# *Schema Strategies and Reading Comprehension*

## *Rebeka C. Gutkind, PhD*

# What to Expect

*This study:*

- Various types of comprehenders based on the concept of schema theory.

- Know how students think

- Opened our eyes (as teachers)
  what are students doing as they are reading?

# What to Expect

*Visible learning......*

- The teacher could see and hear how the students were learning

- The children's thinking became visible:
  - *Think-alouds*
  - *Analysis of responses*

*(John Hattie, 2009)*

# Outline of Presentation

1. Schema Theory
2. Schema Strategies
   - Comprehension
   - Inferences
   - Reading Comprehension
   - Learning
3. Previous Research
4. Current Research- Results
5. Examples of Varied Comprehenders
6. And so what....?
7. Implications for Instruction

# SCHEMA THEORY

# Schema Theory

*In Essence:*

*<span style="color:red">Schema Theory</span> is a theory about*

***KNOWLEDGE***

*Representation of knowledge*

*The use of this knowledge within the structure of the mind.*

(Anderson & Pearson, 1984)

# Schema Theory

## *Totality of>>>>>*

*Experiences,*
*Knowledge,*
*Emotions, and*
*Understanding,*
*which effects* **What** *and* **How** *we learn*

*(Anderson & Pearson, 1984)*

# Schema Theory

A framework for interpreting one's world

A continuous process that occurs in several domains

Acquisition of learning

# Schema Theory

## *Formative Research*

**Bartlett/Kant 1929,1932**:

Interpretation of the world occurs within organized structures or schemas. Schemata mediated between external world and internal mental structures.

**Piaget & Inhelder, 1969**

Cognitive Structures that underlie intelligence and change/adapt to the environment: assimilation and accommodation

**Bruner, 1979**

Constructing new meaning and knowledge from authentic experiences

# Schema Theory

**Rumelhart, 1980, pp. 33-34**

" *. . . building blocks of cognition. They are the fundamental elements upon which all information processing depends. Schemata are employed in the process of interpreting sensory data (both linguistic and non linguistic). . .*"

# Schema Theory

**Rumelhart, 1980, pp. 33-34**

in RETRIEVING information from memory,

in ORGANIZING actions,

in DETERMINING goals and sub goals,
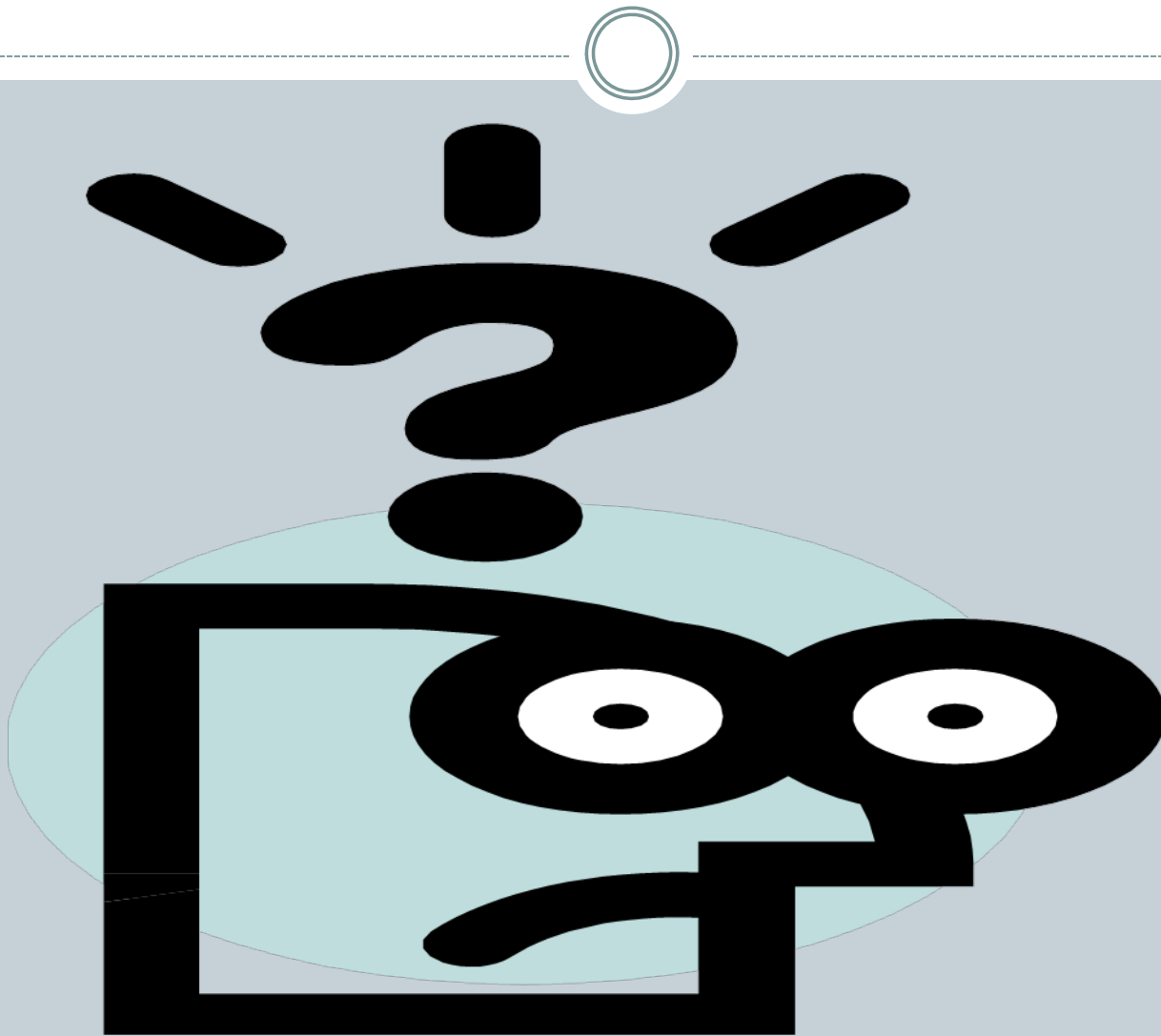
in ALLOCATING resources,  and

generally,

in guiding the *FLOW OF PROCESSING* in the system".

# SCHEMA STRATEGIES

# What are Schema Strategies?

# What are Schema Strategies?

**SCHEMATA :**

*have . . . . . VARIABLES*

*can . . . . . EMBED ONE WITHIN ANOTHER*

*represent . . . . KNOWLEDGE*
*ENCYCLOPEDIA*

*(Rumelhart & Ortony, 1977)*

# What are Schema Strategies?

Schema and Comprehension
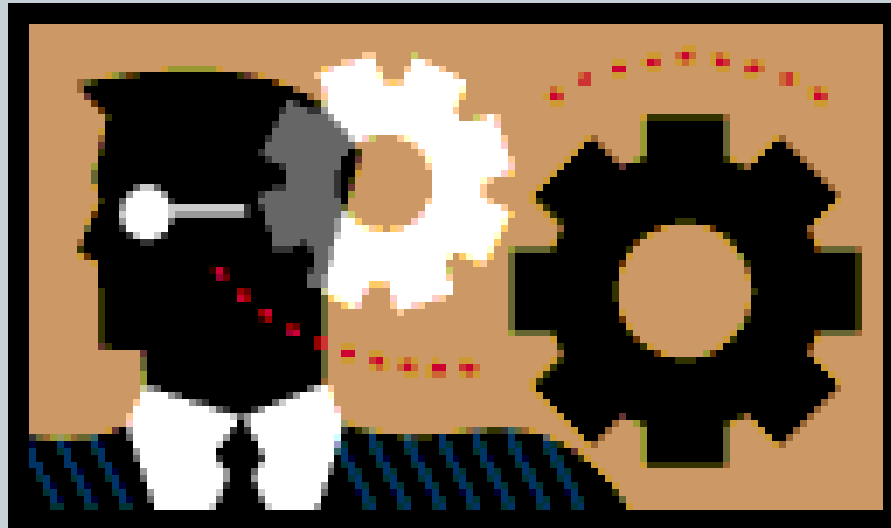
Schema and Inference

Schema and Reading Comprehension

Schema and Learning

# Schema and Comprehension

Information Processing System



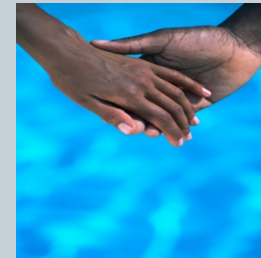*Schema Selection*          *Schema Interpretation*

# Schema and Inference

Unobserved Input

Notion of Parts to Whole

Assigning default values

# Schema and Reading Comprehension

*Equation of Schema and Reading Comprehension*

Accesses Appropriate Schema = Good Comprehension

Accesses Appropriate Schema – insufficient clues =
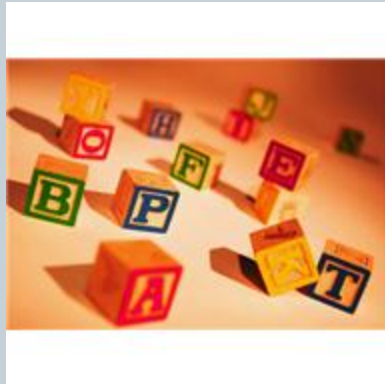Inadequate Comprehension

Accesses Schema ( inconsistent with author's intent) =

Understanding of Passage+ Misunderstanding of Author's
Intent

(Rumelhart, 1980)

# Schema and Learning

## Three Modes of Learning

*Accretion*

# Schema and Learning

## Three Modes of Learning

*Tuning*

# Schema and Learning

## Three Modes of Learning

*Restructuring*
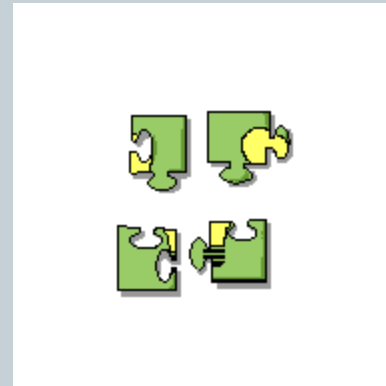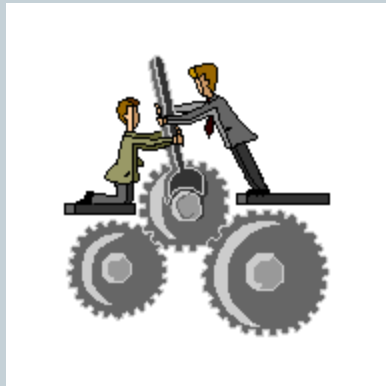
# PREVIOUS RESEARCH

# Previous Research

Activation and Construction of Schema

Rumelhart (1984)

After reading 2-3 sentences in a paragraph.....

Presented adults with the following questions:

*WHO . . . were the characters*

*WHAT . . . they perceived was happening*

*WHY . . . characters acted as they did*

*WHEN . . . the event occurred*

*WHERE . . . the story took place*

# Previous Research

*Business had been slow since the oil crisis*

*Nobody seemed to want anything really elegant anymore*

*Suddenly the door opened and a well-dressed man entered the showroom floor. John put on his friendliest and most sincere expression and walked toward the man.*

*Rumelhart, 1984, p. 6*

# Previous Research

Activation and Construction of Schema

Rumelhart (1984)

*Agreement among participants:*

- inherent outline of the story

- participants activated, evaluated, refined, discarded

- consistent patterns of hypothesis generating

# Previous Research

Wade (1990)

**Investigated** children's use of varied schema strategies in reading comprehension

**Results** indicated varied types of comprehenders

# Previous Research

Wade (1990)

Children reported their insights by responding to two questions:

*what do you think this is about*

*what clues in the story helped you*

Responses: categorized according to similarities in cognitive processing

# Previous Research

*Good Comprehender* – generates hypotheses, tunes, monitors incoming information

*Non-risk taker* – lacks the ability to select appropriate schema

*Non-integrator* – new schema is generated for every sentence read

*Schema imposer* – keeps same schema (no "fix-up" strategies)

*Storyteller* – relates prior knowledge that does not relate to the text          *(Wade, 1990)*

# CURRENT RESEARCH

# Current Research

*Sample*

81 Fourth-graders

32 Third-graders

| Fourth Grade | Below-Average below 25%* | Average 25 − 75%* | Above-Average Above 75%* |
|---|---|---|---|
| Third Grade | | Average 25 − 75% | |

*performance level  based on the  ITBS  Reading Comprehension subtest

# Current Research

**Think–alouds**: read three short story passages out-loud . After every one or two sentences in each passage, ask the probing questions.

**Code** according to Wade's (1990) five types of comprehenders  plus three more types of comprehenders (*Descriptors of Comprehender Types)*

**Record data** on the *Schema Coding Form*

# Current Research

## *Probing Questions and Procedure*

➢ ***Stage One: Initial Questions***
What do you think this is about?
What clues in the story helped you?  or What information led you to think that?

➢ ***Stage Two: Probing Questions***
 - Participant Response in Stage One: "I don't know"
   Can you give me any guesses?
   Can you describe what is happening?
   Can you tell me anything else?
 - Participant Response in Stage One: Change and/or Tuning of Schema
   What made you change your mind?
   What information in the story made you change your mind?

➢ ***Retelling***

# Current Research

## Additional Types of Comprehenders

***Schema omitter*** – tuning and relates text content with background knowledge, but does not activate a particular schema

***Non–integrator: limited tuning*** – new schema is generated for every segment read with minimal use of tuning

***Restater*** – paraphrases, no activation of schema

# Current Research

## Wade (1990)                                      Gutkind (2012)

| Good Comprehender | Non-risk Taker | Non-Integrator | Schema Imposer | Storyteller | *Schema Omitter* | *Non-Integrator: Limited Tuning* | *Restater* |
|---|---|---|---|---|---|---|---|
| Hypothesizes Monitors | "I don't Know | Non-connective clues | Keeps initial schema | Exclusive prior knowledge | Uses tuning No hypothesis | Some use of tuning New schema for every segment of text | Paraphrases |

| Good Comprehender | Medium Comprehender | Inefficient Comprehender |
|---|---|---|
| Use of tuning and/or restructuring | Beginning to retune away from inefficient strategizing | Multiple inefficient strategizing |
| | •Schema Omitter<br>• Non-integrator: Limited Tuning | •Non-integrator<br>•Restater<br>•Schema Imposer<br>•Non-risk Taker<br>•Story teller |

# Results

*Percentage of Comprehender Types for Group 1 across three Stories*

| Type of Comprehenders | Story 1 | | Story 2 | | Story 3 | |
|---|---|---|---|---|---|---|
| | *n* | *%* | *n* | % | *n* | % |
| Good Comprehender | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Medium Comprehender | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Inefficient  Comprehender | 9 | 69.2 | 9 | 69.2 | 11 | 84.6 |
| Mixed (Inefficient Comprehender/ Good Comprehender | 4 | 30.8 | 4 | 30.8 | 2 | 15.4 |

*n* = 13

*Frequency Table of Schema Strategy Use of Group 1 across three Stories*

| Categories | Story 1 | | Story 2 | | Story 3 | |
|---|---|---|---|---|---|---|
| | *n* | *%* | *n* | *%* | *n* | *%* |
| Good Comprehender | 10 | 19.2 | 10 | 19.2 | 9 | 11.5 |
| Schema Omitter | 1 | 1.9 | 0 | 0.0 | 1 | 1.3 |
| Non-Integrator: Limited Tuning | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Restater | 14 | 26.9 | 10 | 19.2 | 18 | 23.1 |
| Non-Risk Taker | 3 | 5.8 | 7 | 13.5 | 23 | 29.5 |
| Schema Imposer | 8 | 15.4 | 0 | 0.0 | 4 | 5.1 |
| Non-Integrator | 14 | 26.9 | 22 | 42.3 | 22 | 28.2 |
| Storyteller | 2 | 3.8 | 3 | 5.8 | 1 | 11.3 |
| Total  *n* | 52 | | 52 | | 78 | |

# Results

*Percentage of Comprehender Types for Groups 2, 3 and Third Grade across Three Stories*

| Type of Comprehenders | Story 1 | | | | | | Story 2 | | | | | | Story 3 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Group 2 | | Group 3 | | 3rd Grade | | Group 2 | | Group 3 | | 3rd Grade | | Group 2 | | Group 3 | | 3rd Grade | |
| | *n* | *%* | *n* | *%* | *n* | *%* | *n* | *%* | *n* | *%* | *n* | *%* | *n* | *%* | *n* | *%* | *n* | *%* |
| Good Comprehender | 14 | 34.1 | 14 | 51.9 | 4 | 21.1 | 13 | 31.7 | 14 | 51.9 | 3 | 15.8 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Medium Comprehender | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 3 | 7.3 | 3 | 11.1 | 1 | 5.3 |
| Inefficient Comprehender | 19 | 46.3 | 7 | 25.9 | 13 | 68.4 | 18 | 43.9 | 4 | 14.8 | 12 | 66.7 | 35 | 85.4 | 15 | 55.6 | 14 | 73.7 |
| Mixed (Inefficient Comprehender/ Good Comprehender | 8 | 19.5 | 6 | 22.2 | 2 | 10.5 | 10 | 24.4 | 9 | 33.3 | 3 | 15.8 | 3 | 7.3 | 9 | 33.3 | 2 | 10.5 |

# Results

*Frequency Table of Schema Strategy Use of Groups 2, 3 and Third-Graders across Three Stories*

| Categories | Story 1 Group 2 n | % | Story 1 Group 3 n | % | Story 1 3rd Grade n | % | Story 2 Group 2 n | % | Story 2 Group 3 n | % | Story 2 3rd Grade n | % | Story 3 Group 2 n | % | Story 3 Group 3 n | % | Story 3 3rd Grade n | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Good Comprehender | 70 | 42.7 | 67 | 62.0 | 25 | 32.9 | 74 | 45.1 | 69 | 63.9 | 21 | 27.6 | 32 | 13.0 | 42 | 25.9 | 16 | 14.4 |
| Schema Omitter | 2 | 1.2 | 4 | 3.7 | 0 | 0.0 | 2 | 1.2 | 5 | 4.6 | 1 | 1.3 | 17 | 6.9 | 13 | 8.0 | 5 | 5.4 |
| Non-Integrator: Limited Tuning | 4 | 2.4 | 1 | .9 | 3 | 3.9 | 5 | 3.0 | 1 | .9 | 2 | 2.6 | 6 | 2.4 | 4 | 2.5 | 9 | 8.1 |
| Restater | 26 | 15.9 | 7 | 6.5 | 20 | 26.3 | 6 | 3.7 | 2 | 1.9 | 7 | 9.2 | 14 | 5.7 | 2 | 1.2 | 12 | 10.8 |
| Non-Risk Taker | 2 | 1.2 | 2 | 1.9 | 0 | 0.0 | 8 | 4.9 | 2 | 1.9 | 3 | 3.9 | 47 | 19.1 | 33 | 20.4 | 23 | 20.7 |
| Schema Imposer | 20 | 12.2 | 8 | 7.4 | 11 | 14.5 | 10 | 6.1 | 5 | 4.6 | 7 | 9.2 | 25 | 10.2 | 23 | 14.2 | 6 | 5.4 |
| Non-Integrator | 33 | 20.3 | 18 | 16.6 | 11 | 14.5 | 57 | 34.8 | 23 | 21.1 | 25 | 32.9 | 104 | 42.3 | 45 | 27.8 | 36 | 32.4 |
| Storyteller | 7 | 4.3 | 1 | .9 | 6 | 7.9 | 2 | 1.2 | 1 | .9 | 10 | 13.2 | 1 | .4 | 0 | 0.0 | 6 | 5.4 |
| Total $n$ | 164 | | 108 | | 76 | | 164 | | 109 | | 76 | | 246 | | 162 | | 111 | |

# Current Study - Restructuring Strategies

| Group 1 below- average | Group 2 average | Group 3 above -average | Third-Graders average |
|---|---|---|---|
| 0  participants | 3 participants | 5 participants | 2 participants |

# Results

*Statistically Significance*

Groups 1, 2, and 3 across all three stories in comprehender types and patterning types

# Results

*Fourth-Graders with Reading Difficulties*

- Difficulty with making coherent representation of text
- Difficulty with making cross-sentence connections
- Selected partial information from the text
- Did not always assimilate new information to modify existing schema
- Missing the intent of the segment or sentence
- Overall difficulty with efficient strategy processing

# Results

*Average and Above Average Fourth-Graders*

- Demonstrated more efficient strategy use than the below average fourth-graders

- Difficulty with making cross-sentence connections for coherent representation of text (*about one-half of average fourth-graders and approximately one-quarter of the above-average fourth-graders*)

# Results

## *Third-Graders*

- Demonstrated more efficient strategy use than the below-average fourth-graders.

- Difficulty with making cross-sentence connections for coherent representation of text

# Results
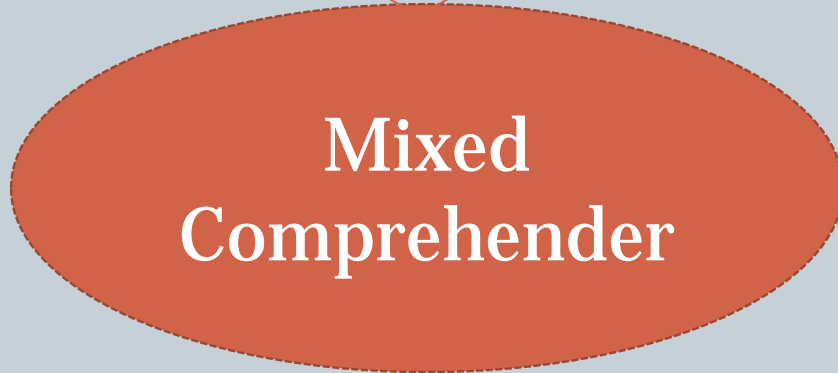
*Descriptors for Scoring Types of Comprehenders*

| Types of Comprehenders | Descriptors | | |
| --- | --- | --- | --- |
| | Hypothesis | Text Information | Understanding Meaning |
| Good Comprehender | -Generates hypothesis<br>-Supports hypothesis | -Uses information from text<br>-Relates text content with background knowledge<br>-Integrates new activated schema<br>-Monitors info that conflicts with generated schema by tuning or creating a new schema | -Recognizes point of story |
| *Schema Omitter | -Does not generate hypothesis | -Uses information from the text<br>-Relates text content with background knowledge<br>-Integrated new information with activated schema<br>-Monitors info that conflicts with generated schema but does not create a new schema | -Sometimes recognizes the point of the story |
| Non–integrator | -Generates new hypothesis for every segment of the text<br>-Never relates new hypothesis to previous hypothesis | -Uses selected info from the text<br>-Fragmented/ disconnected relation of text content with background knowledge<br>-Disregards info that conflicts with the schema of the moment | -Does not recognize point of the story |

| | | | |
|---|---|---|---|
| *Non–integrator: Limited Tuning | -Generates new hypothesis for every segment of the text<br>-Relates new hypothesis to selected segments of previous hypothesis | -Uses selected information from the text<br>-Fragmented/ disconnected relation of text content with background knowledge<br>-Disregards information that conflicts with the schema of the moments | -Does not recognize point of the story |
| *Restater | -Does not generated hypothesis<br>-Does not synthesis information to create a hypothesis | -Restates and/or paraphrases information from the text | -Does not recognize point of the story |
| Schema Imposer | -Generates initial hypothesis without option for alternative hypothesis<br>-Supports only the initial hypothesis | -Uses selected information from text that matches the initial hypothesis<br>-Partial relation of text content with background knowledge<br>-Disregards information that conflicts with initial activated schema | -Does not recognize point of the story |
| Non–risk taker | -Does not generate hypothesis | -Uses minimal information from the text | -Does not recognize point of the story |
| Storyteller | -Generates hypothesis non-related to text | -Does not use information from text | -Does not recognize point of the story |

# EXAMPLES OF VARIED COMPREHENDERS

# Examples
## Varied Types of Comprehenders

I am large and very heavy

- *bulldozer*

I am gray

- *bulldozer, 'cause some bulldozers can be gray*

I have a trunk that you can't pack

- a bulldozer has a digger, so that can be a trunk

You can see me at the circus

- *there are bulldozers in the circus*

# Examples
## Varied Types of Comprehenders

I am the color of a carrot

- *tangerine*

Find seeds inside of me

- *tangerine*

I am the size and shape of a baseball

- *well, a tangerine is smaller than a baseball, so I think it is an orange*

Squeeze me to make juice

- *an orange*

# Examples
## Varied Types of Comprehenders

I am round

- *ball*

I am many colors, but mostly blue

- *the ocean or sea*

Use me at home or at school

- *a notebook*

Spin me to see the whole world

- *playing pin the donkey on the tail*

# Examples
# Varied Types of Comprehenders

I have doors, but rarely have windows.

- *office building*

Several people can ride in me at once

- *Well, you can't ride in an office building, so I will say a van*

Call for me by pushing a button

- *Well you don't call for someone in a van, but you need to push a button when you ring a doorbell and it says it has doors in the first clue, so it's a door bell.*

I go up and down in tall buildings.

- *It says tall buildings, so I guess it is an office building*

# Examples
## Varied Types of Comprehenders

I have a large head

- *Well, it could be an animal or a person, or an insect; not sure*

I live in an ocean

- *Well it is something that lives in the ocean and has a large head –maybe some kind of fish or maybe a plant*

I have eight legs.

- *I know it is some kind of fish, but I don't know which kind*

# Examples
## Varied Types of Comprehenders

I have keys, but no locks.

- *It doesn't have any locks*

I have pedals, but don't move

- *It can't move because it has pedals*

I make noise when you touch me.

- *It can make noise*

Touch my keys to make music

- *It makes music when you touch it*

# Examples
## Varied Types of Comprehenders

You can see me, but can't hold me

- *It's about when a baby feels you can't hold him, but the baby still sees the mommy.*

I follow you everywhere

- *The baby follows the mommy everywhere because he wants mommy*

See me when the sun shines

- *One day, the mommy took the baby outside to see the sun shinning*

I am long in the morning and evening, but short at noon

- *Mommy takes the baby for long walks*

# Examples
## Varied Types of Comprehenders

We are white and yellow.

- *a balloon, no...I don't know*

We are only kernels- not generals

- *I don't know*

We burst out of our shells when we get how.

- *..don't know*

Eat us by the handful at the movies

- *Oh..., maybe it is ?...., no.....I don't know*

# Practice with a Partner

1. **CHOOSE ONE STORY**

2. **ROLE PLAY WITH A PARTNER**

3. **CODE YOUR RESULTS**

# Responses from Story 1

- **Text:**  *When you gain speed, the grown-up will run alongside of you and still hold on.*

  **Researcher:** "*So now tell me what do you think this story is about?*"

  - *Schema Omitter Response:* "A motorcycle, or a car...it can't be a motorcycle, it can't because you can't run that fast.  (It's) about a guy who is on something, I can't figure out what, but he's on something and he has to be helped by a grown up."

  - *Non–integrator Response:* "The story is about when a car is about to hit him so he holds onto his hand."

  - *Restater Response:* "Gaining Speed."

  - *Schema Imposer Response:* (Previous responses were about rollerblading) "That a person who is saying that a grown up helps him and that like he's on rollerblades and when he gains speeds, he runs."

# Responses from Story 1

- **Text:** *The first thing you will want to do is find a grown-up to help you out.  Have the grown-up hold on tight so that everything is steady while you climb on*

  **Researcher:** "*What do you think this story is about?"*

  - *Good Comprehender Response:* "A boy who wants to climb a tree."
  - Researcher: "*What clues made you think climb a tree?"*
  - *Good Comprehender Response:* "It said to hold on tight so maybe he can climb."
  - *Storyteller Response*: "A babysitter, the children - that the children's parents are going out."

  **Researcher:** "*What clues in this story made you think it's a babysitter?"*

  - *Storyteller Response*: "Getting into trouble."

# Responses from Story 2

**Text:** *It seems to be dead, but inside something wonderful is*

- *happening.  After a brief struggle, a body with folded wings breaks out of the silken shell.*
- **Researcher: "***What do you think it's talking about***?"**
- *Good Comprehender Response*: "Now it became a butterfly....well actually it might be a caterpillar.  I'll say a caterpillar because caterpillars have big long cocoon and becomes butterflies."  (Explanation: the student is using the information to tune or change his current activated schema).
- *Non–integrator Response*:  "An animal is having a baby"
- **Researcher:**  *"What clues made you think that?"*
- *Non–integrator Response*:  "Breaking out."  (Explanation: the student generated a schema based on one clue in the story).
- *Schema Imposer Response*: "A bat."  (Explanation: participant's first activated schema was about a bat.  He maintained this schema for half of the story).
- *Restater Response*: "You think that something is bad, but really it's good."
- **Researcher:**  *"What clues made you think that?"*
- *Restater Response*: "Because it seems to be dead, but something wonderful is happening."

# Responses from Story 3

**Text:** *Sometimes it can turn black or brown when it mixes with mud*

- *and dirt.  Sometimes it looks light and delicate.*
- **Researcher:** *"What do you think it's about?"*
- *Good Comprehender Response*: "Snow being mixed with mud and dirt, and then it gets all black."
- *Non–integrator Response*: "I think it's a pig."
- **Researcher: "***What made you think it was a pig?"*
- *Non–integrator Response:* "Turning black and brown when it plays in mud and pigs like to play in the mud."  (Explanation: did not include previous clues about color).
- *Restater Response:* "When it mixes, when mud and dirt mix up and then it becomes very delicate."
- *Schema Imposer Response:* "… maybe it's still a firefly". (Explanation: participant's first activated schema was about a firefly).

# Restructuring Responses from Story 3

**Researcher**: "*Okay, now tell me in your own words what this whole story is about.*"

- *Participant #32*: "It's talking about snow."

**Researcher:** "*What clues made you think that it was snow?*"

- *Participant #32*: "Because it can turn black or brown when it mixes with mud and dirt. Sometimes it looks light and delicate … and a cubic foot of it can weigh only six pounds, but when it is compressed, it can weigh 30 pounds, when it is squished together.

- *Participant #45:* "Snow"

**Researcher:** "*What clues made you think it's about snow?*"

- *Participant #45:* "Colorless…it can turn black or brown…it can weigh six pounds when it's less and ten pounds when its more. It's an insulator. When you put a thermometer in it, it gets colder (warmer)."

- *Participant #62:* "Snow and what it could turn into and it could get very big and powerful and it's one of nature's best insulators and that's it's kind of a science experiment of it."

  *Explanation: During the think-aloud, each of the above participants demonstrated a lack of knowledge regarding certain facts pertaining to snow. At the retelling, they were able to reconstruct a new "snow" schema that incorporated these additional facts (insulator, weight, etc.).*

?

# . . . and so what?

# Validation

***Importance*** of using schema strategizing

Regardless of students' reading comprehension levels *. . Need for teaching...*

**Schema Strategizing . . .**

# . . . and so what?

## Metacognitive Strategies

**Relevant vs. Irrelevant**

**Cross-Sentence Connections**

**Schema Self-Awareness** *(accretion)*

**Verbalizing Students' Schemata** (tuning & restructuring)

# Implications for Instruction

# Implications for Instruction

## Pictorial Presentation
*Concretizes changes in schema*

(based on Visualizing/Verbalizing *Bell, 1991*)

# Implications for Instruction

**Changes in Vocabulary**

**Teaches relevant vs. irrelevant**

*It was the **best** of times…….*

- what schemata are activated?

*It was the **worst** of times…..*

-what schemata are activated now

-how are these two schemata different?

-how are these two schemata the same?

# Implications for Instruction

## Relevant vs. Irrelevant Information

- *The house was **dark, and eerie.***

  what schemata are activated?

- *The house was **bright and cheery.***

  what schemata are activated?

  how did my schema change (tuning)

# Implications for Instruction

- *The **wind howled through the cracks** in the windows.*

  what schemata are activated?

- *A **soft breeze flowed through the open** windows*

  what schemata are activated?

  how did my schema change (tuning)

# Implications for Instruction

**Cross- Sentence Connections**

*Which sentences create a theme or a cohesive picture in your mind's eye (cohesive representation of printed text)*

# Implications for Instruction

## Riddles

*We are **white** and **yellow***

❖ *what schemata are activated?*

(accretion)

❖ *what are the key clues?*

(relevant vs. irrelevant)

# Implications for Instruction

## *We are only <span style="color:red">kernels</span>*

❖ *does our schema change?*

(tuning)

❖ *what clues changed our previous schema?*

(relevant vs. irrelevant)

❖ *what clues maintained our previous schema?*

(relevant vs. irrelevant)

❖ *are all the clues connected?*

(cohesive representation of text)

# Implications for Instruction

## *We **burst** out of our **shells** when we get hot*

*does our schema change?*

    (tuning)

*what clues changed our previous schema?*

    (tuning; relevant vs. irrelevant)

*what clues maintained our previous schema?*

    (relevant vs. irrelevant)

*are <u>all</u> the clues connected?*

    (cohesive representation of printed text)

# We need to make learning . . .

# Visible !