The Development of One-to-One Correspondence for Children with Language Disorders

Pedagogy in Practice
September 20th, 2013

Eduarda van Klinken
eduardavk@bigpond.com

Emma Juleff
emmaj5150@hotmail.com
What is counting?

Major researchers’ views

Learning difficulties and maths

Language and maths

Gesture

Finger counting

Manipulatives

Recommendations

Error analysis – practical activity
The Glenleighden School
33 Cubberla Street
Fig Tree Pocket 4069
Counting

- Reciting a number word
- Pointing to each object
- ‘How many’? (cardinal concept)
Piaget

- Predicts children with language difficulties with have difficulties with representational thought
- Must engage in symbolic play first
Gelman and Gallistel

Five principles of counting...

- One-to-one correspondence
- Cardinal concept
- Stable order of number words
- Abstraction (an awareness of what is countable)
- Order-irrelevance

1. String: Chant number names as a ‘string’

2. Breakable chain: count for meaningful purpose, but need to start from one

3. Breakable chain: can start from midpoint

Features of efficient counters:

- Start counting at one end of the array
- Usually left to right counting
- Usually count items immediately adjacent to each other

Butterworth

- Primary/Biological mathematical ability
- Present at birth
- Present in animals and humans
- Imprecise and nonverbal – influenced by experience and maturation

Is there a role for language in maths?

Various theorists dispute role

Includes:

- Language not necessary for early foundations
- Language plays a critical role
- Language supports but does not alone account for mathematical thinking and learning

What IS evident...

- Language plays an important role in connecting different representations, helping to make early pre-mathematical cognition numeric.

- Interplay between language concepts and skills/languages more fluid, bi-directional, interactive than earlier thought.

Language Disorders

Communication difficulties
- Speech
- Language

Often co-morbid with other developmental areas
- Attention
- Autistic Spectrum Disorder
- Sequencing (auditory)
- Memory (working, auditory)
- Fine/gross motor skills
- Conceptual understanding
Interesting…

Early childhood story telling abilities are predictive of mathematical ability two years later.

Specifically, it was only children’s ability to relate all the different events in the story, to shift clearly from the actions of one character to another and to adopt the perspective of different characters and talk about what they were feeling or thinking.  p.69

Length of utterance and vocabulary were not predictive.

O’Neill, Pearce & Pick quoted in Sarama and Clements 2009

Interesting…

Children with Speech Language Impairment

- Difficulty with rote counting, word sequence
- Miscount objects

BUT…

- When asked to respond with gesture rather than orally perform much better
- Understanding of cardinality same as typical developing peers

Language affects maths...

- Auditory and visual sequencing
- Vocabulary storage
- Word retrieval
- Articulation of words
- Don’t understand the concept of number e.g. ‘threeness’
The Verbal Count

- Requires an auditory memory
- Sequence non-negotiable
- Can’t substitute other words
- Accurate articulation critical
- Order words are said critical
Role of Gesture

- Children typically have accurate gesture before they have accurate verbal count
- Act of moving hand breaks up count into discrete meaningful units
- May ease cognitive load
- When pointing, errors decrease

Types of Gesture

- Touching (typical of 3 year olds)
- Point only (typical of 4 year olds)
- Other body gestures (face, arm, body)

Finger counting

• ‘Embodied cognition’  (Fischer)

• Unless a child can represent a cardinal quantity on their fingers a true understanding of quantity could be questioned.  (Butterworth)


Finger agnosia

- Poor finger agnosia – powerful predictor for mathematical difficulties 3 years later
- Improving finger dexterity may improve mathematical performance

Hand preference

- Research mixed – so allow child their preference
Manipulatives

- Research shows mixed benefit
- Year Two study: rich manipulatives huge effect on task-irrelevant behaviour
- Manipulatives become a distraction – overload working memory
- See objects as individual objects rather than a set
- Negatively affect transfer of knowledge to other mediums
- Difficulty treating an object symbolically once they have played with them.

Recommendations

- Develop automaticity of number count. Flexible speed, dynamics, include stop/start, clap in-between numbers, start at a mid point.

- Encourage counting in purposeful and real life activities.

- Subitize then check by counting. Link the two skills.

- Start with small numbers (1, 2, 3) and gradually increase.

- Start with objects in a linear line to limit working memory demands.

- Encourage students to organise manipulatives before counting.
Recommendations cont.

- Simplify task by teacher points/student counts or vice versa.
- Remove objects as they are counted to avoid recounting.
- Encourage use of one preferred hand.
- Use bland, easy to grasp manipulatives.
- “Give me” is more difficult than “how many?”.
### The Glenleighden Counting Analysis

<table>
<thead>
<tr>
<th>Task/tasks:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Verbal Count</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Verbal number count:</strong></td>
<td></td>
</tr>
<tr>
<td>• Counts correctly to ...</td>
<td></td>
</tr>
<tr>
<td>• Skips or inserts number word</td>
<td></td>
</tr>
<tr>
<td>• Random number words/adds non-number words (e.g. letters)</td>
<td></td>
</tr>
<tr>
<td>• Student is assisted by visual cues (e.g. finger counting, nodding, tapping by student or teacher)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Correspondence</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student counts and points:</strong></td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td><strong>Teacher points, student counts:</strong></td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td><strong>Teacher counts, student points:</strong></td>
<td></td>
</tr>
<tr>
<td>• Verbal count matches movement (too fast/slow)</td>
<td></td>
</tr>
<tr>
<td>• Continues counting after all objects accounted for</td>
<td></td>
</tr>
<tr>
<td>• Stops counting before all objects accounted for</td>
<td></td>
</tr>
<tr>
<td>• Counts the same object more than once</td>
<td></td>
</tr>
<tr>
<td>• Skips over an object</td>
<td></td>
</tr>
<tr>
<td>• Recycles numbers (says same number more than once)</td>
<td></td>
</tr>
<tr>
<td>• Touches the same object more than once</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cardinality</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student describes “how many”:</strong></td>
<td></td>
</tr>
<tr>
<td>• Recounts all the objects and gives correct answer</td>
<td></td>
</tr>
<tr>
<td>• Recounts all the objects and gives incorrect answer</td>
<td></td>
</tr>
<tr>
<td>• Random guess</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other impacting elements related to the task</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gesture:</strong></td>
<td></td>
</tr>
<tr>
<td>Describe gesture (e.g. touches objects, points only, eye points, other body movements – rocking, head nodding) Which hand was used?</td>
<td>Comments:</td>
</tr>
<tr>
<td>Attention: Cannot focus on task (e.g. distracted by objects or environment)</td>
<td>Comments:</td>
</tr>
<tr>
<td><strong>Organisation:</strong></td>
<td></td>
</tr>
<tr>
<td>Describe organisation (e.g. organises materials prior to counting, starts from one end and moves to the other, counts objects adjacent to each other)</td>
<td>Comments:</td>
</tr>
<tr>
<td>Verbalisation: Describe verbalisation (e.g. counts out loud, sub-vocalises, no lip movement, articulation)</td>
<td>Comments:</td>
</tr>
<tr>
<td><strong>Fine/gross motor skills:</strong></td>
<td></td>
</tr>
<tr>
<td>(e.g. drops/difficulty handling objects)</td>
<td>Comments:</td>
</tr>
<tr>
<td>Other:</td>
<td>Comments:</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested intervention:</td>
<td></td>
</tr>
</tbody>
</table>
Your turn!
Thank-you!