
White			
50%	2.26	.57	1.19
75%	2.64	.66	1.09
90%	3.79	.95	.409
Color			
50%	3.31	.83	.832
75%	3.18	.80	.997
90%	3.46	.87	.756

*number correct out of four trials

The inferential analysis also suggested that color response card format with 50% accuracy was more discriminable than white response card format with 50% accuracy (d = .519), and white response card format with 75% accuracy (d = .349). Additionally, the inferential analysis suggested that color response card format with 75% accuracy was more discernable than white response card format with 50% accuracy (d = .422).

Among color response card format with 90% accuracy, the inferential analysis suggests that the color 90% accuracy format provides a more discernable signal than white response card format with 50% accuracy (d = .618). The color response format with 90% accuracy also appears to be more discernable than the white response card format with 75% accuracy (d = .446).

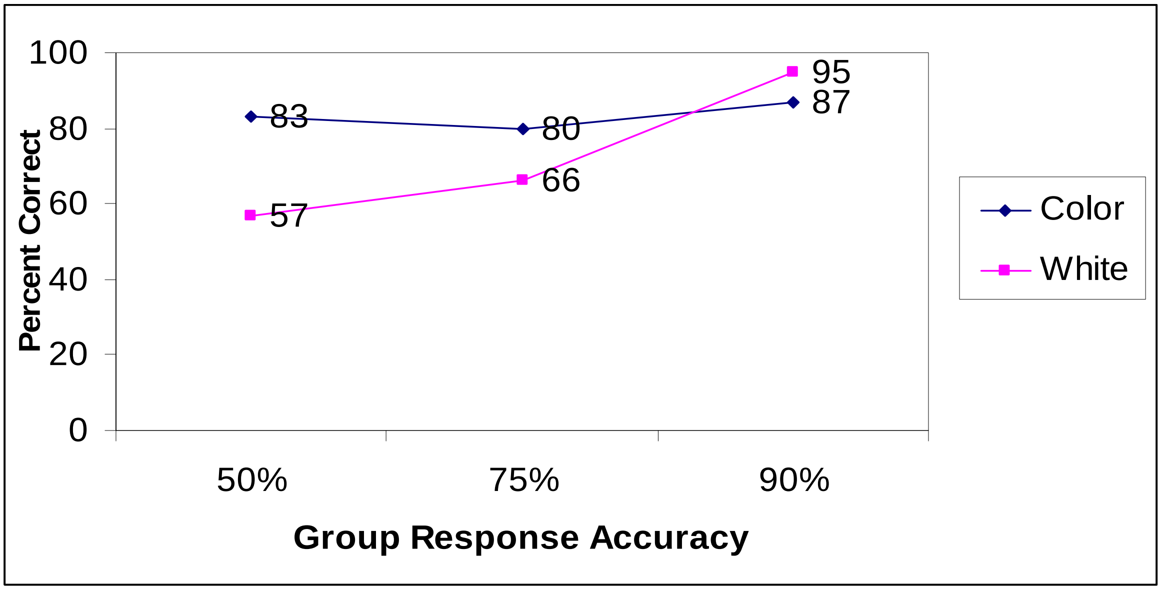

Figure 3. Participant Mean Accuracy.

Latency Results. Similarly, an ANOVA yielded a Color Format x Student Response Accuracy interaction, *F*(2, 37) = 48.98, p = .001. Analysis of the simple effects of this interaction indicated that like prior results for the participant accuracy measure, student response accuracy levels were the primary effect driving the interaction. See Table 3 for specific mean and standard deviation data. Follow-up inferential analysis yielded results that suggest that participants respond faster during trials with white response card format and student accuracy of 90% compared to; white response card format with 50% of the students responding accurately (d = .449), white response card format with 75% of students responding accurately (d = .647), and color response card format with 75% of the students responding accurately (d = .276).

Table 3.

Latency Means and Standard Deviations

Response Card Format Class Response Accuracy	Mean* n = 39	Standard Deviation n = 39
White		
50%	5.89	1.34
75%	6.28	1.22
90%	4.83	1.02
Color		
50%	4.74	1.05
75%	5.47	1.30
90%	4.52	.940

* time in seconds

Similar results were found when the inferential analysis suggested that participants answered faster when the response card format was color with student accuracy at 50% compared to; white response card format with 50% of students responding accurately (d = .478), white response card format with 75% of students responding accurately (d = .674), and color response card format with 75% of students responding accurately (d = .306).

The inferential analysis had similar results suggesting participants answered more quickly with trials using the color response card format with 90% of students responding accurately compared to; white response card format with 50% of students responding accurately (d = .601), white response card format with 75% of students responding accurately (d = .815), and color response card format with 75% of students responding accurately (d = .424). Additionally, the inferential analysis suggested that participant latency rates were faster with color response cards with students responding with 75% accuracy compared to white response cards with 75% student accuracy (d = .321).

Summary of Results

This investigation sought to test and answer two primary research questions as well as collect descriptive demographic data regarding participants. The first question compared color response cards to white response cards and varying student response accuracy rates and their effects on accuracy of teacher instructional decision making. The second question compared color response cards to white response cards and varying student response accuracy rates and their effects on latency of teacher decision making. There were statistically significant differences among the groups in terms of teacher accuracy, as well as practical differences as reported by the various d statistics. Results of analyses suggest that when student response accuracy is varied (i.e. 50% or 75%) color cards help teachers discriminate responses.

The second question compared color or white response card formats with differing student response accuracy rates on latency of teacher instructional decision making. Statistically significant differences were found among the groups as well as practical differences as reported with varying d statistics. The results indicate that participants were quicker to make instructional decisions when student response accuracy was at 90%, regardless of response card format. These results are similar to results from the accuracy comparison. Similarly, when color response card trials were used, participants were faster in trials when students responded with 50% and 75% accuracy than when trials were conducted with the white response cards. See Figure 4 for a diagram of effects.

	Student Response Accuracy Rate		
	50%	75%	90%
Signal			
Strong	C	C	C/W
Weak	W	W	

C = color W = white

Figure 4. Interaction between response card format and student accuracy rates and their effect on signal strength.

Chapter 5

DISCUSSION

Interpretation of Findings

The purpose of this study was to ascertain if different response card formats and different unison responding accuracy rates have differential effects on pre-service teacher accuracy in assessing students' unison responses, and consequent determination of the next appropriate instructional step. In addition, this study quantified participant latency to answer the pen and paper questionnaire during each trial from the unison responding assessment video. This study intended to look at the teacher, or in this case the pre-service teacher, as a variable in unison responding. Prior studies focused on student variables including increased academic attainment and increased opportunities to respond (Armendariz & Umbreit, 1999; Cavanaugh, et al., 1996).

Accuracy of Instructional Decisions

Participant accuracy in choosing the next appropriate instructional step was highest under the condition with classes responding at 90% accuracy rates. It appears that student responding at this high rate where all, or most response cards reflect the same answer sends the strongest 'signal' to the participant, regardless of response card format. This result appears to be based on the fact that most of the cards being held up by the students were correct sending a more uniform signal, compared to lower or mixed accuracy rates which sent a 'noisy' signal in the form of mixed correct and incorrect answers. For both response card formats at 90% accuracy, participants' selection of the next instructional step was accurate from 95% to 87% of the time. These results concur with tenets of Signal Detection Theory, which suggest that when 'noise' is lowered or the signal strengthened, accurate information or communication exchange can take place (Green & Swets, 1966). The results of this study suggest that the use of color cards strengthened the signal that participants used to make instructional decisions when there was more variance in the student responses. Indeed, color appears to be a useful, easy to manipulate ‘feature’ that allows participants to more successfully attend to the signal (Macho, 2007).

When 50% of students responded accurately, participants’ instructional decision accuracy rates dropped slightly under the color response card format and more disparately under the white response card conditions. Again, results suggest that SDT explains teachers’ abilities to pick up on student signals. Their ability to proceed in a best-practice decision making model is hindered by weak or mixed signals. However, within the color format the ‘noise’ appeared to decrease and the signal strengthened under the 50% and 75% accuracy trials. Adding color to the response card format appeared to increase teacher selection of appropriate instructional decisions, thereby avoiding potentially detrimental results that could result from inaccurate decision making using the white response card format. Noise became a more significant factor when the white response card format was implemented. Participant ability to choose an appropriate answer was impacted by noise coming from one variable, accuracy rates, and a potentially weaker signal in the form of white response cards.

These results suggest that unison responding using visual response formats may be best implemented with color response cards. However, even with white response cards, teachers can still potentially retain high accuracy in instructional implementation as long as their students have successfully mastered the material delivered in the preceding lesson. If students' responses send a mixed signal, it may be best to err on the side of caution and reteach concepts or provide a brief explanation of the correct answer.

Participant accuracy at selecting the appropriate instructional response dropped to lower rates, down to 66% with the white response cards and up to 80% under the color response card trials. Again, these results suggest that 'noise' in the form of mixed student responses may limit teachers' abilities to correctly choose appropriate instructional procedures. When 75% of students answered accurately the varied response cards delivered more 'noise', compared to when students answered with 90% accuracy therefore sending a much clearer and readily interpretable signal. Conversely, if students were to respond with 90% inaccuracy, this might also provide teachers a strong signal for decision making.

Latency of Instructional Decisions

Latency results were similar to accuracy results in that pre-service teachers responded faster when answering the questionnaire for trials that showed 90% of students responding accurately. Teachers responded more slowly during trials under other conditions in the white format suggesting that color may also play a role in strengthening the response card signal.

'Noise' appeared to be a factor again when 75% of students responded accurately; teacher latency was significantly increased within the white format suggesting again that varying response card answers increase 'noise' and consequently impact teachers' ability to respond efficiently and accurately. These results are similar to the results from teacher accuracy at the 75% student accuracy level. It appears that when 75% of students in a color response format answer accurately, teachers respond faster, suggesting that the ‘noise’ of varying student responses is somewhat offset by the stronger ‘signal’ sent by color response cards. These results also may be explained by Signal Detection Theory and its role in teacher selection of appropriate instructional procedures. While the latency results reported were of statistical significance, functionally the mean differences in teacher responding under the differing conditions were less than three seconds. It appears that while the differences were significant, they are probably not practically meaningful, and emphasis should remain on teacher accuracy of decision making not speed of decision making. It should be noted however, while the results have little to recommend for practical implementation, the statistically significant latency results do support the theoretical implications that color improves detection within unison responding procedures.

Implications for Practice

In a meta-analysis, Hamlin, Lee, and Ruhl (2008) found that unison responding procedures may act as a ‘fluency builder’. The meta-analytic results suggested that student attainment and on-task behavior increased when unison responding was conducted in massed practice with student response times paced quickly. These results suggest that teacher presentation rate may play a factor. The teacher needs to keep the lesson moving and if it takes longer to make an instructional decision, students may seek other reinforcement. If that is indeed the case, teacher latency as defined in this study, may directly impede or maximize student outcomes, depending on the rate at which teachers can respond accurately within the unison responding procedure. Additionally, previous research on opportunities to respond, teacher pacing, and reinforcement timing support the idea that for unison responding procedures to be implemented most efficaciously, rate of accurate teacher responding will play a pivotal role in student achievement (Heward, 2008). However, results of this study, while statistically significant, appear to suggest that functionally, unison responding procedures can be used in a very quick, efficient manner regardless of the format.

Study results suggest that pre-service teachers are both accurate and efficient at determining when students are answering at a mastery level, and selecting when it is instructionally appropriate to move on to the next fact, concept, or procedural question. These results make a case for teaching students through 'errorless learning'. Difficulties arise when students are not answering at mastery level. While participants had trouble distinguishing exactly what student responses were, they did recognize that further explanation was needed. Additionally this study supports the idea suggested by Bushell and Baer that teachers are most effective when they have "close continual contact with relevant outcome data" (1994, p. 3). When teachers are provided student responses that suggest mastery of a concept, teachers are able to make accurate instructional decisions to move the lesson forward, keeping instructional pace at an appropriate level. To assist teachers in receiving a strong 'signal', color response cards should be used to help increase teacher accuracy in instructional decision making.

These results are important for teachers who work with students with special needs. With a majority of students now placed in general education classrooms, much instruction is now taking place in large groups. Reviews of prior research suggest that without implementation of unison responding, students with disabilities or who are at-risk often do not answer questions when posed in the more traditional hand-raising format (Hamlin, Lee, & Ruhl, 2008). By implementing unison responding, students with disabilities become more active participants in the general education setting and increase their academic attainment and consequently provide teachers with relevant data for instructional decision making.

Recommendations for Future Research

Given these results, it seems prudent for teachers to implement colored unison response cards to strengthen student signals when using unison responding. One potential option that may help strengthen the 'signal' sent by student unison responding may be to incorporate use of electronic 'clickers'. Clickers are available commercially as 'class-wide performance systems'. Students are given a small clicker, about the size of a television remote control. Students use these clickers to send their unison responses to a computer. Many of these systems offer the ability to display student response accuracy rates on the computer screen therefore offering an explicit statement of percent accurate (i.e. a potentially stronger 'signal') than what may be available through the index card unison responding format. Clickers may help teachers with the decision making process and in turn increase effective and appropriate instructional delivery. To date, no peer-reviewed research on clicker implementation with students with disabilities has been published. One current drawback to adoption of 'clicker' systems is the significant cost. Some systems require capital expenditures in the range of several thousand dollars, making widespread implementation unlikely especially in lower socioeconomic communities with limited resources. Using colored index cards provides a more cost effective option to clicker use.

Additionally, as this study was only conducted with novice pre-service teachers, researchers may want to replicate this study with participants who are more experienced with implementing unison responding procedures. Familiarity and practice may make the instructional decision making process easier for experienced teachers and thus, color of cards used may be less of an issue.

Limitations

Although useful, these results must be viewed within the limitations of this study. First, use of the mock classroom video in evaluating the instructional decisions of the pre-service teachers may have limited the external validity of these findings to more applied settings. However, use of the video allowed for better control of student responses and classroom sizes, thus enhancing the internal validity of the study. Future researchers may wish to replicate these results in more applied settings. Second, although each participant was enrolled in a teacher preparation program, we did not document prior teaching experiences and training (e.g., volunteer work), which may have affected results. However, use of a within-subject design, whereby each participant served as his or her own control, may have controlled for these effects.

An additional limitation is the time required to participate in this study. Each participant had to answer a survey in addition to watching the video assessment module. The entire study session could have lasted up to an hour. This may have influenced willingness to participate at the outset of the study.

Another limitation is the sample size. While the sample met the requirements of the power analysis, it was drawn from a limited geographic region and one educational institution which may limit generalizability of the results. Given the commitment needed and only a small monetary incentive, one can only speculate that a limited number of pre-service teachers decided to participate in this study. Students may have decided to participate due to intrinsic motivation and the desire to assist in improving their chosen field. In the recruitment flyer and verbal script presented to classes, participants were informed that this study might help them improve a critical teaching skill, as well as assist teacher trainers in developing better instruction recommendations for unison responding procedures.

Summary

Data from this study suggest that pre-service teachers are able to efficiently and effectively select an instructional decision when students have mastery of relevant content based upon unison responses regardless of response card color. Teachers are then able to choose the next instructionally appropriate step, which is to move on to new questions or concepts. However, when students have not mastered material (i.e. accuracy rates are varied), teachers have more difficulty selecting the next instructionally appropriate step. Adding color appears to help with this process. The results of this study are further explained using tenets of Signal Detection Theory that state that when a signal is weakened by noise, accurate communication or information sharing is less likely to occur. Features such as color may help to increase reception of signals that are otherwise affected by noise such as student response accuracy levels. Identifying additional ways to strengthen the signal in UR will enhance both student and teacher benefits of this procedure. Future research should address more technically advanced methods to implement unison responding procedures that may help to strengthen the signal when unison responding is used with students who have not mastered relevant course material. Implementation of more technologically accurate class-wide performance systems may also help ameliorate these difficulties by providing teachers a stronger signal to help instructional decision making.

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Appendix A

INFORMED CONSENT FORM
FOR SOCIAL SCIENCE RESEARCH
The Pennsylvania State University

ORP USE ONLY: IRB#25324 Doc.#1
The Pennsylvania State University
Office for Research Protections
Approval Date: 04-17-2007 DWM
Expiration Date: 04-12-2008 DWM
Social Science Institutional Review Board

Title of Project: Unison Responding: Procedural Knowledge and Assessment Skill of Pre- Service Teachers

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1. **Purpose of the Study:** The purpose of this research is to determine pre-service teacher knowledge and effective use of unison responding procedures.

2. **Procedures to be followed:** You will be asked to watch a video with several classroom scenarios showing unison responding procedures. At the end of each segment you will be asked to answer questions relating to the video.

3. **Discomforts and Risks:** You will not experience any discomforts/risks outside of those already experienced in a classroom setting.

4. **Benefits:** You will receive extra-individualized practice and assessment in an area relevant to career achievement.

5. **Duration/Time:** You will be asked to participate in the study for one session lasting approximately 30 minutes.

6. **Confidentiality:** Your participation in the research will remain confidential. You or other personally identifiable information will not be linked to your responses. Data will not be associated with personal identifiers; instead, codes will be used to protect privacy and will be kept separate from master code list. All research records will be

kept in a locked file cabinet and analyzed on password protected computers in a locked office. Data will be reported in aggregate form. The following may review and copy records related to this research: The Office of Human Research Protections in the U.S. Department of Health and Human Services, Penn State University's Social Science Institutional Review Board, and Penn State University's Office of Research Protections. Only the person in charge, and his/her assistants, will know the participant's identity. If this research is published, no information that would identify the participant will be written.

8. **Right to Ask Questions:** You can ask questions about this research. Contact Dawn W. Hamlin at 814-237-2320 with questions. You can also call this number if you have concerns about this research, or if you feel that you have been harmed by this study. If you have questions about your rights as a research participant, or have concerns or general questions about the research, contact Penn State University's Office for Research Protections at 814-865-1775. You may also call this number if you cannot reach the research team or wish to talk to someone else. You may also call the Special Education Department at 814-865-6072.

9. **Payment for Participation:** Student will receive $10 in cash for participating in this study.

10. **Voluntary Participation:** Your decision to be in this research is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer. Refusal to take part in or withdrawing from this study will involve no penalty or loss of benefits you would receive otherwise.

11. **18 years or older:** You must be 18 years of age or older to participate in this research project.

If you agree to the information above, please sign your name and write the date below. You will receive a copy of this form.

____________________________________ ____________________

Participant Signature **Date**

____________________________________ ____________________

Person Obtaining Consent **Date**

Appendix B

Recruitment Flyer/Script
The Pennsylvania State University

Title of Project: **Unison Responding: Procedural Knowledge and Assessment Skill of Pre-Service Teachers**

Person in Charge: Dawn W. Hamlin
Penn State University
226 CEDAR Building
University Park, PA 16802
814-237-2320
dmw175@psu.edu

We need you.
We want to learn how to make unison responding procedures easier to implement in the classroom. We invite you to be a part of a research study, which involves assessing unison responding procedures.

What you will get.
You will receive $10 in cash for participating in this study.

What you will do.
You will be asked to watch an approximately 30 minute video and answer questions about different clips in the video.

It's private information.
All of the information we get will be private and your name will not be used anywhere. Nothing you do will change your grades or placement in school. You may quit the study at any time.

You Can Ask Questions.
There are no known risks outside of those already experienced during school. You can ask questions about the research. The person in charge will answer your questions. Contact Dawn Hamlin at 814-237-2320 with questions. If you have questions about your rights as a research participant, contact Penn State's Office for Research Protections at (814) 865-1775.

You do not have to participate in this research project. If you agree to participate you can withdraw your participation at any time. You can refuse to answer specific questions.

Please contact Dawn Hamlin at dmw175@psu.edu or 237-2320 if you would like to participate.

Appendix C

Background Information

Directions: Answer each question. Circle the correct answer.

1. Gender
   a. Female
   b. Male

2. Age in years ____

3. Ethnicity (circle all that apply)
   a. White
   b. Hispanic or Latino
   c. Black or African American
   d. Asian
   e. Native Hawaiian or Pacific Islander
   f. American Indian or Alaska Native
   g. Other – Please specify _______________

4. Are you working toward a Special Education certificate?
   a. Yes b. No

5. Are you working toward an Elementary Education certificate?
   a. Yes b. No

6. Number of courses taken in teaching
   a. 1
   b. 2-3
   c. 4-6
   d. 7-10
   e. >10

Appendix D

Training Procedures for Inter-rater Reliability:

1. Show trainee sample observation sheet. _____
2. Show trainee how to fill in obsv. sheet. _____
3. Show trainee sample clip. _____
4. Show trainee how to start second timer. _____
5. Have mock participant watch 2 clips. _____
6. Model for trainee how to score time. _____
7. Have mock part. watch set of 6 clips. _____
8. Do trial timing with trainee. _____
9. Compare time scores for 6 clips. _____
10. Inter-rater agreement is reached w/in +/- .5 sec. _____

Continue trials until 90% agreement reached. __

Appendix E

1. **PROTOCOL / PROCEDURAL CHECKLIST:**

   Have participants sign consent forms. ___________

2. Give participant copy of consent forms. ___________
3. Tell participants order and directions. ___________
   - You will watch 8 sets of video clips. ___________
   - As soon as the classroom clip begins, answer the question with and A, B, or C in the correct box. ___________
   - Put pen down immediately after answering each question.___________
   - Show/Model participants answer sheet. ___________
   - Show/Model participants order to fill in boxes. ___________
   - Give participants answer sheet ___________
   - Give participants group letter –tell P fill it in on answer sheet. ______
   - Give student code number – tell P fill in on answer sheet. ___________
4. Show training video. ___________
5. Have students do practice trials. ___________
6. Ask Participants do they have any questions. ___________
7. Clarify questions if needed. ___________
8. Give participants demographic survey. ___________
9. Collect demographic survey. ___________
10. Start first DVD. ___________
11. Start stopwatch at start of classroom clip 1. ___________
12. Note time participant answers question/pen down. ___________
13. Continue steps 11 & 12 through rest of clips. ___________
14. Take out DVD replace with next set/DVD. ___________
15. Have participants note on answer sheet new set letter. ___________
16. Repeat steps 10 – 15 until all sets complete. ___________
17. Collect data sheets. ___________
18. Have participants sign compensation form. ___________
19. Give participants compensation. ___________

Thank all participants.

Dawn W. Hamlin

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Education:

BA 1992	St. Lawrence University, Multi-field: Geography, History, Government	Canton NY
Certification	Southern Connecticut State University, Special Education • CT Certification in 1st to 12th grade • Practica 1- taught in inner-city- 7th grade LD/ED • Practica 2 -taught in residential ED school -10-19 years old	New Haven CT
MS 2003	LeMoyne College, Education – Special Education • Permanent Certification in NY State – Special Education	Syracuse NY
Ph.D. Candidate (expected 8/2008)	The Pennsylvania State University Special Education- Cognate: Educational Psychology and Adolescence Areas of Interest: • Assessment and Instruction/High Incidence Disabilities (LD/ED) • Applied Behavioral Analysis	University Park, PA

Professional Experiences:

2008 MVCC, Adjunct Instructor – PY 210 Research Methods

2003-2006 Penn State, Graduate Assistant/Supervisor, Undergraduate Students in G Practica
- Supervised students in a data-based practica in an inclusion setting at the elementary level

2004-2005 Penn State, Co-Taught SPLED 454 – Assessment for Students with Disabilities

Publications:

Lee, D. L., Hamlin, D. W., Hildebrand, K. E., Carranza, M. K., Wannarka, R., & Hua, Y. (2007). A descriptive analysis of publication trends in the Journal of Behavioral Education: 1991-2005. *Journal of Behavioral Education, 16,* 327-332.

McNaughton, D., Hamlin, D., McCarthy, J., Head, D., & Schreiner, M. (2007). Learning to listen: Teaching an active listening strategy to preservice education professionals. *Topics in Early Childhood Special Education, 27,* 223-231.