ASSUMPTIONS, DEFINITIONS, AND PRINCIPLES FOR A SCIENCE-BASED APPROACH TO TEACHING & LEARNING

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Presented for Eldar ABA Studies
Tel Aviv, Israel - June 13, 2016
Outline

Science
- purpose/aim
- assumptions and attitudes shared by all scientists
- basic methodology

A science-based approach to education
- underlying definitions and assumptions
- guiding principles

Distinguishing science-based teaching practices from those made popular by fad, fashion, fraud, and faulty notions.
- anti-science, pseudoscience
- critical thinking and skepticism
GUIDED NOTES

Participants’ Guided Notes for

ASSUMPTIONS, DEFINITIONS, AND PRINCIPLES FOR A SCIENCE-BASED APPROACH TO TEACHING & LEARNING

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Outline

• Science: Purpose, assumptions, basic methodology
• A science-based approach to education: Definitions and assumptions
• Guiding principles for a science-based approach to education
• Recommended readings

Explanation of Symbols in Guided Notes

○ Write a definition, concept, key point, or procedure next to each bullet or asterisk during lecture/class.

□ Fill-in blank lines with key word(s) to complete a definition, concept, key point, or procedure during lecture/class.

◆ The pointing finger comes into play later when you review and study your notes. The finger is a prompt to think of and write your own examples of a concept or ideas for applying a particular strategy.

Big Idea A statement or observation with wide-ranging implications for understanding and/or applying course content.

GOAL OF SCIENCE

What Is Science?

• A systematic approach for __________________________ about the natural world.

• Goal/purpose:
  o to achieve a thorough understanding of the phenomena under study.
  o To discover natural facts and universal laws that exist and operate

  held by an person or group, including the scientist.

Levels of Scientific Understanding - three levels of scientifc understanding that yield different types of knowledge:

• __________________________ - objective facts derived from observational studies
  o can be quantified, classified, & examined for possible relations with other known facts
  o descriptive studies often lead to hypotheses or questions for additional research

• __________________________ - repeated observations reveal a consistent correlation between two events
  o when one event occurs another event occurs (or doesn’t) with some known probability
  o results of correlational studies do not signal a causal relationship, but do enable preparation

• __________________________ - based on experimental demonstrations of a __________________________ between two events.
What Is Science?

* Systematic approach for seeking and organizing knowledge about the natural world

* Goal/Purpose
  - a thorough understanding of phenomena under study
  - discover natural facts and universal laws that exist and operate independent of the opinions and beliefs held by any person or group, including the scientist
Levels of Scientific Understanding

Different types of scientific investigations contribute to three types or levels of understanding:

- description
- prediction
- control

Each level contributes to the overall knowledge base in a given field of science.
Levels of Scientific Understanding

- **Description -** objective facts derived from observational studies
  - can be quantified, classified, & examined for possible relations with other known facts
  - descriptive studies often lead to hypotheses or questions for additional research
Levels of Scientific Understanding

* Prediction - repeated observations reveal a consistent correlation between two events
  - when one event occurs another event occurs (or doesn’t) with some known probability
  - results of correlational studies do not signal a causal relationship, but do enable preparation
Levels of Scientific Understanding

* Control - based on experimental demonstrations of a functional relation between events

- A functional relation is evident when the systematic manipulation of one event reliably produces a predictable change in another event and the change was unlikely the result of extraneous factors.

- used to develop technologies (e.g., medicine, communications, transportation, ... socially significant behavior change!)
How Science Gets Done

Instruments improve our contact with behavior and the variables of which it is a function.

B. F. Skinner – Science and Human Behavior (1953)
How Science Gets Done

- There is no standard “scientific method”
- Scientists in all fields share
  - an assumption about the nature of the universe and
  - a set of attitudes that guide their practice
- This assumption and attitudes guide both basic and applied research in behavior analysis
Attitudes of Science

* Determinism - scientists presume the universe is lawful and orderly.
  
  - natural events do not occur in a completely random, chaotic way
  
  - natural events are related to one another in systematic ways
Attitudes of Science

* Empiricism - scientists conduct objective, systematic observations of the phenomena of interest.

* Empirical results (i.e., data) are:
  - independent of the beliefs, prejudices, and opinions of the scientist or others
  - available for inspection and interpretation by others
Experimentation - scientists conduct experiments. An experiment is a controlled comparison of some measure of the phenomenon of interest under at least two different conditions.
Replication - scientists repeat experiments to confirm previous findings and discover errors and determine the reliability and believability of findings.
Attitudes of Science

* Parsimony - scientists prefer simple, logical explanations over complex or abstract explanations. Parsimonious interpretations...
  - contain only those elements necessary and sufficient to explain the phenomenon
  - help scientists fit findings within the existing knowledge base
Philosophic doubt - scientists continually question the truthfulness of current knowledge.

This healthy skepticism requires scientists to...

- regard all theory and knowledge as tentative
- replace or revise current beliefs with knowledge from new discoveries
How ABA Science Gets Done

- ABA is a science devoted to understanding and improving human behavior.
- Research methods in ABA are guided by how behavior analysts define their subject matter (i.e., behavior) and the working assumptions they hold about it.
2 Defining Features of Behavior

* Behavior is an individual phenomenon.
* Behavior analysts define the subject matter of their science as the interaction between an organism and its environment.
* Therefore, experimental method in ABA focus on within-subject analyses of behavior-environment relations.
2 Defining Features of Behavior

- Behavior is a dynamic, continuous phenomenon
- Behavior occurs in an ongoing, unbroken stream
  - you can't hold it still
  - a dead person can't do it
- Therefore, repeated measurement over time is a hallmark of ABA research and practice.
2 Assumptions About Behavior

* Behavior is determined
  - like all natural phenomena, behavior is functionally related to other events.

* Therefore, functional relations between environmental events and behavioral improvements is the primary goal of ABA experiments.
2 Assumptions About Behavior

* Behavioral variability is extrinsic to the organism.

* Behavioral variability observed in an ABA experiment is considered a function of one or a combination of environmental factors:
  - the independent variable under investigation
  - uncontrolled factor(s) within the experiment
  - uncontrolled or unknown events outside of the experiment
Role of Measurement in ABA

* ABA is a scientific approach for
  * discovering environmental variables that reliably influence socially significant behavior (i.e., improve people’s lives), and
  * developing a technology of behavior change based on those discoveries.

* Both goals require accurate, reliable measurement of the existence, direction, and extent of behavior change.
Measurement Defined

- The process of assigning numbers and units to particular features of objects or events.

- It involves attaching a number representing the observed extent of a dimensional property to an appropriate unit.

- The number and the unit together constitute the measure (e.g., 15 cm, 50 kg, 30 sec)

Johnston & Pennypacker (1993)
Direct and frequent measurement enables practitioners to detect their successes and, equally important, their failures so they can make changes to change failure to success.

- Cooper, Heron, & Heward (2007)
**Dimensional Quantities of Behavior**

- **Repeatability** - instances of a response class can occur repeatedly through time (i.e., behavior can be counted).

- **Temporal extent** - each instance of behavior occurs during some amount of time (i.e., duration of behavior can be measured).

- **Temporal locus** - each instance of behavior occurs at a certain point in time with respect to other events (i.e., when behavior occurs can be measured).

Cooper, Heron, & Heward (2007, pp. 75-76)
Definitional Measures

**Topography** the physical form or shape of the behavior can be measured (and modified).

**Magnitude** the force or intensity with which a response is emitted can be measured (and modified).

Cooper, Heron, & Heward (2007, pp. 83)
Measurable Dimensions of Behavior

- Rate/Frequency - how many responses occur in a given amount of time, usually measured in number of responses per minute
- Duration - how long a response lasts
- Latency - how much time elapses between a stimulus change and onset of a response
- Topography - the correctness or quality of the response
- Magnitude - the strength or intensity of the response
Let's practice ...

Rate/Frequency

Duration

Latency

Topography

Magnitude
Which Dimension?
(Rate/Frequency, Duration, Latency, Topography, or Magnitude?)

Mrs. Lehrer asks her fourth graders to get their science books out and turn to page 48. Mandy responds by getting out of her seat, sharpening her pencil, throwing some paper away in the trashcan, and talking to another student on the way back to her seat. Mrs. Lehrer says, "Mandy, I told you to get your science book out." Mandy replies, "I am!"
Mandy did not contact reinforcement for getting out her science book because her latency was too long.

✓ latency was too long
✓ 1, 2, 8
Devorah complains to her parents that she often must stay in the classroom and work on math problems during morning recess. When Deborah’s parents asked the teacher about this they were told that their daughter is a well-behaved, pleasant student who answers problems accurately. But because she does not finish all assigned problems in the allotted time, Devorah has to finish the problems during recess.
Which Dimension?
(Rate, Accuracy, Duration, Latency, or Magnitude?)

Devorah often misses morning recess because her-

✓ rate of answering math problems is too slow
✓ 1, 5, 7
Which Dimension?
(Rate, Accuracy, Duration, Latency, or Magnitude?)

Zee is working part-time at a t-shirt store. His job involves sealing logos and designs on t-shirts with a hot pressing machine. To operate the machine, a lever must be **pulled down with significant force** and then lifted back up. Zev’s supervisor has complained that some customers are returning the t-shirts because the logos are falling off.
customers are complaining because Zev’s -

✓ magnitude of lever pulling is too low
✓ 4, 7, 10
Yonatan is part of a four-person packaging team at the Goldstar Brewery. The other members of the team are complaining that Yonatan is not getting his items packaged fast enough, causing the team to miss out on bonus pay for meeting production quota.
Which Dimension?
(Rate, Accuracy, Duration, Latency, or Magnitude?)

Yonatan’s team is losing pay for meeting production quotas because his-

✓ rate/frequency of packaging items is too slow

✓ 1, 3, 9
Ariel has been learning how to wait for his turn. He does all right in fast moving activities and games, but whenever the time between turns is more than 30 seconds, Ariel begins talking out and grabbing for the materials being used by another child.
Which Dimension?
(Rate, Accuracy, Duration, Latency, or Magnitude?)

Ariel has a problem taking turns because the -

☑ duration that he waits is too short

☑ 2, 3, 5
Shiri is a high school student with autism. Her academic work is improving, but she has few friends due to poor social skills. The school counselor is teaching Shiri how to engage in informal conversations with others. Shiri has learned to start conversations, and her classmates initially respond to her openers. But when it is Shiri's turn to talk, she **talks without stopping for a very long time**. Shiri is not making any new friends and her classmates are avoiding her.
Which Dimension?
(Rate, Accuracy, Duration, Latency, or Magnitude?)

Shiri’s classmates may be avoiding her because the -

✓ duration of her conversational talk is too long

✓ 7, 7, 10
Leah’s teacher is trying to help her learn to initiate conversations with peers during recess and lunch break by saying, “Hi guys, how's it going?” But Leah goes up to the group and immediately begins telling them what he saw on TV the night before. Her peers usually ignore her or walk away.
Which Dimension?
(Rate, Accuracy, Duration, Latency, or Magnitude?)

Leah's problem starting conversations may be because of the poor-

✓ topography of her conversation openers--he says the wrong things

✓ 2, 4, 8
Measurement: Necessary but Not Sufficient

- Measurement provides evidence of behavior change, but measurement alone cannot reveal why the change occurred.

- Applied behavior analysts conduct experiments to determine the factors responsible for behavior change.

- This is the analysis in ABA.
Components of ABA Experiments

- subject/participant
- behavior
- setting
- measurement system and ongoing visual analysis
- treatment/intervention
- manipulation of the independent variable
- experimental question
Other Ways of Knowing

- contemplation
- common sense
- logic
- authority
- folklore
- religious beliefs
- political campaigns
- testimonials
- pseudo-science
What Every Behavior Analyst Should Know About the “MMR Causes Autism” Hypothesis
William H. Ahearn, Ph.D., BCBA, The New England Center for Children, Western New England College

ABSTRACT
In 1998, the English physician Andrew Wakefield suggested that the MMR vaccine insults the guts of children who then regress developmentally and become autistic. Although his research did not provide firm evidence for this hypothesis, many believe that (a) the MMR vaccine can cause autism; (b) children with autism typically have gastrointestinal problems; and, (c) a necessary component of treating autism is “treating the gut” through dietary restrictions. Research has subsequently shown that Wakefield’s hypothesis is unquestionably false, children with autism are not more likely to have gastrointestinal problems, and there is no sound evidence that diets are a valid treatment for autism. This paper will critically review these topics.

Keywords: Andrew Wakefield, autism, MMR vaccine, vaccines

BEHAVIOR ANALYST USE OF AND BELIEFS IN TREATMENTS FOR PEOPLE WITH AUTISM

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2Pathway School, Norristown, PA, USA

With the increase in the numbers of children diagnosed with autism and scientific support for Applied Behavior Analysis (ABA) treatment, a proliferation of professionals have sought to provide services to this population. However, not all have been reported to provide services. This study surveyed Board Certified Behavior Analysts (BCBAs; N = 469) on their beliefs, endorsement, and use of a variety of scientifically supported and unsupported treatments for people with autism. Although not all endorsed using ABA, BCBAs professionals most strongly endorsed using ABA and ABA-related treatments. Surprisingly, BCBAs endorsed and used all types of treatments despite their beliefs that the treatments were difficult to implement, not cost effective, and not supported by research. Copyright © 2008 John Wiley & Sons, Ltd.

Radical Behaviorism: A Productive and Needed Philosophy for Education

William L. Heward, Ed.D.1,2 and John O. Cooper, Ed.D.3

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Radical behaviorism is the philosophy of the science of behavior originating in the work of B. F. Skinner and elaborated over the years by a community of researchers, scholars, and practitioners. Radical behaviorism is a complete, or thoroughgoing behaviorism in that all human behavior, public and private, is explained in terms of its functional relations with environmental events. Radical behaviorism is often misrepresented in the literatures of education and psychology. Two fundamental misconceptions of radical behaviorism are that its followers (1) are logical positivists who require that a phenomenon be observed by two or more people before it qualifies for scientific analysis, and (2) either will not or cannot incorporate private events (e.g., thoughts, feelings) into their analyses of human behavior. This paper offers an advocacy perspective on contemporary radical behaviorism. In particular, we define radical behaviorism and briefly outline the history of the term’s use in psychological literature, discuss the scientific practice of behavior analysts, explain the “intolerance” exhibited by radical behaviorists, and comment on the use of popularity as a criterion for good science. The paper concludes with a discussion of the recent shift in educational research and practice from empiricism and outcome-oriented intervention toward a holistic/constructivist philosophy described by its advocates as incompatible with behaviorally-based instruction.

KEY WORDS: behaviorism; educational theory and practice; epistemology; methodological behaviorism; radical behaviorism.
Definitions and Assumptions for a Science-Based Approach to Education

Definitions

* **Learning** – a change in behavior due to changes in the environment. In education, learning entails the acquisition and generalization of knowledge or skills due to instruction.

* **Curriculum** – the knowledge and skills students are to learn and that teachers should teach (e.g., reading, math, science).

* **Instruction** – the things teachers do to help students learn curriculum content. All instructional methods (i.e., teaching) entail changing the learner’s environment.
Definitions and Assumptions for a Science-Based Approach to Education

Definitions

- **Lesson** – planned period of instruction focused on at least one measurable learning objective.

- **Effective lesson (short term)** - students know something (e.g., who discovered the polio vaccine) and/or can do something (e.g., calculate the area of a circle) that they didn’t know and/or couldn’t do prior to the lesson (i.e., acquisition).

- **Effective lesson (long term)** - students use the knowledge and/or skills acquired in the lesson in relevant settings/situations at a later time (i.e., generalization and maintenance).
Definitions and Assumptions for a Science-Based Approach to Education

Assumptions

* Students can and do learn without being taught.
* More learning is better than less.
* What teachers do (and don’t do) influences student learning.
Guiding Principles for a Science-Based Approach to Education
Principle #1: Effective teaching practices are identified by their function, not form

- To the extent a teaching practice enables students to learn and subsequently use knowledge and skills they did not have prior to instruction, the practice can be judged effective.

- The learning outcomes produced by a teaching practice, not its structure or form (i.e., what it looks like) is of primary importance.

  “The proof of the process is in the pudding.” - Tom Lovitt
Principle #2: The most effective teachers focus on alterable variables.

- Alterable variables
  - reliably affect student learning and can be controlled by teaching practices (Bloom, 1980).

- Examples: time allocated for instruction, sequence of activities in lesson, whether students make recognition or recall responses, pacing of instruction, how errors are corrected

  "The proof of the process is in the pudding." - Tom
Principle #3: Active student responding (ASR) is a kingpin alterable variable

- High-ASR lessons produce more learning than lessons in which students make few responses or passively attend.
- ASR occurs when a student makes a detectable response to the lesson.
- Teachers know active student participation is important.
- The challenge: providing all students with frequent opportunities to respond during group instruction.

Recommended reading: Heward & Wood, 2015
Principle #4: Details the lesson’s instructional design determine what students learn

- ASR is a major factor in how quickly and how much students learn during instruction.
- The selection, sequence and design of instructional examples and materials determine what students learn.
- Stimulus control matters!
A compound word is made by joining together two smaller words. Put these puzzle pieces together to make nine list words.
Word Check 2
UNIT 2: BELOW AND ABOVE EARTH’S SURFACE

Name ___________________________ Class __________ Date __________

Read each clue. Look in the Word Box for the word that matches the clue. Write the word where it belongs in the puzzle.

Clues

Across
1. The layer of air closest to Earth
2. The line on a globe that divides Earth into a Western Hemisphere and an Eastern Hemisphere
3. The center of Earth
4. Half of a round object
5. The line on a globe that divides Earth into a Northern Hemisphere and a Southern Hemisphere
6. The layers of air above Earth’s surface
7. How hot or cold something is
8. Earth’s solid outer layer
9. Strong pulling force from inside Earth
10. Very tiny droplets of water or other liquid
11. The layer of hot and melted rock below Earth’s crust

Down
2. The line on a globe that divides Earth into a Western Hemisphere and an Eastern Hemisphere
9. ____________
10. ____________
11. ____________

Word Box

atmosphere  core  crust  equator  gravity
hemisphere  mantle  prime meridian
temperature  troposphere  vapor
Principle #5 - Explicit instruction is better than round-about teaching*

Explicit instruction is characterized by:

- clearly defined and measurable learning objectives
- presentation of new material in small steps
- frequent, active, and successful participation by all students that moves from guided to independent practice
- systematic feedback and error correction
- students’ learning monitored by varied exercises (e.g., seatwork, peer tutoring, homework)

* when specific learning outcome matter; “round-about teaching” is proxy for trial-and-error learning, discovery learning, exploration, facilitated learning, or any other approach where teachers help students construct their own meaning in the absence of specific learning outcome.
Principle #6 - You can’t teach everything a student with disabilities needs to learn

* Most students with disabilities have many skill deficits and behavioral excesses.

* Attempting to treat the entire scope of a student’s learning needs at once invites failure. Neither the student nor his/her teacher(s) can devote the time and resources needed for so many behavior changes.

* Sometimes “thinking small” takes us the farthest. Enables team and student to focus instructional resources on the most important and accessible behavior changes.
### Judging the Relevance of a Potential Target Behavior

#### Considerations

<table>
<thead>
<tr>
<th>Behavior Consideration</th>
<th>Assessment</th>
<th>Rationale/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is this behavior likely to produce reinforcement in the client's natural environment after intervention ends?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
<tr>
<td>Is this behavior a necessary prerequisite for a more complex and functional skill?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
<tr>
<td>Will this behavior increase the client's access to environments in which other important behaviors can be acquired and used?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
<tr>
<td>Will changing this behavior predispose others to interact with the client in a more appropriate and supportive manner?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
<tr>
<td>Is this behavior a pivotal behavior or behavioral cusp?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
<tr>
<td>Is this an age-appropriate behavior?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
<tr>
<td>If this behavior is to be reduced or eliminated from the client's repertoire, has an adaptive and functional behavior been selected to replace it?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
<tr>
<td>Does this behavior represent the actual problem/goal, or is it only indirectly related?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
<tr>
<td>Is this &quot;just talk,&quot; or is it the real behavior of interest?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
<tr>
<td>If the goal itself is not a specific behavior (e.g., losing 20 lbs.), will this behavior help achieve it?</td>
<td>Yes/No/Not sure</td>
<td></td>
</tr>
</tbody>
</table>

#### Summary notes/comments:

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Cooper, Heron, & Heward (2007), *Applied Behavior Analysis, 2nd ed.* (p. 54). Pearson Education.
Prioritizing Potential Target Behaviors

Client's/Student's name: ____________________________ Date: ____________

Person completing worksheet: ____________________________

Rater's relationship to client/student: ____________________________

Directions: Use the key below to rank each potential target behavior by the extent to which it meets or fulfills each prioritization criteria. Add each team member's ranking of each potential target behavior. The behavior(s) with the highest total scores would presumably be the highest priority for intervention. Other criteria relevant to a particular program or individual's situation can be added, and the criteria can be differentially weighted.

Key: 0 = No or Never; 1 = Rarely; 2 = Maybe or Sometimes; 3 = Probably or Usually; 4 = Yes or Always

<table>
<thead>
<tr>
<th>Potential Target Behaviors</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does this behavior pose danger to the person or to others?</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
</tr>
<tr>
<td>How many opportunities will the person have to use this new skill in the natural environment? or How often does the problem behavior occur?</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
</tr>
<tr>
<td>How long-standing is the problem or skill deficit?</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
</tr>
<tr>
<td>Will changing this behavior produce a higher rate of reinforcement for the person?</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
</tr>
<tr>
<td>What is the relative importance of this target behavior to future skill development and independent functioning?</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
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<tr>
<td>Will changing this behavior reduce negative or unwanted attention from others?</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
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<tr>
<td>Will changing this behavior produce reinforcement for significant others?</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
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<tr>
<td>How likely is success in changing this behavior?</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
</tr>
<tr>
<td>How much will it cost to change this behavior?</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
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</tbody>
</table>

Totals
A student who does not use new knowledge and skills in relevant settings over time, does not experience an improved quality of life.

The traditional non-approach of “train and hope” isn’t good enough.

Applied behavior analysis research has identified strategies and tactics for promoting maintenance and generalization.

Educators should be knowledgeable of these methods and skilled in their application.
Principle #8 - Your students can tell you how well you’re teaching, let them

- Don’t ask students, “Do you understand?” They will always say, “Yes.”

- Don’t rely on answers of a few students who raised their hands to participate during the lesson.

- Students’ responses during high-ASR activities provide direct, ongoing information on
  - their understanding of and growing competence with lesson’s objectives, and
  - your effectiveness
Eight Guiding Principles for a Science-Based Approach to Education

1. Choose teaching practices by their function, not form
2. Focus on alterable variables
3. Provide lots of ASR; it’s a kingpin variable
4. Pay attention to details of instructional design (watch out for faulty stimulus control!)
5. Use explicit instruction
6. Carefully select and prioritize skills a student with disabilities needs to learn
7. A skill worth teaching merits a plan for its generalization and maintenance
8. Let your students’ responses tell you how well you’re teaching
Let's practice ...

<p>| | | | |</p>
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<tbody>
<tr>
<td>1</td>
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<td></td>
<td>Yes/True</td>
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<td>No/False</td>
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<td>A</td>
<td>B</td>
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<td></td>
<td>C</td>
<td>D</td>
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</tbody>
</table>
True or False?

The best way to find out if students understand key parts of a lesson is to ask them?
True or False?

The best way to find out if students understand key parts of a lesson is to ask them?

False!

Provide students with frequent opportunities to respond during the lesson. Students’ responses will make clear how well they “understand.”
True or False?

The overarching purpose of practitioners whose work is guided by applied behavior analysis is improving people’s quality of life by changing socially significant behavior.
True or False?

The overarching purpose of practitioners whose work is guided by applied behavior analysis is improving people’s quality of life by changing socially significant behavior.

TRUE - 4 & 5
True or False?

Empiricism is the assumption held by scientists that the universe is lawful and orderly; that natural events are related to one another in systematic ways.
True or False?

Empiricism is the assumption held by scientists that the universe is lawful and orderly; that natural events are related to one another in systematic ways.

**False - 4, 8, & 9**

Determinism is the assumption held by scientists that the universe is lawful and orderly; that natural events are related to one another in systematic ways.
Principles for a Science-based Approach to Teaching & Learning

Explicit instruction is characterized by ..

A. clearly defined, measurable learning objectives

B. frequent, active, and successful participation by all students (i.e., high ASR)

C. systematic feedback and error correction

D. all of the above
Explicit instruction is characterized by ..

D. all of the above (and more*)

* presentation of new material in small steps; students’ learning monitored by varied exercises
Principles for a Science-based Approach to Teaching & Learning

If a skill is important enough to teach, teachers should...

A. devise a plan to promote students’ generalization and maintenance of the skill
B. devote some instructional time to the skill each day
C. tell students to never forget the skill
D. all of the above
Principles for a Science-based Approach to Teaching & Learning

If a skill is important enough to teach, teachers should...

A. devise a plan to promote students’ generalization and maintenance of the skill

2, 4, & 10
What is Science?

Scientific investigations contribute to these three types or levels of understanding:

A. see, hear, and report

B. description, prediction, and control

C. experimentation, manipulation, and documentation

D. external, internal, and uncontrolled
What is Science?

Scientific investigations contribute to these three types or levels of understanding:

B. description, prediction, and control

6, 7
What is Science?

An experiment is...

A. the only meaningful way to contribute to scientific knowledge
B. any careful test of the researcher’s hypothesis
C. a controlled comparison of some measure of the phenomenon of interest under at least two conditions (e.g., the presence and absence of some variable)
D. both A and C
What is Science?

An experiment is...

C. a controlled comparison of some measure of the phenomenon of interest under at least two conditions (e.g., the presence and absence of some variable)

1, 9
True or False?

Experimental control is achieved when repeated observations reveal a consistent correlation between two events.
True or False?

Experimental control is achieved when repeated observations reveal a consistent correlation between two events.

**False - 5, 6, & 10**

*Experimental control* requires demonstration of a functional relation between events.
What is Science?

A functional relation has been achieved when...

A. two events repeatedly change together
B. replications of an experiment produce the same results
C. systematic manipulation of one event reliably produces a predictable change in another event and the change was unlikely the result of uncontrolled factors
D. at least 2 independent observers agree experimental control has been achieved
What is Science?

A functional relation has been achieved when...

C. systematic manipulation of one event reliably produces a predictable change in another event and the change was unlikely the result of uncontrolled factors.
What is Science?

Because behavior is a dynamic, continuous phenomenon, research and practice in ABA is characterized by . . .

A. direct and repeated measures of the target behavior (or dependent variable)

B. whole-interval recording

C. frequently asking participants to report their performance

D. observing and measuring every response by the client or research participant throughout all treatment or experimental sessions
What is Science?

Because behavior is a dynamic, continuous phenomenon, research and practice in ABA is characterized by . . .

A. direct and repeated measures of the target behavior (or dependent variable)
   2, 4, 6, 8, & 10
What is Science?

Philosophic doubt is an “attitude of science” requiring scientists to..

A. continually question the truthfulness of current knowledge
B. regard all theory and knowledge as tentative
C. replace or revise current beliefs with knowledge from new discoveries
D. all of the above
Philosophic doubt is an "attitude of science" requiring scientists to...

D. all of the above

1, 3, 5, 7, & 9
2 More Handouts

FUTURE TRENDS

Evidence-Based Practice: Easier Said Than Done

Should science guide practice in special education? Most individuals would say “Yes.” However, the “devil is in the details.” (Odom et al., 2005, p. 137)

WHEN CONGRESS REAUTHORIZED IDEA IN 2004, one of the most significant changes was the stipulation that the special education and related services prescribed in a child’s IEP be “based on peer-reviewed research to the extent practicable.” Thus, Congress made a legal requirement of something many special educators had always strived to do: use the results of scientific research to ensure their students receive the highest-quality instruction.

It is unfortunate that a federal law is required to motivate educators to use scientifically sound teaching practices with children whose learning is most dependent upon effective instruction. The reality, however, is that far too few teachers use evidence-based practices in their classrooms (Burns & Ysseldyke, 2009), many students with disabilities have been the recipients of teaching methods that are misguided at best, and some students have been subjected to practices that research has shown repeatedly to be not only benignly ineffective but also harmful (Heward, 2003; Jacobson, Fox, & Mullick, 2005).

While the mandate to use evidence-based practices (EBPs) may appear straightforward, it is not. Just some of the questions that the field must address are the following: What criteria should educators use to define EBPs? Who will apply those criteria to determine which practices teachers should use and which ones should be avoided? What are the most effective and efficient ways to disseminate information about EBPs to IEP teams and teachers? How can a teacher determine the validity and trustworthiness of an EBP for her students?

DEFINING EVIDENCE-BASED PRACTICES

No universal standards exist for defining an EBP. The field of special education, and education in general, is in the process of developing criteria for determining whether a practice should be considered evidence-based. Two fundamental issues are determining criteria for the type and amount of research evidence required for a practice to be considered an EBP (Kretlow & Blitz, 2011). The Department of Education’s Institute for Education Sciences and What Works Clearinghouse have identified the randomized control trial (RCT) (also called a randomized experimental group design) as the gold standard for research methodology to show evidence of an instructional technique’s effectiveness. While there is no doubt that well-conducted RCTs provide strong experimental evidence of the effectiveness of an intervention, the research base of many special education’s research has been produced with other research methodologies, most notably nonrandomized group designs, single-subject research, and quasi-experimental studies (Odom et al., 2005).

More recently, information obtained from qualitative studies has provided conceptual frameworks and support for emerging practices that can be analyzed and evolved further with experimental studies. Examples of quality indicators for evidence education research using each of these methodologies can be found in literature (e.g., Albert, 2005; Homer et al., 2005; Thompson et al., 2005; and Brantlinger, Jimenez, Klingner, Fugach, and Richardson, 2005, respectively).

Five teams of authors applied these quality indicators to published research in the Spring 2009 issue of the journal Exceptional Children.

Another issue to be resolved is who will determine what practices are designated as evidence-based. Traditionally, peer-reviewed literature reviews and meta-analyses (a sophisticated statistical comparison and assessment of the results produced by a group of studies that evaluated the same practice) by scholars have been used. However, a recent review of research for a given practice, one author concludes the evidence base to be very strong while another’s assessment of the same set of studies yields a much lower rating (e.g., Kavale & Forness, 1996; McIntosh, Vaughn, & Zarrago, 1991).

Professional organizations and nonprofit groups are also contributing to the discussion of EBPs. For example, the Council for Exceptional Children (CEC) (2006a) proposed a process and criteria by which practices would be classified into three levels:

- Research-based practice: recommended for special educators’ repertoire
- Promising practice: may be included in special educators’ repertoire with clear caveats for following the developing literature
- Emerging practice: informative, but research base does not yet lead to recommended use

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It’s Ok to Say I Don’t Know: Advice from ASAT Advisory Board Member Bill Howard, EdD, BCBA-D by Pritchard, PNB, BCBA-D

Could you tell the readers how you came to be involved with ASAT? How long have you been on the advisory board?

Catherine Maurice, one of ASAT’s founding members, told me about the organization and invited me to participate. I was a member of ASAT’s Board of Directors for two years and have been on the advisory board since 2006.

What does ASAT signify to you? Why is it important? How does it relate to your interests and work?

Basic research has revealed some powerful principles about how people learn (e.g., reinforcement, stimulus control), and applied studies have discovered and refined strategies and techniques (e.g., self-monitoring, introducing easy tasks/known items) for putting those principles to work for the benefit of individuals with autism. No matter how powerful these findings, they’re of little impact if practitioners and parents are unable to distinguish them from the vast array of unsubstantiated claims claiming for their attention.

Ethics in education and treatment of children with disabilities have been plagued by the promise and popularity of unproven interventions (Heward & Silvestri, 2005). For example, in the ‘70s and ‘80s parents and teachers were told that having children with learning disabilities look through colored lenses and walk on balance beams would make effective readers. The multitude of ineffective (at best) and sometimes harmful autism treatments promoted today is unmatched in the history of special education. The tremendous range of behavioral deficits, excuses, and idiocesies by which autism spectrum disorders is manifested makes an especially fertile ground for the proliferation of unsubstantiated treatments.

ASAT’s mission— to educate parents, professionals, and consumers about autism and its treatment by disseminating scientifically sound information and combating inaccurate or unsubstantiated information—is every bit as important as the discovery and refinement of scientifically valid knowledge. ASAT’s leadership—an impressive mix of parents, researchers, and practitioners—does an outstanding job separating scientific wheat from ideological and/or financially driven chaff.

Resources on ASAT’s website and articles published in its newsletter inform my thinking, and I often share that information with teachers and parents with whom I work. Daniel Mruzek’s (2012) discussion of the peer review process, Jim Todd’s (2010) examination of the fallacy of facilitated communication, and Tom Zane (2010) review of Relationship Development Intervention (RDI) are examples of many excellent articles in Science in Autism Treatment that help parents and professionals recognize distinctions between scientific and unsubstantiated claims.

What kinds of things do you do related to autism?

I read, write, and talk about the relevance and use of applied behavior analysis in the education and treatment of people with autism. I don’t read nearly as much as I should, have not written as much I’d like, and almost certainly do too much talking! My most recent writing project was revising a textbook for future
תודה!

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