RBT ONLINE TRAINING COURSE

RBT® Section A: Measurement Part 2

Without Data and Analysis . . .

It Does Not Exist!

Special Learning, Inc.

Autism Education for Parents, Teachers, and Therapists

RBT® Task List Item(s) Addressed

This training program is based on the RBT Task List (2nd ed.) and is designed to meet the 40-hour training requirement for RBT certification. The program is offered independent of the BACB.

RBT® Task List Item	Item Description
A-01	**Prepare for data collection.**
A-05	**Enter data and update graphs**

Measurement:
Data Collection and Graphing

Objectives & Learning Outcomes

This training program is based on the RBT Task List (2nd ed.) and is designed to meet the 40-hour training requirement for RBT certification. The program is offered independent of the BACB.

RBT® Task List Item	Objective
A-05	Learn to identify & discriminate between different types of graphs. Understand what is required in graphs and how to "read". Learn how to create graphs.

Objectives & Learning Outcomes (*Continued*)

This training program is based on the RBT Task List (2nd ed.) and is designed to meet the 40-hour training requirement for RBT certification. The program is offered independent of the BACB.

Ultimate Learning Outcome (s)
➢ **Demonstrate understanding of data collection and the need for measurement.**
➢ **Learn steps to record behaviors.**
➢ **Demonstrate knowledge of various types of data collection.**
➢ **Demonstrate understanding of trustworthy measurement.**
➢ **Learn about ABC data, task analysis, and other types of measurement.**
➢ **Understand Visual Analysis**
➢ **Differentiate between the different types of graphs used in ABA**
➢ **Learn how to make a paper graph**
➢ **Learn how to make a graph on the computer**

Data Collection

- ABA is a data driven teaching method. ABA practitioners collect copious amounts of data and analyze it by using charts and graphs to determine the effectiveness of an intervention program.
- Data can be collected for any behavior, whether academic, social, or behavioral.
  - We can take data on behaviors we want to increase such as raising hand to answer questions, self-dressing, reading sight words, or greeting peers.
  - We can take data on behaviors we want to decrease such as throwing items, leaving the classroom, or screaming.
- Data collection may seem tedious, but using data to make the correct decisions in an intervention program is necessary for ethical practice.

The Need for Measurement

Data collection is important!

- Obtain Baseline

- It lets the BCBA® or Program Supervisor evaluate the effects of a behavioral intervention, as well as ensure all academic, language, social, and play programs are progressing properly.

- It can be used by the BCBA® as a guide for decision making in all aspects of ABA programming.

- It can help the BCBA® spot and prevent mistakes
  - ➢ Continue effective treatment
  - ➢ Discontinue ineffective treatment

Steps to Recording Behavior

1. Define the target behavior (observable/measurable)
2. Identify who, when, how, and where to record – the logistics of collecting data
    a. Choose a recording method (what type to record)
    b. Choose a recording instrument (how to record)
    c. Define the setting(s) in which to collect data (where to record)
    d. Define the interval(s) or time to record data (i.e. 15 minutes, 24/7)
3. Consider reactivity of recording
4. Inter-observer agreement assessment

Common Data Recording Methods

- **Frequency:** The **number of times** a behavior occurs. This would be used for behaviors that have a definitive start and end and are quick in nature, such as hitting, turning in homework, greeting peers.

- **Duration:** The **length of time** the behavior occurred for. Duration data would be used for behaviors that either take a long time to complete or repeat in succession at a very fast pace, such as tantrums, hand flapping, or playing with a toy.

- **Fluency:** **How quickly the student can respond** within a specified amount of time. This is often used to measure things like reading or typing (70 words per minute).

Common Recording Instruments

- **Frequency:** The number of times a behavior occurs.
  - Paper/Data sheet and Pen
  - Tally clicker

- **Duration:** The length of time the behavior occurred for.
  - Timer and data sheet
  - Scatterplot recording sheet
  - For later review

** Please refer to previous module on how-to take data collection.

Trial by Trial (Continuous)

- Trial by Trial data collection is utilized when the practitioner takes data for each response for every discrete trial implemented.
- This method may be time consuming but offers ample amounts of data for analyzing programs and interventions
- Trial by trial data collection may be preferred when the consumer requires multiple discrete trials per session for mastery.
- Trial by trial data also allows for accuracy of progress across single sessions.
- Carefully observe for patterns of prompted trials.
  - ➢ If data indicates that the first trial is consistently prompted or incorrect, but consumer is reaching 80 – 90%, mastery may not be achieved. The consumer may rely on the initial prompt and thus should not be considered mastered.
  - ➢ If data indicates consistent correct responses in the first trial, but subsequent trials require prompting or incorrect responses, the consumer may be bored with the same presentation, when mastery has actually been achieved.

How to Record Trial Data

- **Trial**
- Present SD
  - If correct, reinforce and mark + on data sheet
  - If incorrect use the Error Correction Procedure and mark - on data sheet

Error Correction:

- Represent SD with providing a full prompt
- Present distractor trial (e.g. give me 5)
- Represent SD will lesser or no prompt.
- Reinforce if correct.

****Data is not recorded for the error correction trials!

Trial Data Example

Sample Data:
Student: John Q. Program: Receptive Identification of Food Items

Date/Initials	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	% correct
5/15/20 TV	-	-	+	-	+	+	-	+	+	+	60
5/16/20 TV	-	+	-	-	+	+	+	+	-	+	70
5/17/20 TV	+	-	+	+	+	-	-	+	+	+	70
5/18/20 TV	-	+	+	+	+	+	+	-	+	+	80
5/19/20 TV	+	-	+	+	+	+	+	+	+	+	90

Your Turn! ASR #1: Trial-by-Trial Data

- Data is recorded for every SD presentation (SD: “Touch purple”)

Trial #	Response
1	
2	
3	
4	
5	
6	
7	
8	

Let's Check the Data Reliability!

- Data is recorded for every SD presentation (SD: "Touch purple")

Trial #	Response
1	+
2	+
3	+
4	+
5	+
6	+
7	+
8	+

First Response (Probe or Discontinuous)

- First Response, or probe data collection method is when the therapist records only the **first trial** of a learning opportunity regardless how many discrete trials will be conducted.
- This method may be preferred for consumers who learn best in a naturalistic environment where limiting the practitioner to data collection stimuli would be counterproductive.
- This method does not allow for observation of progression throughout a single session.

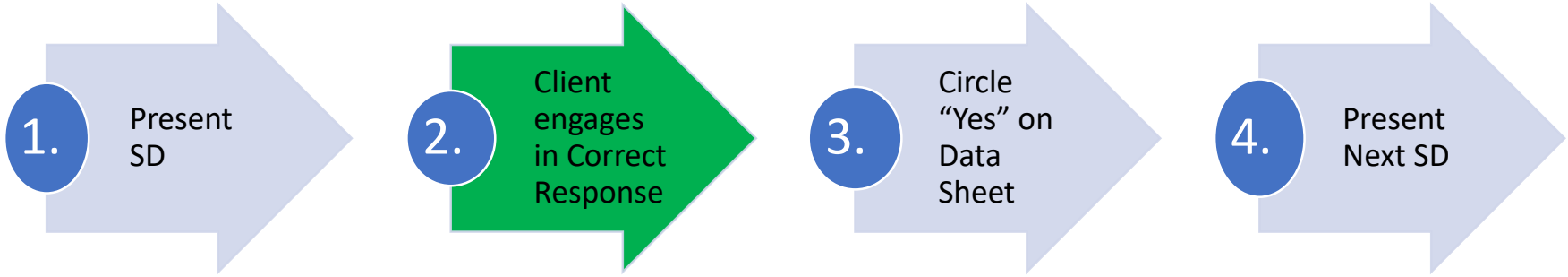
How to Record Probe Data

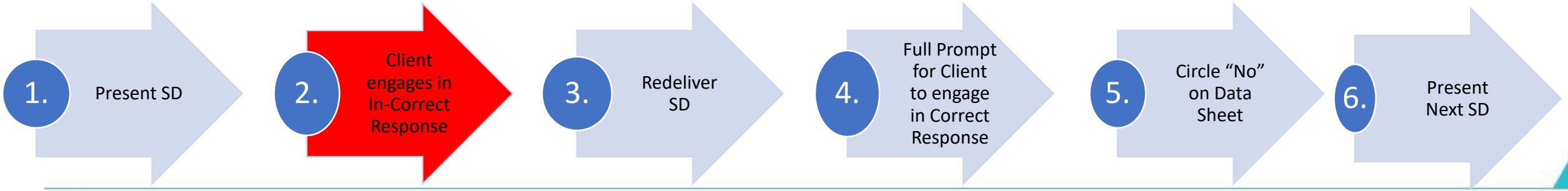
Present SD

-- If correct, reinforce and circle or record **Yes** on probe data sheet

-- If incorrect, represent SD with full prompt and circle or record **No** on data sheet.

Present next SD





Trial/Probe Data Collection Procedure

- For most data being collected, independent performance of a target behavior will be recorded with a "+" which means that the consumer performed the task requested without any prompts and within 3-5 seconds of presentation of the initial direction/command (Sd).

- If the target task is not completed accurately or appropriately, it is typically recorded with a “-”.

- If a prompt is used during the trial, a “P” may be recorded, though this would still be considered a “–” or incorrect response for data collection and analyzing purposes.

Your Turn! ASR #2: Probe Data

- Data is recorded for initial SD presentation only
- When the consumer is engaged in an activity

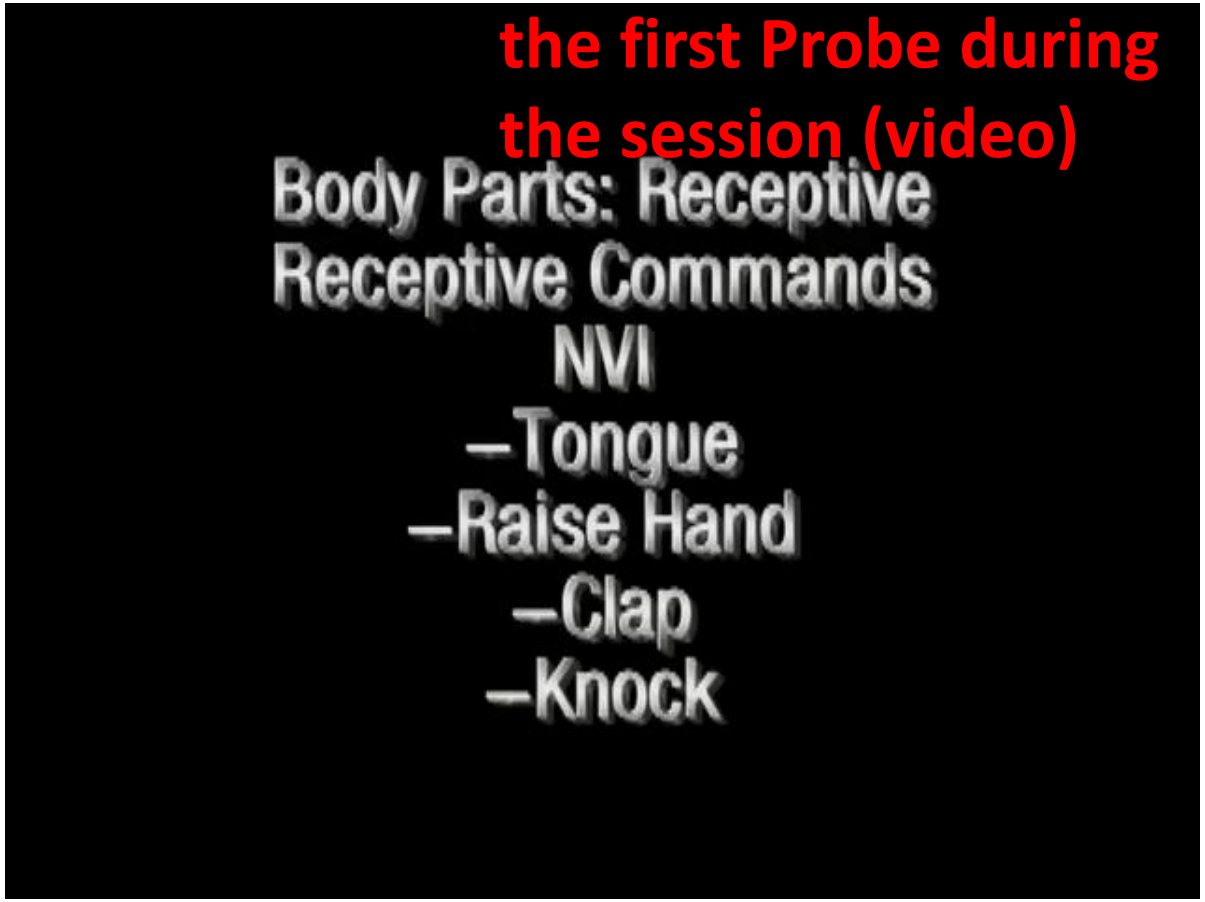
SD	Response
Touch Tongue	
Point	
Clap	
Knock	
Wave	

Let's Check the Data Reliability!

We will not record SD: "Find the Tongue" because we already recorded the data for the first Probe during the session (video)

- Data is recorded for initial SD presentation only
- When the consumer is engaged in an activity

SD	Response
Touch Tongue	✚
Point	✚
Clap	✚
Knock	✚
Wave	✚



Duration Data

- Duration data should be recorded as per the Skill Acquisition Sheet

  - Unit of measure (seconds, minutes, etc)

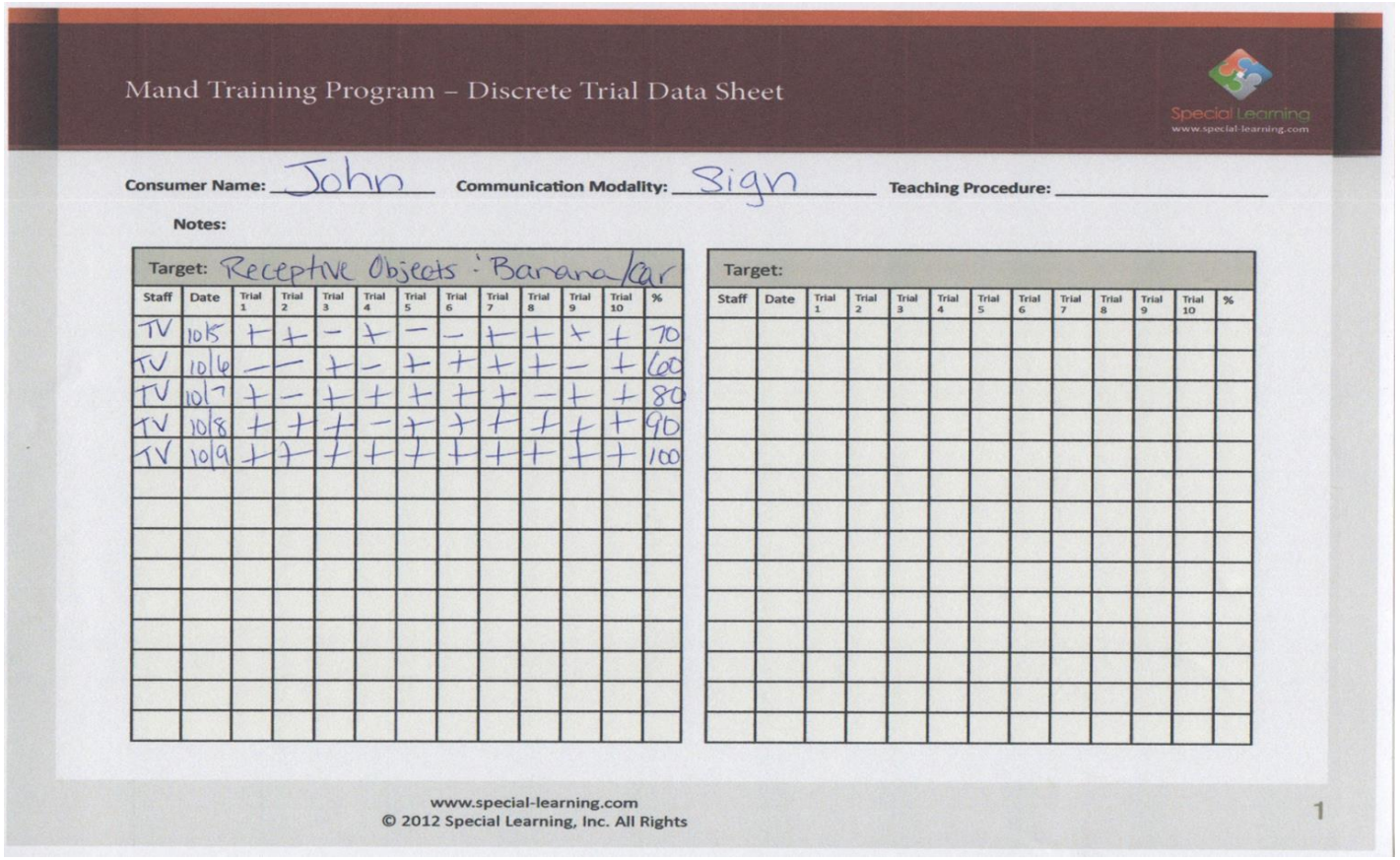
  - Amount of time target behavior occurs or does not occur
    - Ex: on task vs off task

  - Date, time of start and stop of target, and total length of time should all be recorded on the data sheet
    - EX: 3/2/17 10:48-11:03 -> 15 MINUTES

Data Collection Sheets

Academic Data (Discrete Trial)

- Guideline: If your consumer has DTT programs, data should be collected during every session.
- When using Trial by Trial data, data will be recorded and analyzed using percent of correct responding



Mand Training Program – Discrete Trial Data Sheet

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Consumer Name: John Communication Modality: Sign Teaching Procedure: _____

Notes:

Target: Receptive Objects : Banana/car

Staff	Date	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	%
TV	10/5	+	+	−	+	−	−	+	+	+	+	70
TV	10/6	−	−	+	−	+	+	+	+	−	+	60
TV	10/7	+	−	+	+	+	+	+	−	+	+	80
TV	10/8	+	+	+	−	+	+	+	+	+	+	90
TV	10/9	+	+	+	+	+	+	+	+	+	+	100

Target:

Staff	Date	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	%

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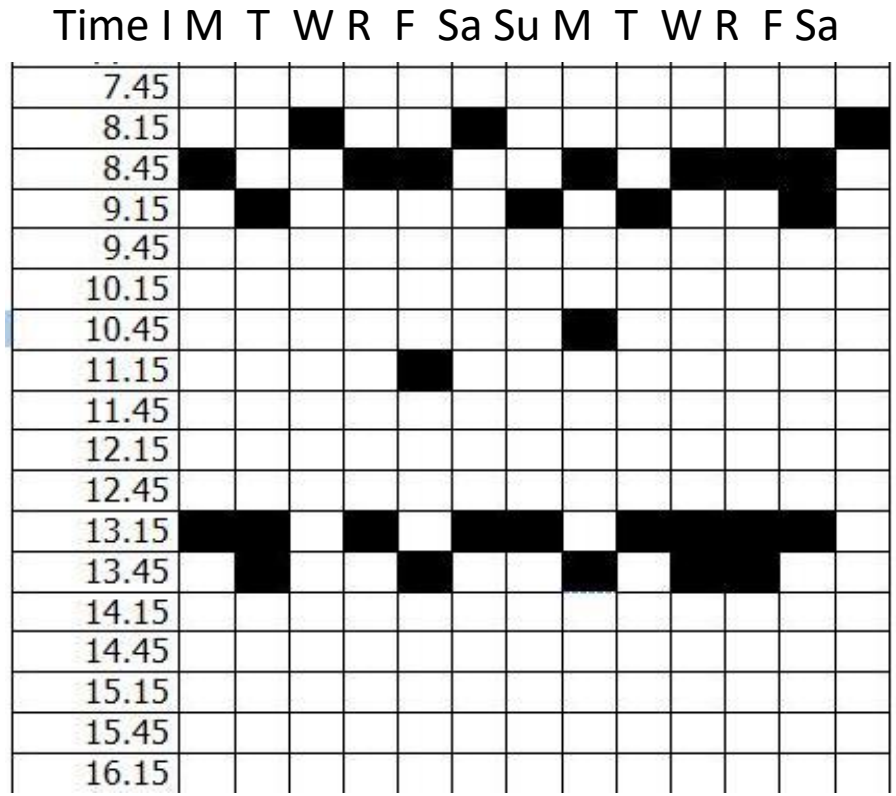
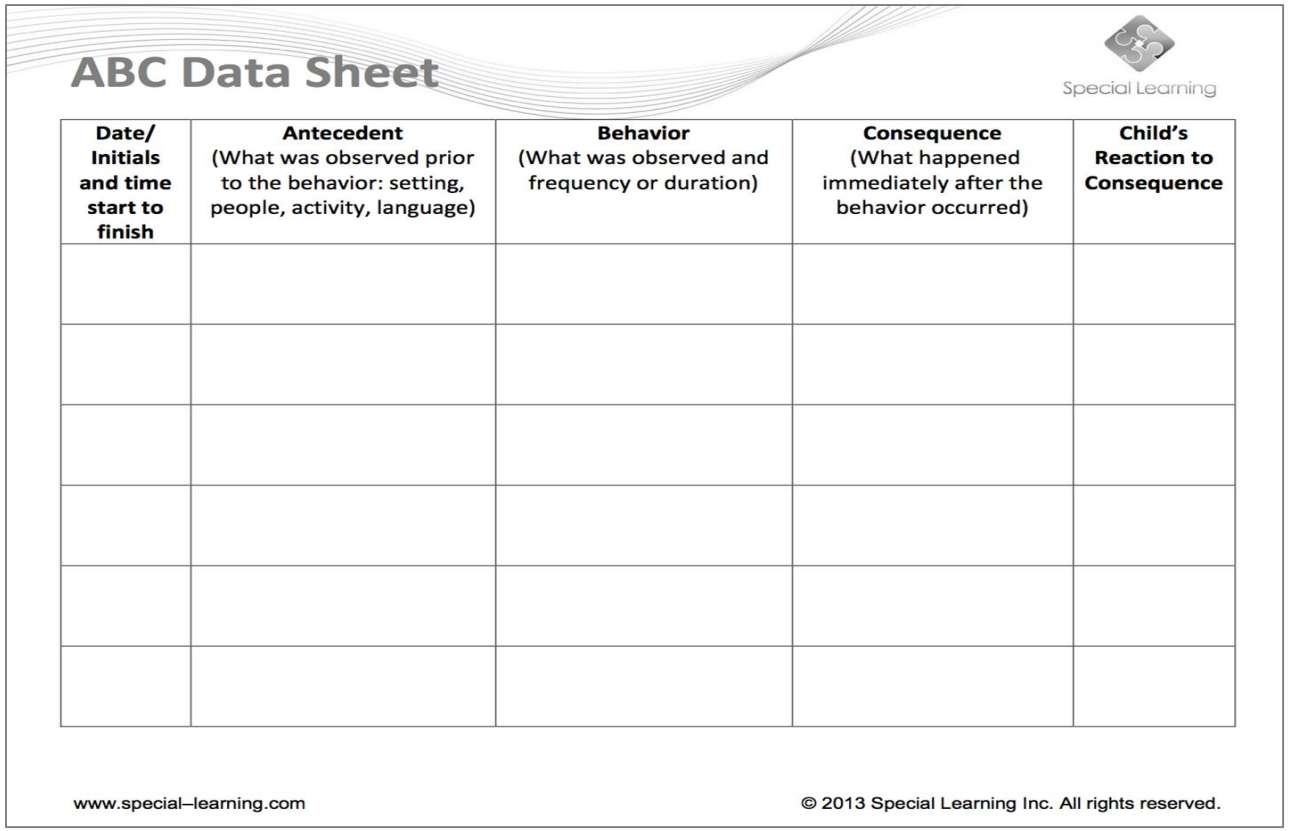
Behavioral Data-Scatterplot

- Record when target behavior occurs
- Can be shaded or can add tally marks within for an additional frequency count
- Can select the interval length (15 minutes, 30 minutes, 1 hour, etc)
- Can be useful to look for a pattern of when target behaviors occur



Behavioral Data- ABC Data

Record what happens before, during, and after the behavior to help identify the function of behavior



ABC Data Sheet

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Date/ Initials and time start to finish	Antecedent (What was observed prior to the behavior: setting, people, activity, language)	Behavior (What was observed and frequency or duration)	Consequence (What happened immediately after the behavior occurred)	Child's Reaction to Consequence

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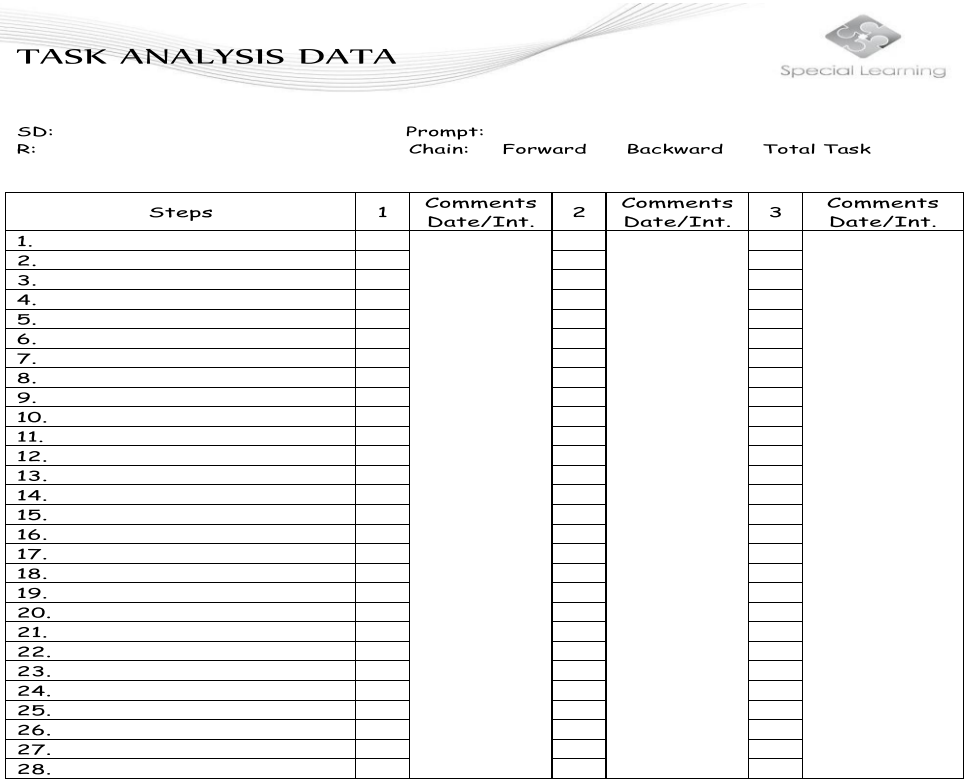
Task Analysis Data

For behaviors with multiple steps to completion such as hand washing, teeth brushing, arrival/dismissal

Record I for independent and P for prompted

Graph percent or number of steps independent



TASK ANALYSIS DATA

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SD: Prompt:
R: Chain: Forward Backward Total Task

Steps	1	Comments Date/Int.	2	Comments Date/Int.	3	Comments Date/Int.
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						
26.						
27.						
28.						

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Toileting Data

Data collection daily

Every time until fully trained

Self-graphing data sheet: circles should shift from left to right

Date	Time	Dry	Accident	Success	Self-Initiation	Comments
			U BM	U BM	U BM	
			U BM	U BM	U BM	
			U BM	U BM	U BM	
			U BM	U BM	U BM	
			U BM	U BM	U BM	
			U BM	U BM	U BM	
			U BM	U BM	U BM	
			U BM	U BM	U BM	
			U BM	U BM	U BM	
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			U BM	U BM	U BM	
			U RM	U RM	U RM	
			U BM	U BM	U BM	
			U BM	U BM	U BM	
			U BM	U BM	U BM	

KEY		
U = urination	B = bowel movement	Success = defecating/urinating in the toilet
Accident = defecating/urinating in location other than toilet	Self-Initiation = defecating/urinating in toilet independently (no prompts)	

Social and Communication Data

- Data on:
  - ➢Functional language and communication
  - ➢ Social skills and social language in various settings
  - ➢Play and leisure skills with peers
- Data can be taken with:
  - ➢ Frequency
  - ➢ Duration
  - ➢ Scatterplot

Requesting/ Mand Data

- Tally independent and prompted trials to calculate a percentage

Date / Time	Prompt Level	Item 1 _____	Item 2 _____	Item 3 _____	Item 4 _____	Item 5 _____	Item 6 _____	Item 7 _____	Item 8 _____	Item 9 _____	Item 10 _____	Staff Initials
9/7	Spontaneous											
8:20-8:40	Prompted											
	Spontaneous											
	Prompted											
	Spontaneous											
	Prompted											
	Spontaneous											
	Prompted											
	Spontaneous											
	Prompted											
PROMPT CODES: FP = Full Physical, PP = Partial Physical, VP = Verbal, GP = Gestural, I = Independent												

Graphing

Why Visual Analysis?

- In ABA, we use data to drive our teaching.
- Collect data in order to track progress, make instructional changes, inform instructional pacing, and make data-based decisions.
- Take frequent data to ensure that our teaching is effective.
- By collecting data routinely/graphing and analyzing data, we can determine if students are making progress or if modifications need to be made.

Why Visual Analysis? (*Continued*)

- Graphs provide opportunities for visual analysis of data. This is the preferred method of data analysis by behavior analysts.

- According to Cooper, Heron, and Heward (2007), graphs provide an analyzable format for identifying behavior trends, levels, and variability that does not rely on statistical assumptions.

- We will be discussing graphing both on the computer and using paper and pencil.

Equal Intervals Graphs

- The equal interval graph is the most common type of graph used to display data for behavior modification purposes.
- A variety of units of measurement can be used in this type of graph.
- Data collected on frequency, duration, time intervals, sampling, and rate can all be shown on this graphic display.
- The X-axis (the horizontal line) is where you place the time/date intervals.

Types of Graphs Utilized in ABA

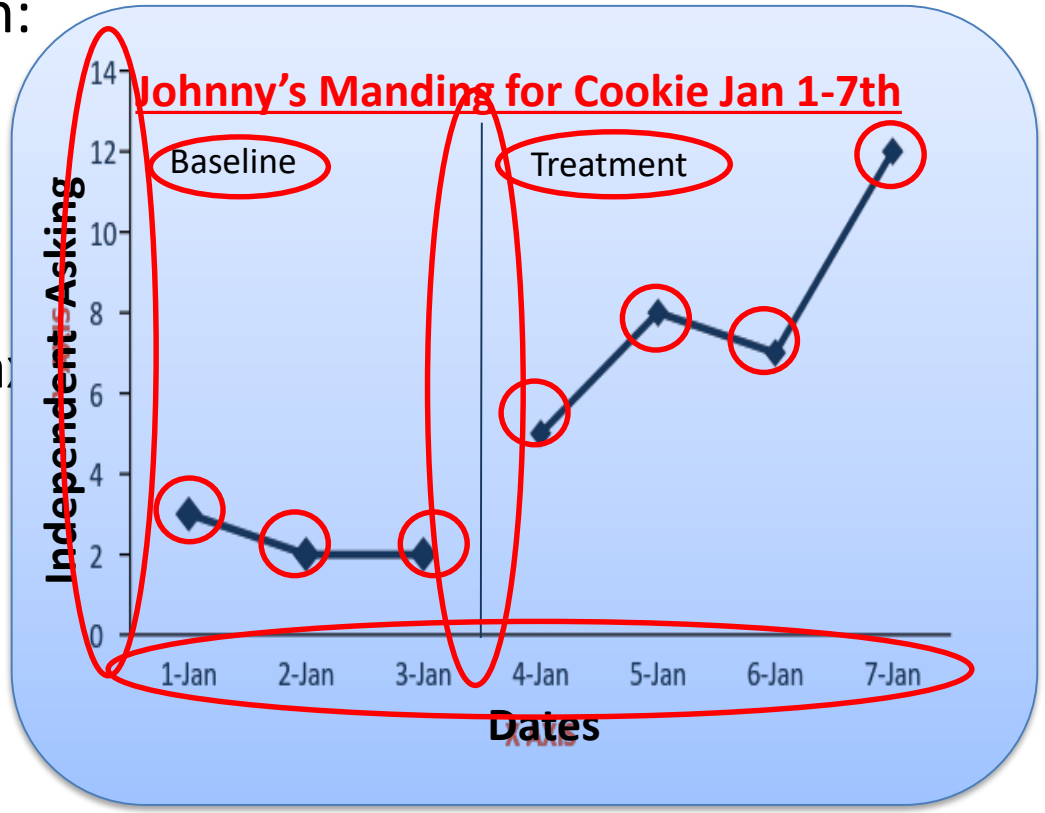
- **Line graph**
- **Bar graphs**
- **Cumulative record**
- **Scatterplots**

Line Graph

- Two-dimensional area formed by intersecting lines
- Points on the plane represent relationships
  - Level of the dependent variable when the independent variable was in effect
- Comparisons of data points reveals the presence or absence of changes in level, trend, and/or variability

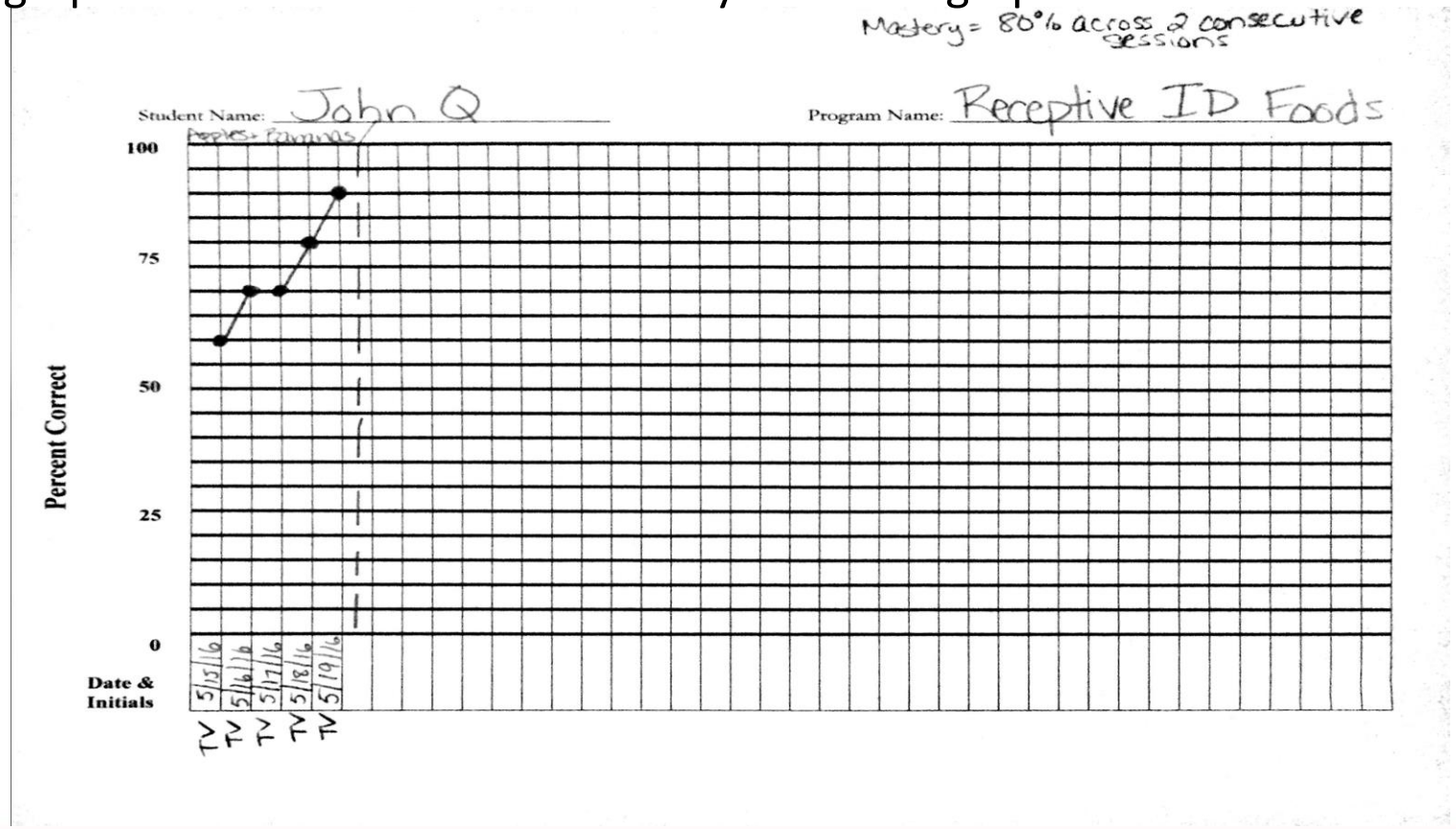
Necessary Components of an Equal-Interval Line Graph

- There are six necessary components of a graph:
  - ➢Title of the graph
  - ➢Labels for the y axis and x axis
  - ➢Units of measurement on the y axis and x a
  - ➢Data points
  - ➢Phase change lines
  - ➢Phase labels



Percent Graph

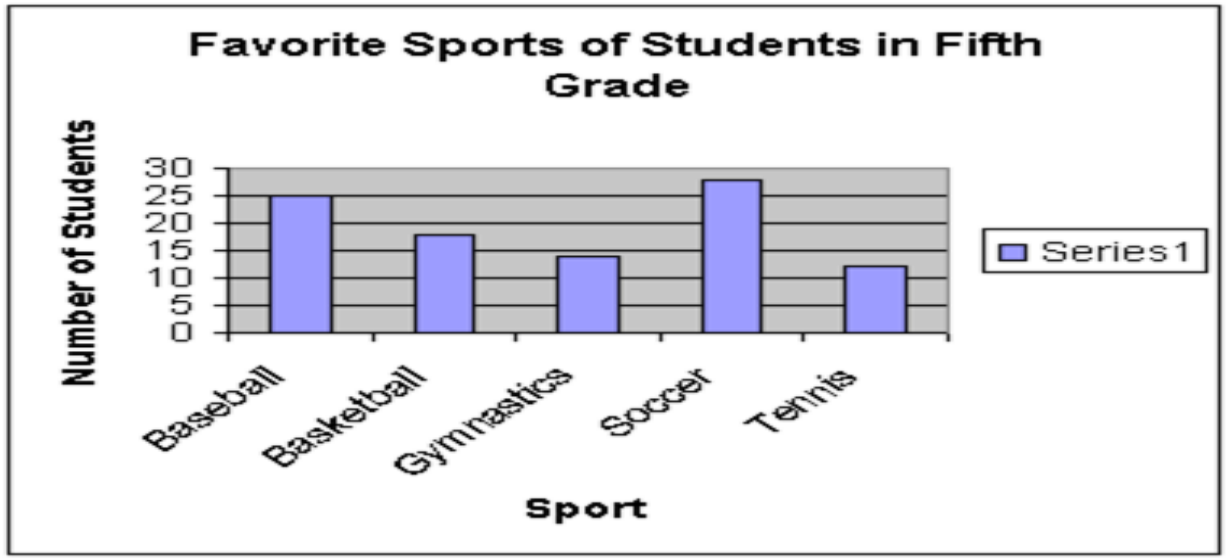
A percent graph is one of the most commonly used line graphs in ABA



Bar Graphs

- No distinct data points representing successive response measures through time
- Functions
  - Displaying and comparing discrete sets of data that ARE NOT related by a common underlying dimension by which the horizontal axis can be scaled
  - Visual summary of participant or group performance during different experimental conditions
- Provides efficient summary of data
  - DOES NOT allow for analysis of variability & trends in behavior

Sample Bar Graph



Cumulative Record

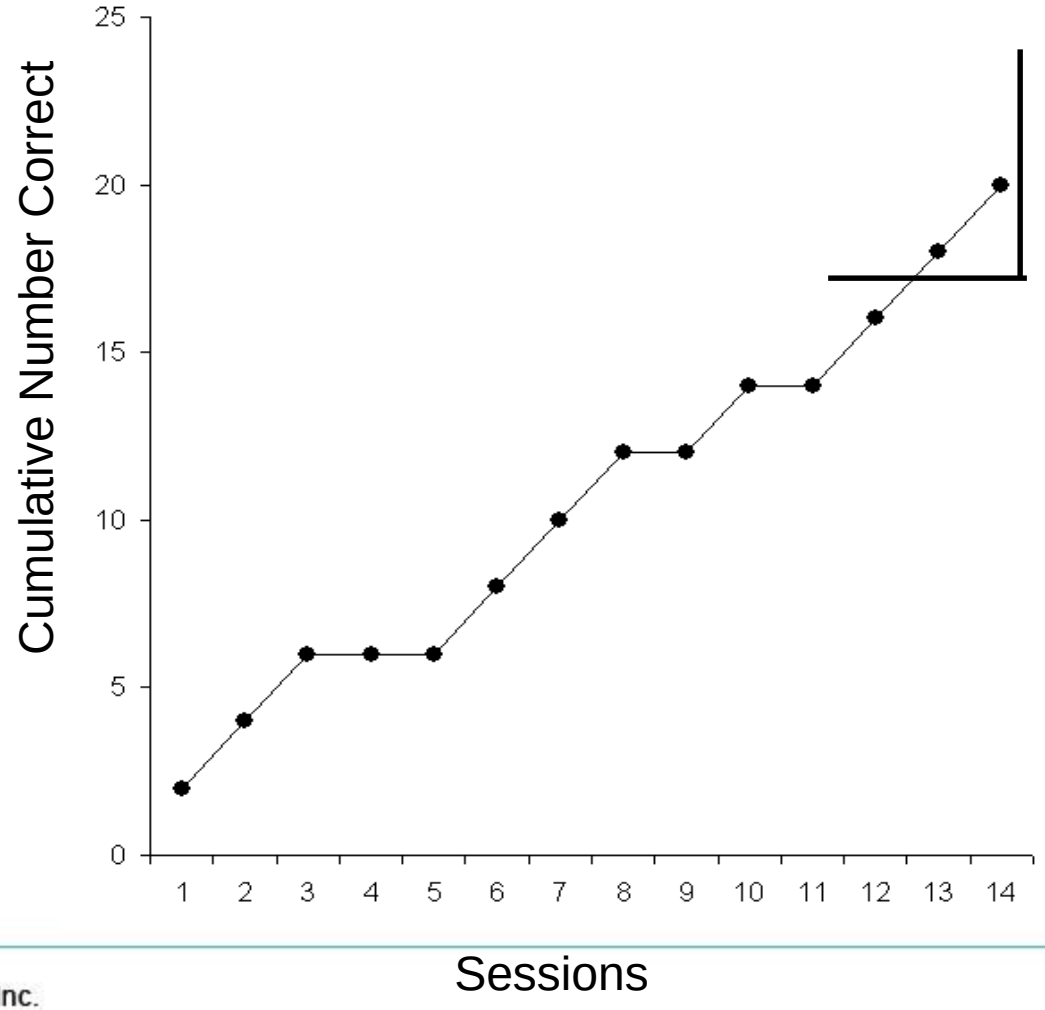
- Number of responses recorded are added to the total number of responses recorded during previous observations
  - Cumulative

- Y-Axis (vertical axis)
  - Represents the total number of responses recorded since the start of data collection

- Display
  - Total number of responses at any given point in time

- Relative rates of response
  - The steeper the slope, the higher the response rate

Sample Cumulative Record



The steeper the slope, the higher the response rate

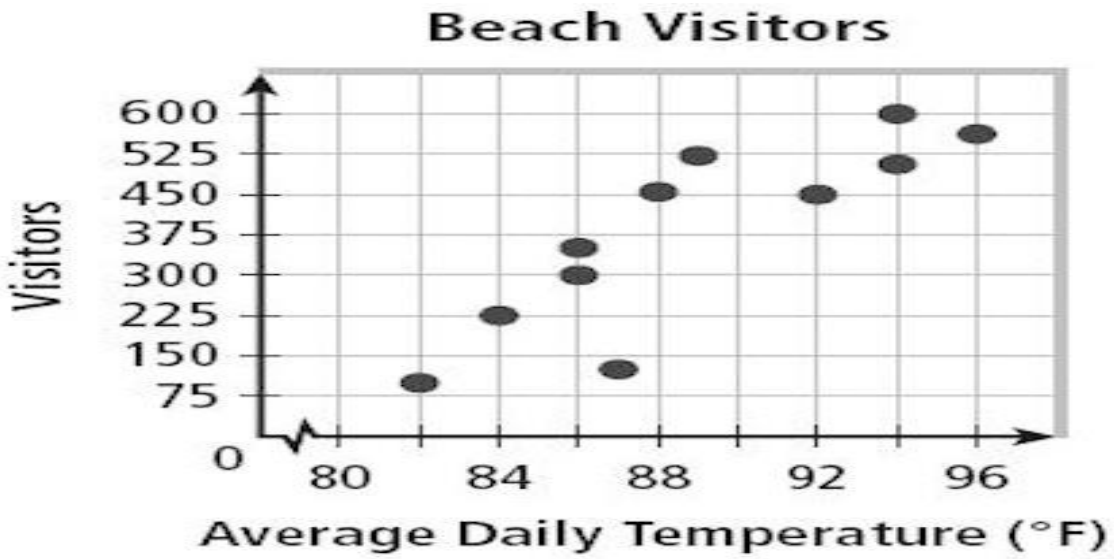
Cumulative Record (*Continued*)

- When to use cumulative graph over noncumulative graph
  - Progress toward a specific goal can be measured in *cumulative units*
    - *E.g., Number of new words learned, quarters saved*
  - Graph is used as personal feedback
    - Total progress and relative rate of performance easily detected
  - Target behavior can only occur once per observation period
    - Yes/No
  - Intricate details between behavior & environmental variables are of interest
    - E.g., within session analyses

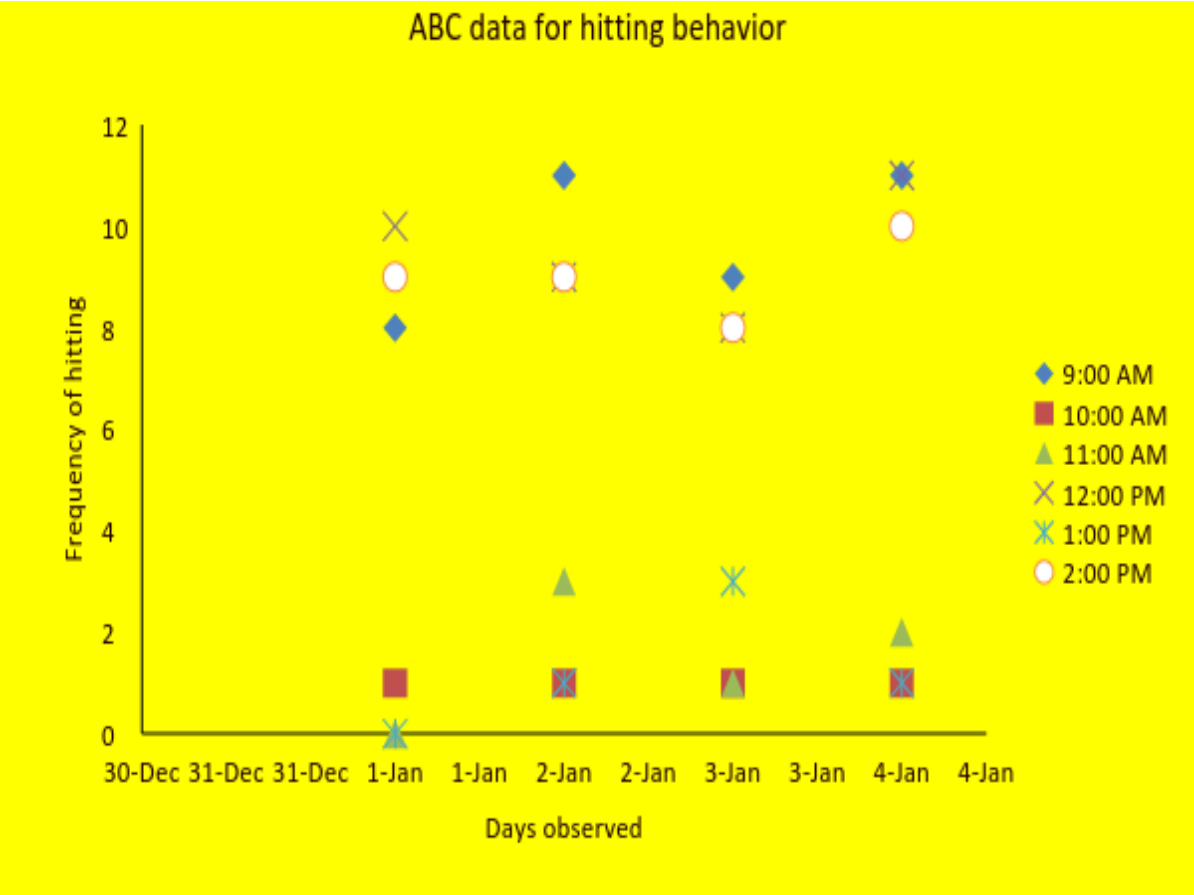
Scatterplot

- Shows relative distribution of individual measures in a data set
- Data points are **NOT CONNECTED**
- Depicts changes in value on one axis correlated with changes in value on the other axis
- A scatter plot is used best when highlighting patterns. Patterns suggest certain relationships
  - Sometimes used to discover the temporal distribution of the target behavior
  - Sometimes you may be wondering if the behavior occurs at a certain time of day, or in the presence of a certain individual. A scatter plot can provide the visual analysis to make some assumptions and thus guide your intervention.
- A scatter plot is typically not used to display behavior change procedures.
- A scatter plot can be a helpful way of visually analyzing ABC data

Sample Scatterplot #1



Sample Scatterplot #2



Date	Time	A	B	C
2-Jan	9:00 AM	mom said goodbye	hit teacher 11 times	ignored prompted to seat
2-Jan	9:05 AM	teacher prompting to sit down	hit teacher 1 time	continued to prompt
2-Jan	10:45 AM	peer took toy away	hit peer 3 times	teacher said "no hitting"
2-Jan	12:00 PM	lining up for lunch	hit teacher 9 times	ignored and prompted to stay in line
2-Jan	2:00 PM	singing good bye song	hit teacher 1 time	prompted to continue singing
2-Jan	2:05 PM	lining up to go home	hit teacher 9 times	teacher said "no hitting"

Analyzing Data

Describing Graphical Representation

- **Variability**
- **Level**
- **Trend**

Variability

“Variability refers to the extent to which measures under the same environmental conditions differ from one another” (Cooper, Heron, and Heward, 1987, p. 131).

- Data points depicting high variability show a lack of stability.
- High variability often requires the need for additional data.
- Does the behavior have spikes up/down (variable)?

Level

The level is examined in terms of median, mean, or range

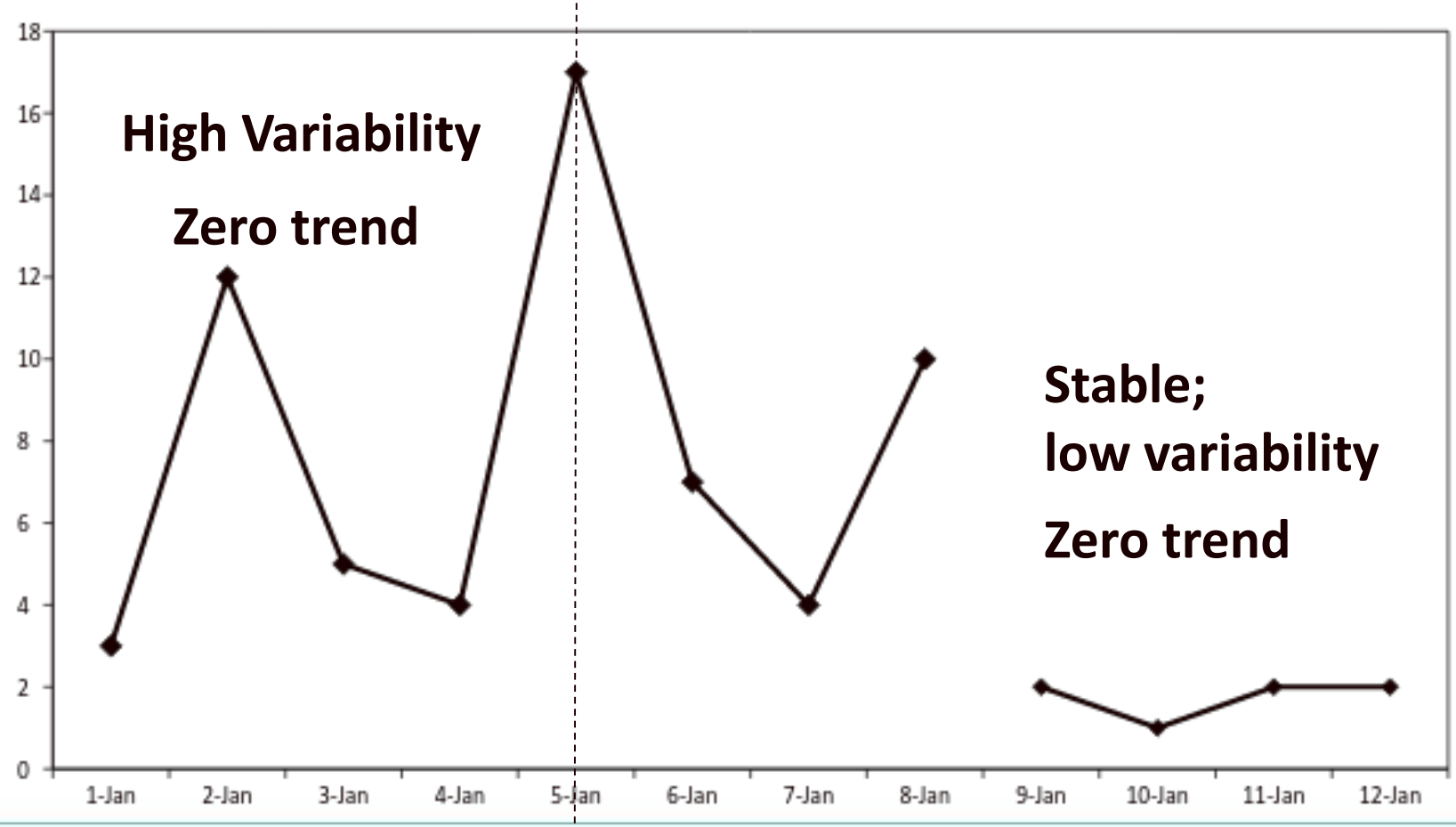
- Typically viewed as the average of all data points in a given phase.
- If there is much variability amongst data points, level may be irrelevant.
- Stability: When data points fall at or near a specific level
- Does the behavior have a steady line that is almost flat/horizontal (no spikes).

Trend

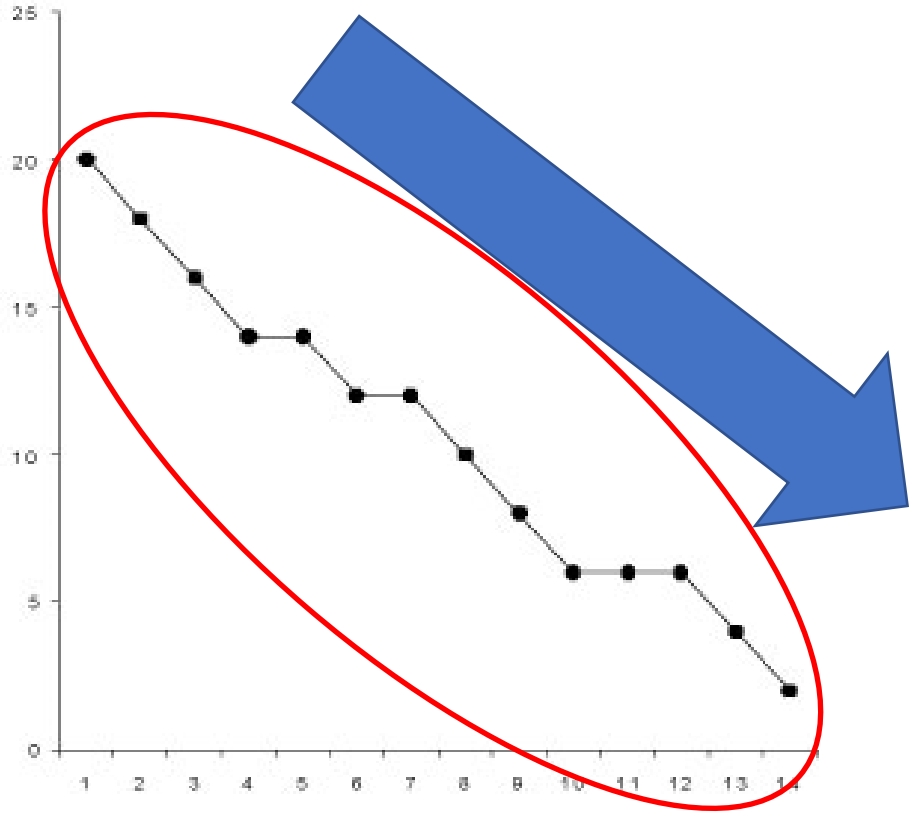
"**Trend refers to the overall direction taken by a data path"** (Cooper, Heron, and Heward, 1987, p. 133).

- The direction described by the data points can either be increasing, decreasing, or zero trend.
- Degree of trend: gradual or steep.
- Is the behavior on an upward trend, downward trend, or stable tend?

Variability and Trend

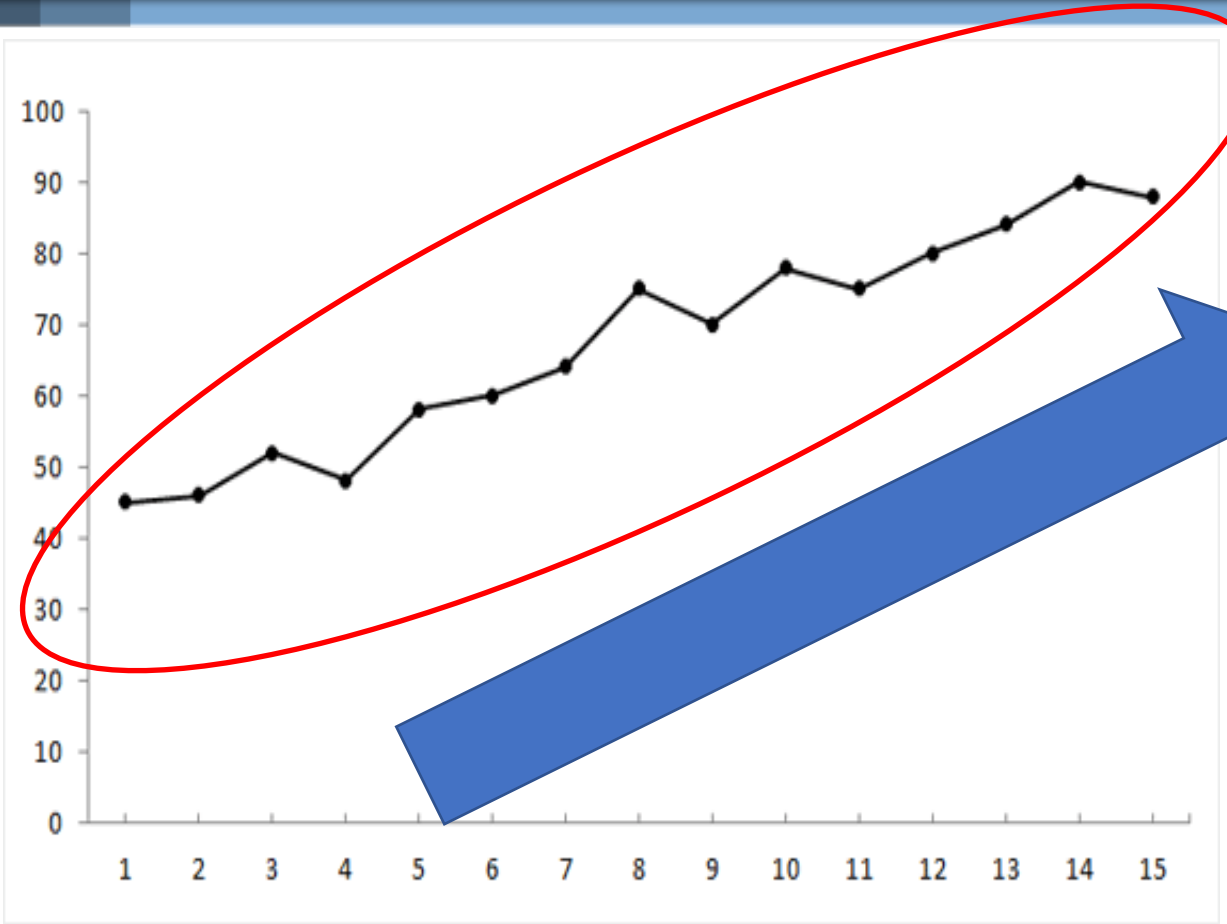


Describe the Graph



Rapidly Decreasing, stable trend (downward trend)

Describe the Graph



Gradually increasing, stable trend (upward trend)

Paper Graphing Tutorial

- Graphing in your student's program binder can be quick and easy when you have your binder organized and your graphs properly set up.

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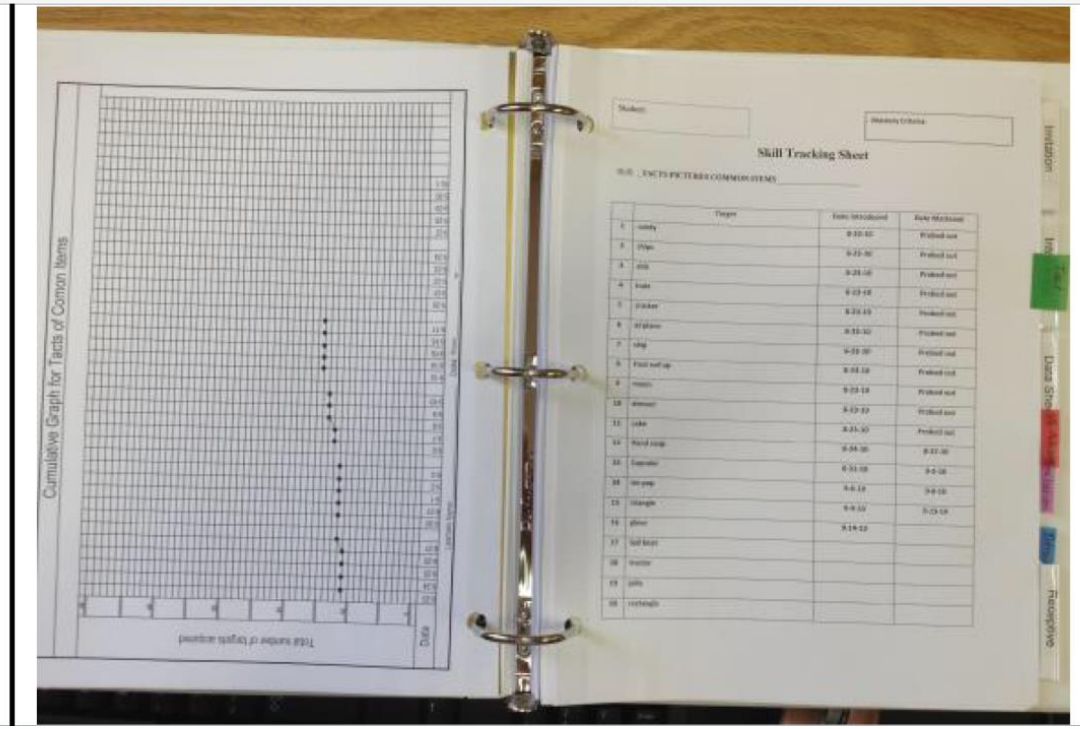


Sample Data Sheet

Percent Correct Response Graph

Student: John Q.

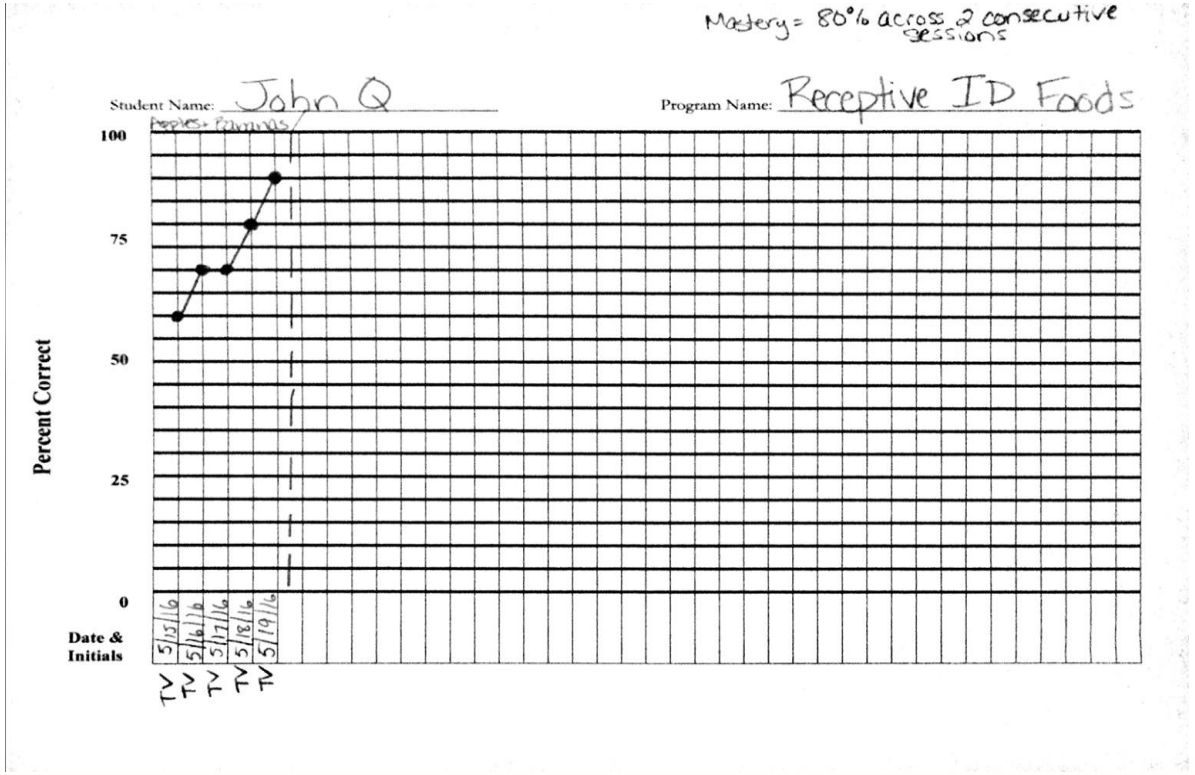
Program: Receptive Identification of Food Items

Current Target: ID bananas and apples in F-O6

Date/Initials	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	% correct
5/15/20 TV	-	-	+	-	+	+	-	+	+	+	60
5/16/20 TV	-	+	-	-	+	+	+	+	-	+	70
5/17/20 TV	+	-	+	+	+	-	-	+	+	+	70
5/18/20 TV	-	+	+	+	+	+	+	-	+	+	80
5/19/20vTV	+	-	+	+	+	+	+	+	+	+	90

Paper Graphing (Cont.)

Once our data is collected and calculated into percent correct data, we need to graph the data in order to accurately analyze the data and our student's progress. Here is an example of John's data properly graphed.



Graphing Considerations

- **Every graph should include:**
  - The student's name
  - Program name and current targets
  - Dates
  - The initials of the person who collected the data.

- **Why is it important to include the initials of the person who collected the data?**
  - When there is more than one person working with the same child on the same goals, being able to see who ran each session can be helpful in understanding data fluctuations and determining why a program might have very variable data.
  - Two different teachers may be running the program differently or expecting different levels of responses. It could be that one instructor has more effectively paired with the student and is therefore able to elicit better attention and responding.

Graphing Considerations (Cont.)

- Graphing should be done **daily** at the **end of every session** to ensure programs are progressing and not being overrun (once a skill is mastered, you want to move the program on).
- This also gives you a chance to note if a program needs to be changed, modified, or if a prompt procedure needs to be added.

Computer Graphing Tutorial

ABA Terminology

- Direct Observation
- Indirect Observation
- Direct Measurement
- Indirect Measurement
- Continuous Recording
- Discontinuous Recording
- Frequency
- Rate
- Duration
- Latency
- Interval
- Level
- Variability
- Intensity
- Trial-by-trial Data
- Event Recording
- Momentary-time Sampling
- Whole Interval Recording
- Partial Interval Recording
- Permanent Product Recording
- Baseline
- Probe Data
- X-axis
- Y-axis
- Trend

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