Metacognitive Learning Opportunities with Disability

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Learning disabilities (LD) are concerned with unexpected underachievement. They may be categorised based on the need of intervention, metric distance from typical achievement, or differentially to biologically based conditions. Learning disabilities are also differentially delineated from expected underachievement due to secondary conditions, such as high neuroticism, economic or contextual factors, the boundary, however, is fluid (Fletcher et al., 2007). Karmiloff-Smith (2013) emphasizes that domain-specific differences may arise from general biology, e.g. in the Williams Syndrome. The four prevailing categorisations compare aptitude-achievement discrepancy, low achievement, intra-individual differences, and the response to intervention.

Intellectual disability (ID) measures general learning ability. Measures of general ability, for example, IQ tests are based on underlying domain-specific abilities even if they attempt to generalise on them. Learning or intellectual disability may best be assessed comparing peer performance in their embedding society, with continued responsiveness as a predictor for further eligibility to intervention (Fletcher et al., 2007).

Learning and Meta-Cognitive Knowledge

Metacognitive knowledge, i.e. awareness about knowledge of strategies, learning requirements of specific tasks, and personal strengths and weaknesses help people understand the nature of their performance. Consequently, people may focus on specific skills to improve. Extracting metacognitive knowledge, the transfer of learning between different domains is enhanced (Brandsford et al., 1999).

For learning new vocabulary, it helps to know about memory capacity. Attempting to memorize arbitrary new words, working memory will limited to about 4-5 items (Bertrand et al., 2015; Sewell et al., 2014), translating to roughly 20s for a cluster of words in rote

learning. For children with language impairment, Lukacs et al. (2016) suggest that this span is lower than in typically developing (TD) children for verbal tasks, and needs further reduction in learning opportunities. As short term memory is transient, information will be lost after 10-20 minutes if it is not rehearsed (Miller & Miller, 1976). The same clusters may be reinforced two days later, enhancing early long term memory (Herszage & Censor, 2017).

Differentially presented information is more easily picked up. Building on prior knowledge, it helps if two similar words are presented next to each other. Extracting the difference facilitates forming new memories (Meltzer et al., 2017). Only 2-3 similar items should be presented.

Metacognition and Intellectual Disability

In adults with ID, self-regulation is typically less developed than in ability-matched children with typical development. Verbal comprehension appears to be a predictor of self-regulation skills and metacognition. Nader-Grosbois (2014) found adult individuals with intellectual disability did not overestimate their academic competence, although their self-perception was not significantly related to their individual level of ability.

In children with mild ID (MID), metacognitive knowledge may help build strategies. Particularly, enhancing verbal skills may help with self-regulation (Nader-Grosbois, 2014). For MID, computer-aided graphic organizers were effective (Sheriff & Boon, 2014). Bilgi & Özmen (2014) found some evidence for improvement of metacognitive skills by reading in students with MID. Particularly, knowledge about the task at hand may improve undirected behaviour. The ability to form metacognitive knowledge may thus qualify as differential marker for learning disabilities, while it also offers an opportunity for intervention (Pintrich, 2002).

Metacognitive Strategy Development

Bilgi & Özmen (2014) emphasize a holistic approach, including thinking out loud, interactive dialogues, graphic organisers, teaching the structure, including reason, method and

when to use these strategies. Similar emphasis on graphic organisers has been placed by Sheriff & Boon (2014). Accompanying students, Fletcher et al. (2006) emphasize the need to follow-up and re-investigate multiple times over the course of one year.

Metacognitive strategies from the Reading Strategy Scale (RSS; Nicolielo-Carrilho & Rocha de Vasconcellos Hage, 2017) may be clustered into pre-reding, during-reading, and after-reading strategies. Pre-reading strategies include developing an image from the title, assessing the length and sequence. During-reading strategies include re-reading poorly understood parts or following distraction, observing figures, marking, dictionary lookup and mental summarizing. Post-reading strategies include re-reading difficult texts, summarizing main points, and talking with colleagues to compare understanding.

Learning Opportunity

The general strategy for the proposed learning opportunity is summarized in Table 1.

Table 1

General Strategy for learning Opportunity

Step	Activity	Stage
1a	Explain purpose of the exercises (e.g. combining easy syllables to 3-syllabic words or forming sentences from choice of words)	Pre-Exercise
1b	Introduce exercise structure (layout, graphic organisation)	
1c	Give an example, thinking aloud	
1d	Present 3 options max. to select per graphical placeholder or 3 syllables to combine, or use 3-object graphical sentence metastructure	
1e	Ask for description of all displayed items	

2a	Let participants describe the layout of the exercise.	During-exercise
2b	Ask for confirmation, whether they think they pronounced or did it correctly	
2c	Correct and rehearse mistakes repeatedly on the spot, slow down speed in difficult passages. Reinforce successful attempts (use "correct", not "good").	
2d	Use dialogue to probe understanding	
2e	Rehearse the whole word or sentence to practice fluidity	
3a	Plan for 15 minutes, repeat the same content in a mildly different setup up to 3 times	Post-Exercise
3b	Probe the learned sentences from memory without visual aid	
3c	Use sentences that may be used in playful dialogues between participants	

Opportunity for Learning Disability

In difference to younger persons with reading disability, Chapleau et al. found exception word proficiency in older people to be superior, whereas in younger people sub-word vocalises (pseudowords; PW) and low-frequency regular words (RW) were pronounced significantly faster. This view is supported by Roberts et al. (2008), who emphasize phonemic exercises in younger, less proficient, and morphemic exercise in older learners.

Reading LD in the Young

For young children, intervention programs may build on monosyllabic PW, pronouncing syllables and working constructively towards the two or three-syllabic words.

Once the word is assembled (3 PW into 3 consecutive boxes), the words must be connected to a picture that represent its meaning. A maximum of 3 words is used in the session. Focus is placed on phonemics and pronunciation. Afterwards, students may read their words or short sentences to each other, producing a guided dialogue.

Reading LD in the Elderly

Interventions regarding reading disability in the elderly may be based on whole-word processes, start from the general structure, and slow down to reintegrate difficult pieces. Individual problem words may be extracted by letting the participants read sentences and probe for understanding. They are analysed and broken down into syllables that are rehearsed separately, with a focus on morphemics. Afterwards, these words are attributed different qualities, e.g. nice, big, sweet, and sentences written down. In a last step, the participants lead short dialogues reading from these sentences.

Opportunity for Intellectual Disability

Reading with ID in the Young

A reading intervention is based on simple 3-word sentences that are displayed graphically. Below each box is a set of three words where children must identify the correct words. In a computer aided setup, students may click the word and receive visual and audio feed-back. The pronunciation of the words is afterwards rehearsed syllable by syllable. The presented words are then transferred to a new context, e.g. from domestic to outside setting. A simple, 3x3 story template must be filled with the words. Participants try to paraphrase the story with own words.

Reading with ID in the Elderly

For elderly people with intellectual disability, focus is placed on everyday situations. An exercise may contain difficult items from a menu or itinerary. Metacognitive probes include context, how to use the maps or menus, where to look for which information, and in

which situations to use them. Three items are singled out and practiced individually. Afterwards the participants practice their use in roleplay. The goal is to master a previously challenging situation.

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