Interactive Computer Training for Graphing Embedded Phase Change Lines in Microsoft Excel

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Graphing in Education

• Evaluating student performance at the individual level
  • Skill Acquisition
  • Behavior Reduction Programs for Problem Behavior

• Allows for timely modification to an ineffective program
• Provides evidence to continue a successful program
Importance of Graphing and Data Analysis

Prevent Type I Errors
- When the intervention is not working, but you think it is (boy is not telling the truth)
- Consequence: student is accessing ineffective programming

Prevent Type II Errors
- When the intervention is working but you think it isn’t (boy is telling the truth)
- Consequence: student is losing effective programming
What change is needed to make it more likely that teachers and clinicians will graph data?

- Low-effort
- Low-time requirement
- Beneficial
Phase Change Lines

- Facilitate detecting a behavior change from one phase to the next
Literature on Graph Training

Carr & Burkholder (1998)
- First published excel training for behavior analysts

Dixon et al., (2009)
- Updated version

Kranak et al., (2018)
- BST live training
Deochand, Costello, Fuqua, (2015)

- Developed task analysis that simplifies phase change procedure
Phase Changes

- Easy method
- Repeatable
How to train task analysis?
Computer-based instruction

- Reach wider audience
- Deliver training asynchronously
Evidence-based training components

- Instruction/Rationale
- Modeling
- Rehearsal
- Feedback
Evidence-based training components

- Instruction/Rationale
- Modeling
- Rehearsal
- Feedback
Interactive Computer Training

- Incorporates active learning components
- Including feedback using self-monitoring activities
Purpose

Develop and evaluate a computerized training program that will efficiently train professionals to create simple excel graphs quickly, without direct feedback from a trainer.
Research Questions

1. To what extent will participants graphing accuracy change following a self-directed computer training?
2. To what extent will participants maintain graphing scores two-weeks following post-training sessions?
3. How long will participants engage in training activities?
Methods
Participants (n = 4)

Demographics
3 College Students (<30 yrs)
1 Professional (>30 yrs)

Profession
Education field
Graphing relevant in work
Setting
Session

Procedures

- 20 minutes to create one graph from prompt
- Participants could end session at any time
- Baseline
  - No access to notes
- Post-Training
  - Access to printed materials from training

Prompt 1

Instructions: Make a graph representing the number of times Eric is aggression each session. You will have 20 minutes to complete as many graph elements as possible. You may not use the internet or other resources to help you create your graph.

When you are finished working on your graph, please alert the researcher who will assist you in uploading your graph.

<table>
<thead>
<tr>
<th>Baseline:</th>
<th>aggression per session:</th>
<th>12, 14, 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention:</td>
<td>aggression per session:</td>
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</table>
Study Design

Multiple-probe design across participants

Internal Validity
- Staggered baseline
- Repeated effect across legs
- Interobserver Agreement (In Process)

Procedural Integrity (In Process)
Training Content
Training Procedures

Self-Directed Learning

Training facilitator did not provide any guidance other than saying "Do your best and refer to your materials if you are stuck"

Implications of Self-Directed Learning

• If training is effective, any learner could access materials via online materials.
Training Content

Four modules

1. Labels
2. Phase Change
3. Insert Graph
4. Insert Data

Same structure

• Instruction and Rationale
• Video Model of Skill
• Opportunity to Practice (Rehearsal)
• Practice Test and Self-Check (Feedback)
Training Materials
Example of Self-Check in Module

Practice Test Instructions

To test out of this module, you will need to complete these steps without errors within 6 minutes.

This practice test will give you an opportunity to check out your current skills.
Backward Chaining

Teach final steps in task analysis first

Move backwards
Task Analyses (TA)
Requirements to Test Out

<table>
<thead>
<tr>
<th></th>
<th>TA 4</th>
<th>TA 3</th>
<th>TA 2</th>
<th>TA 1</th>
<th>Complete</th>
</tr>
</thead>
<tbody>
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Test Out: Module 1

Before

After
Task Analyses (TA)
Requirements to Test Out

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Module 1 - Labels
## Task Analyses (TA)

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**Before**

![Before graph](image)

**After**

![After graph](image)
### Task Analyses (TA)

**Requirements to Test Out**

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**Test Out: Module 2**

**Before**

- 2

**After**

- 1

**E. Aggression Intervention**

- Baseline
- Intervention
**Task Analyses (TA) Requirements to Test Out**

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<td>Module 3 - Insert Graph</td>
<td></td>
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**Test Out: Module 3**

**Before**

![Before graph](image)

**After**

![After graph](image)
# Task Analyses (TA) Requirements to Test Out

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**Test Out: Module 3**

**Before**

1. 
2. 
3.

**After**

![Graph showing E. Aggression Intervention](image)
# Task Analyses (TA)

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### Test Out: Module 1

**Before**

- **Prompt 1**
  - Instructions: Make a graph representing the number of times this is aggression each session. You will have 20 minutes to complete as many graph elements as possible. You may not use the Internet or other resources to help you create your graph.
  - When you are finished working on your graph, please alert the researcher who will assist you when uploading your graph.
  - **Baseline:** aggression per session: 12, 14, 17
  - **Intervention:** aggression per session: 1, 2, 1

**After**

- Graph Created
# Task Analyses (TA)

## Requirements to Test Out

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<td>X</td>
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</table>

Before: Module 4

After:

*Graph showing Aggression Intervention*
## Task Analyses (TA)

### Requirements to Test Out

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<th>Phase</th>
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**Training Complete**

![Graph](image_url)

**Test Out: Module 4**

Before

<table>
<thead>
<tr>
<th>Session</th>
<th>Baseline</th>
<th>Intervention</th>
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<tbody>
<tr>
<td>1</td>
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<td>0</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
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<td>15</td>
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<td>30</td>
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<tr>
<td>6</td>
<td>25</td>
<td>35</td>
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Results
Baseline and Post-Training Comparison
Orientation to graph

Y-axis
• Percentage of steps correct

X-axis
• Sessions

Phase Labels
• Baseline
• ICT (computer training)
• Post-Training

Do results replicate across participants?
Results

All participants score 98% or better on post-test graphs

- Improvement only after post-training
- Immediate increase
- Immediate change in level
Graphing Speed

• All participants completed post-training graphs in under 8 minutes
Maintenance

- With notes, all participants scored 100%
- 2 participants scored better than baseline during maintenance
- Two participants returned to baseline responding
Average Duration:
1 hour 45 minutes

• Maybe participants who spent more time practicing during the training were able to maintain skills more than those who practiced less.
Average Duration: 1 hour 45 minutes

Time spent in training did not correspond with maintenance without notes scores.
Maintenance Implications

• Backward chaining may work better for learners who have some skills
• Forward chaining may work better for learners who are beginners

More research to identify optimal training format and length that produces skills that maintain.
Discussion

Data indicate that the self-directed training resulted in accurate graphing skills in a short amount of training time
Future Directions

- forward chaining procedures
- generalization skills across computer types (PC vs. Mac)
- intermediate graphing targets
- open online access training and evaluation study
Questions?