Specificity and Transfer in Learning
How to Follow Navigation Instructions

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Flight Crew
Left 2 squares
Down 2 levels
Forward 1 step
Training Conditions

Easy (Lengths 1-3)
Hard (Lengths 4-6)
Mixed (Lengths 1-6)

Testing

Mixed (Lengths 1-6)
Schneider, Healy, Barshi, & Bourne (2007)

Proportion Correct

Message Length

- Easy
- Hard
- Mixed
Encoding Specificity Principle (Tulving & Thomson, 1973)

Retrieval is successful to the extent that the encoding cues and operations correspond with those available at retrieval.


Performance depends more on the correspondence between the processing occurring during acquisition and that occurring during testing than on the level of processing during acquisition.
Procedural Reinstatement Principle

Specificity of training is found for procedural information (knowing how to do something), whereas transfer of training is found for declarative information (knowing that something is the case).
Dimensions of Navigation Task
Response type
Wordiness of the instructions
Presentation mode of the instructions
Display type
Size of the grids
Presence of landmarks

Measures of Performance
Specificity (same vs. different)
Transfer (train vs. test)
Dimensions of Navigation Task
Response type
Wordiness of the instructions
Presentation mode of the instructions
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Measures of Performance
Specificity (same vs. different)
Transfer (train vs. test)
**Response Type**  
*Schneider, Healy, Barshi, & Parker (2012)*

**Training Condition**
- **Key**
- **Mouse**

**Test Condition**
- **Key**
- **Mouse**

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>7</td>
<td>F</td>
<td>9</td>
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<tr>
<td>L</td>
<td>5</td>
<td>R</td>
<td>D</td>
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<tr>
<td>1</td>
<td>B</td>
<td>3</td>
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<td>Enter</td>
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<td>0</td>
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</table>
Schneider, Healy, Barshi, & Parker (2012)

![Graph showing proportion correct for Key and Mouse conditions](image)
Wordiness of the Instructions
Schneider, Healy, & Barshi (2012a)

Training Condition
Minimal
Redundant

Test Condition
Minimal
Redundant

Command Wordiness
Minimal (two words):
Left two

Redundant (four words):
Turn left two squares
Schneider, Healy, & Barshi (2012a)
Presentation Mode of the Instructions
Schneider, Healy, & Barshi (2010)

Training Condition
Auditory (hear words)
Visual (read words)
Spatial (see movements)
Symbol (see arrows)

Test Condition
Auditory (hear words)
Visual (read words)
Spatial (see movements)
Symbol (see arrows)
Symbols Shown to Subjects

- **Moves of one**
  - Four arrows pointing in different directions.
  - Colored arrows: blue up, red left, green right, yellow down.

- **Moves of two**
  - Eight arrows pointing in different combinations.
  - Colored arrows: blue up, red left, green left, yellow down.

- **Moves of one or two grids**
  - Two grid shapes: one with a line and one without.
  - Colored arrows: one grid is purple, and the other is black.
Schneider, Healy, & Barshi (2010)

![Bar chart showing proportion correct by modality for 'Same' and 'Different' conditions.](image)
Schneider, Healy, & Barshi (2010)
Display Type
Schneider, Healy, Barshi, & Parker (2005)

Training Condition
Bird’s Eye
Blank
Desktop VR

Test Condition
Bird’s Eye
Blank
Desktop VR
Schneider, Healy, Barshi, & Parker (2005)

![Figure showing the proportion correct across different conditions. The x-axis represents the condition (Bird's Eye, Blank, Desktop VR), and the y-axis represents the proportion correct. Bars show the same condition (red) and different condition (blue) with error bars indicating variability.](image)
Size of the Grids
Schneider, Healy, & Barshi (2012b)

Training Condition
3 x 3
4 x 4
5 x 5

Test Condition
3 x 3
4 x 4
5 x 5
Schneider, Healy, & Barshi (2012b)

![Bar chart showing proportion correct across different conditions: 3 x 3, 4 x 4, and 5 x 5. The chart compares 'Same' and 'Different' conditions, with error bars indicating variability.](chart.png)
Schneider, Healy, & Barshi (2012b)
Presence of Landmarks
Schneider, Healy, & Barshi (2011)

<table>
<thead>
<tr>
<th>Training Condition</th>
<th>Test Condition</th>
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</thead>
<tbody>
<tr>
<td>Direction Empty</td>
<td>Direction Empty</td>
</tr>
<tr>
<td>Direction Landmark</td>
<td>Direction Landmark</td>
</tr>
<tr>
<td>Location Landmark</td>
<td>Location Landmark</td>
</tr>
</tbody>
</table>

### Directions
- Direction left 2
- Location green E
Schneider, Healy, & Barshi (2011)

![Bar graph showing the proportion correct for different conditions.]

**Condition**
- Direction Empty
- Direction Landmark
- Location Landmark

**Proportion Correct**
- Red: Same
- Blue: Different
Schneider, Healy, & Barshi (2011)

![Graph showing proportion correct by condition (Direction Empty, Direction Landmark, Location Landmark) with error bars for both Train and Test groups.](image-url)
Dimensions of Navigation Task

Response type
no specificity, transfer

Wordiness of the instructions
specificity for redundant, no transfer

Presentation mode of the instructions
specificity for symbol, transfer to visual

Display type
specificity for blank & desktop VR, transfer to bird’s eye

Size of the grids
specificity for 5 x 5, transfer to 4 x 4

Presence of landmarks
specificity for direction landmark & location landmark, transfer to direction empty
Dimensions of Navigation Task

Response type
no specificity, transfer

Wordiness of the instructions
specificity for redundant, no transfer

Presentation mode of the instructions
specificity for symbol, transfer to visual

Display type
specificity for blank & desktop VR, transfer to bird’s eye

Size of the grids
specificity for 5 x 5, transfer to 4 x 4

Presence of landmarks
specificity for direction landmark & location landmark, transfer to direction empty
Practical Implications

Simulator training does not need to be faithful to the response requirements in the field.

Simulator training should duplicate the cognitive and perceptual procedures used in the field, especially when unique procedures are required.

Simulator training that introduces new task features might be useful for the development of new task representations.
Acknowledgments

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