Dyslexia Action
Training and Professional Development

STRUCTURED MULTISENSORY TEACHING AND LEARNING BOOKLET

Contents

Resources to Structure Active Learning Engagement and Metacognition

By metacognition most writers mean 'thinking about thinking' in some respect. One of the key writers on this topic is Flavell and here is an early formulation of what he means by the term:

> *Metacognition refers to one's knowledge concerning one's own cognitive processes or anything related to them, e.g. the learning-relevant properties of information or data. For example, I am engaging in metacognition... if I notice that I am having more trouble learning A than B; if it strikes me that I should double-check C before accepting it as a fact; if it occurs to me that I should scrutinize each and every alternative in a multiple-choice task before deciding which is the best one.... Metacognition refers, among other things, to the active monitoring and consequent regulation and orchestration of those processes in relation to the cognitive objects or data on which they bear, usually in the service of some concrete [problem solving] goal or objective. (Flavell, 1976, cited in Schoenfeld, p. 38, 2009)*

Giving learners a metacognitive stance does not directly influence the subject matter under consideration, but rather how the learner interacts with the material and reflects upon this interaction. A National Teacher Research Panel publication (Price, 2008) describes the use of metacognitive strategies in a Key Stage 3 History class. One student commented at the end of the short project: "I find this way of thinking very different and interesting. It is not that often that people delve deep into their own minds and question their own thinking instead of others. I like the fact that it is different to anything I have done before, and I believe that by using this method it challenges the mind and in time it helps it to grow".

It has been known for many years that reflecting upon the structure of knowledge and how it is assimilated is crucial to the remediation of a diverse group of learners who experience barriers to learning when traditional teaching methods are used (Finkelstein, in Gardiner, 1994; Skemp, 1989, 1976; Mellin-Olsen, 1981; Grauberg, 1997; Pimm, 2003; Hornsby & Shear, 1993). Fresh research is still being produced that finds the positive effect of self-regulated learning and explicit instruction for a wide range of learner profiles (see, for example, Hessels-Schlatter, Hessels, Godin & Spillmann-Rojas, 2017; Kistner, Rakoczy, Otto, Dignath-van Ewijk, Büttner & Klieme, 2010).

Perhaps, the key thing to consider is that metacognition makes every learning task, an active, problem-solving undertaking, involving monitoring and reflection. This is the connection between multisensory processing and metacognition – active learning with self-regulated monitoring necessitates vigilance. Passive learning tasks do not engage learners in same way.

Thinking about Perspectives, Attitudes and Strategies

Sorting activities are active, problem-solving tasks that can be used to get across a wide-range of subject matter. Sets of sorting cards can be used in an open-ended way. Although the subject matter of the cards in this example is metacognition (thinking about learning strategies), the 'content' of the cards could be any two groups/sets of perspectives/levels of competence on any topic – e.g. dosage calculation and administration for nursing students,

making a sponge cake, techniques for drawing objects etc. An important element of the cards is how using them promotes the learner to switch perspective – they look at how someone else is studying, how someone else thinks about learning and exams etc. Additionally, because the cards feature two different approaches/views to learning the pros and cons of each approach can be considered as well. See **Figure 1**. The full set of cards is available in the Appendix.

I concentrate on learning the information that I have to know to pass.	
When I'm reading, I like to stop from time to time to think about what I am trying to learn from it.	

Figure 1

There are also two blank cards included these can be used in a number of ways, for example:

- To create 'header cards' when the sorting process is complete.
- To add further characteristics to the groups.
- For the learner to write a reflection on why he/she is most like one group and not so much like the other group etc.

Whether the self-check symbol is added to the blank cards depends upon how you intend to use the cards – in most cases it is probably best to leave the backs blank.

It is useful to have a self-check element to the task to help confirm that there are two groups that the cards can be sorted into. Use the self-check symbol (in the second column) – cut these out and stick them to the back of the cards – so that the learner cannot see them when the cards are facing upwards.

A suggested way of using them:

1. Place cards face up on the table and ask the learner to read through them or share the reading of them. Ask questions to promote thinking about the quality of the learning that is expressed in each card and also about what the person is expressing – e.g. interest, anxiety, reflectiveness, study skill efficiency, study skill effectiveness etc.
2. Ask (or work with the learner) to sort the cards into two groups – discuss during the process to ascertain why choices are made.
3. Get learner to self-check (the fact-focused learner is represented by the  symbol; the meaning-focused learner is represented by the  symbol).
4. Promote a discussion about which type of student (which group of cards) the learner most relates to, or can they see a mixture of approaches in what they do – this can then lead to discussion of things that might be worked upon during support sessions.

Note how the cards promote thought and give a structure to the dialogue, it also allows the objective consideration of different attitudes to learning without it being 'personal'. The use of the cards gives a varied and active way of considering different perspectives to a topic, consider the alternative ways the same subject matter could have been broadcast to the learner:

- A PowerPoint presentation
- A written discussion of the different perspectives
- A 'top tips' for effective study poster
- A discussion with a peer or with a teacher/support tutor

Consider how the card-sorting method embraces a root and branch approach to promoting metacognition.

Sentence Punctuation Self-check: Stepping-stones to Proof-reading

Making the steps in a task explicit and giving the learner a schematic 'analogue' is another way to enable the learner to think about super-structures, overviews and the overall framework – to draw something from a learning situation that is more than details or facts or instructions to be followed.

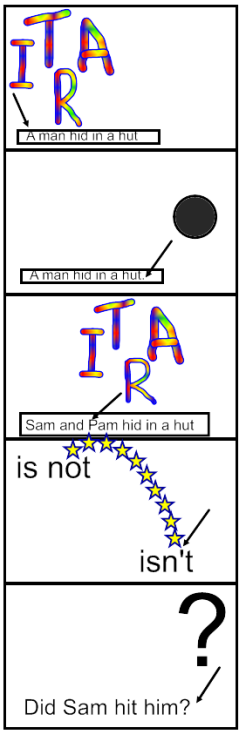

Figure 2

Figure 2 is an example of a simple self-check strip that was developed for an adult learner, who needed something visual to remind him what to check when he had finished writing the short emails he had to compose as part of his job as a salesman. It gives a structure to work through when checking and consciously brings to mind the steps/elements in the checking process. Such strips give the learner a means of monitoring (and appraising) his/her own performance and to self-correct independently. Clearly, much more complex strips could be developed for a wider range of proof-reading skills, which included checking for meaning, word omissions, homophones, missing letters, etc. It also (just like the card-sorting task earlier) provides an opportunity for structured and explicit discussion about an aspect of learning in an objective way and gives invaluable practice at self-monitoring and appraising. This sort of shared self-checking process can then lead to the learner setting him/herself some targets as well as acknowledging emerging competence in areas of practice.

Visual Strategy Prompts E.g. Active Reading

Visual prompts can also be designed to structure how learners monitor their own work – giving them visual reminders of different strategies they can try to overcome obstacles or to hone skills. In **Figure 3** we see an example of a set of strategies tailored to a learner to give her a range of things to try when she gets stuck when reading ('stuck' meaning both in terms of sounding out/decoding the word and in terms of drawing meaning from the text). This was made with the learner – so the words and pictures would be meaningful to her.

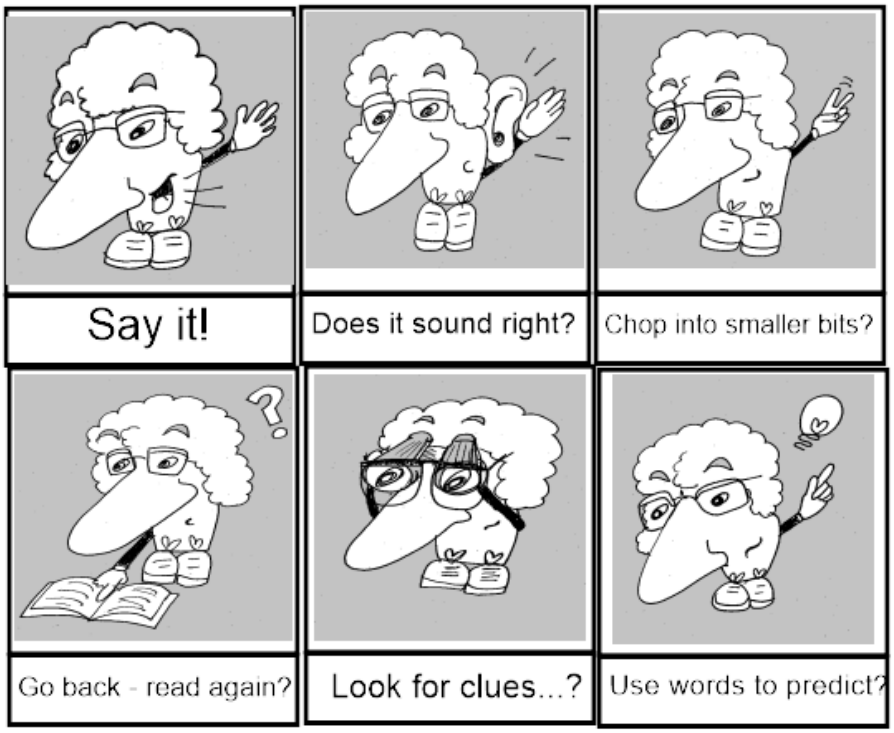

Figure 3

This approach could also be used to give learners a reminder about strategies they can use to enhance their work. For example, in art, a grid could be made to suggest different techniques to enhance the 3D/depth-handling in their drawing of objects- using techniques to indicate light and shade, perspective and so on. Again, using a strategy prompt like this can also be used as part of a self-regulated assessment process – as the criteria for success could be twinned with the strategies on the cards. Similarly, peer-review could be undertaken if all class/study group members have the same prompts – and feedback can be structured using the prompts.

The reading strategy example and a blank grid are available in the Appendix.

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Using Structured Multisensory Strategies and Resources to Support Memory

When we consider the idea of 'active' learning we need to consider why or what is about certain sorts of activity that make them 'productive' (that is, make them beneficial to learning). Shams and Seitz (2008), for example have produced research demonstrating that our brains function (and therefore learn) at optimal efficiency when we are in contexts where information is held and assimilated multiple sensory channels (modalities). Dewey (e.g. 1928/1997) has written at length about the links between education and experience and how exciting stimulating learning contexts are not sufficient by themselves. Dewey in particular emphasises the role of structure (and of the teacher's role as designing educational activities to maximise their productivity for learners).

Taking this a step further there is a substantial movement in neuroscience called 'embodied cognition', which it is pertinent to consider briefly here. As Clark puts it:

Biological brains are first and foremost the control systems for biological bodies. Biological bodies move and act in rich real-world surroundings. These apparently mundane facts are amongst the main driving forces behind a growing movement within cognitive science – a movement that seeks to reorient the scientific study of mind so as to better accommodate the roles of embodiment and environmental embedding [how our thought processes and behaviour are linked to the functions we carry out in the world] (2017, p. 203).

This is very important to consider when we think about multisensory processing (how the brain channels and combines the different signals it receives) and the impact that multisensory (in the sense of rich, goal-oriented activities) can have upon learning. Let's look at a few examples:

- There is a lot of experimental evidence that suggests that the processing of information from the hands when manipulating objects is enhanced (Bolognini & Maravita, 2007; Ishibashia, Hiharaa, Takahashia, Heikeb, Yokota et al., 2002). Think about how this might be linked to humans (and higher apes) being specialised tool-users. It has also been found that working memory for manipulable versus non-manipulable objects has been found to be distinct (Mecklinger, Gruenewald, Besson, Magnie, & Von Cramon, 2002). This is of particular interest, as it could mean that for some learners using objects that can be manipulated is a new path to understanding: using concrete apparatus might bind meaning and focus attention in ways that allow insights to be formed that have previously evaded a particular learner (Pimm, 2003; Grauberg, 1997).
- There has been some interest in science education about the potential for using movement and haptic feedback to enhance understanding of complex scientific ideas (Druyan, 1997). One experiment used a desktop rollerball system that gives one the experience of touching complex computer simulations of things such as viruses. So, using this system gave the learner a sense of actually touching a large-scale model of the virus and feeling its structure. The experiment revealed that the use of the system increased the number of touch-related words the students used to describe the viruses and post-experiment assessments revealed a significant difference in the number of characteristics of viruses that students were able to recall (Jones, Minogue, Tretter, Negishi & Taylor, 2006). So, we can see that potentially using

touch information that is directly relevant to the subject we are considering, in this case the structure of viruses and how they multiply within us, can enhance our understanding by enriching our learning perspectives. For example, perhaps feeling the surface of a virus would trigger a greater awareness of how they are designed to latch on to naturally occurring structures in our bodies.

- Gesture is another element that can be used. Pointing and other gestures are an integral part of language and are manifestations of the drive to communicate (McNeill, 2000). Spoken language and arm gestures are controlled by the same motor command system within our bodies. Some researchers see gestures as additional ways of processing our understanding of the world around us. This links to Sperry's idea about our thoughts being linked to action. Our actions are a way of expressing meaning without words (Sperry, 1952; Gentilucci & Dalla Volta, 2008; Zwaan & Taylor, 2006; Krauss, Chen & Gottesman, 2000). Research has shown that children are sensitive to teacher's gestures and can draw additional information from them (Singer & Goldin-Meadow, 2005) and use this information to aid performance in classroom tasks (Cook, Mitchell, Goldin-Meadow, 2008; Cook & Goldin-Meadow, 2006).

- Wang, Bernas & Eberhard (2004) have also demonstrated gesture to be a useful tool for engaging learners with learning delays including those with ADHD. In learners with specific language impairment (SLI) when comprehension falters, gesture may be relied on in preference to speech, whereas typically developing children showed a preference for spoken cues rather than non-verbal gestures (Botting, Riches, Gaynor & Morgan, 2009). Sometimes understanding can be evident in gestures before children can articulate their understanding in words, so it is clear that this is an interesting and potentially fruitful area to explore with learners.

Examples of Structured Multisensory Strategies and Resources

Let's look at some examples of strategies and resources that share certain features. The features are not present in all of them, but there are overlaps and characteristics in common:

- The learner is at the centre of them and leads them
- The activity is purposeful
- The learner is given a meaningful framework to work within
- There are moveable items (cards, dice, counters) or movement in other ways (gestures, body movements)
- The target subject matter/topic or skill is made explicit by the process or reveals something important about the subject matter
- The activities give the learner a perspective to adopt (becoming someone/something in personification), a collector in the maths game etc.

The Spelling Card Routine

This is a routine that is used to practice newly or recently acquired phoneme-to-grapheme links. That is, when a new spelling of a phoneme is learnt, it is captured on a spelling card. This card is then used to rehearse the links between the sound of the phoneme, the name of

the letter and the movement required to write the letter. Note also how the routine includes the learner watching the articulation of the phoneme by the teacher/tutor and it requires the learner to self-check her/his response. Each step in the spelling card routine acts as a foil for memory and the many elements make it a highly multisensory rehearsal. The stages of the spelling routine are set out in Table 1 and the rationale is given, so that you can see how each of the steps involves different types of actions on the learner's part.

Table 1

The Steps in the Spelling Routine	The Rationale for the Step
Teacher hold cards and says "Look at my mouth and repeat after me..."	Because learner needs to see the correct articulation of the phoneme and copy the speech action to create the phoneme for him or herself.
Teacher says the phoneme.	Because learner needs to hear the pure sound (i.e. without the schwa).
Learner echoes sound then says the letter name /t/ is <t>.	Because learner needs to utter the phoneme correctly to trigger the link to the letter name.
Learner writes repeating "/t/ is <t>" whilst writing.	The letter name triggers the kinaesthetic memory to produce the written output.
The tutor shows the card to the learner.	So, the learner can self-check and gain a sense of independence rather than having work 'marked'.

The spelling card routine works because it forges a memory link between the phoneme, the letter name and the movement pattern used to generate the grapheme. It also encourages spelling by letter name string (rather than phoneme string) – this is the best procedure to use in order to spell accurately in an opaque orthography such as English.

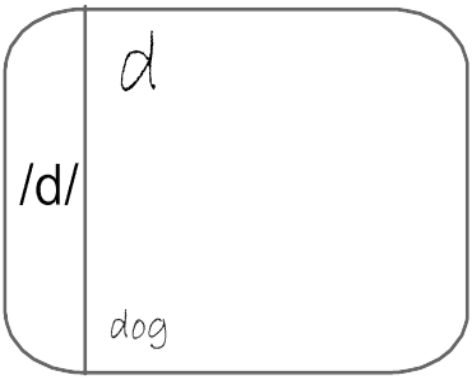

Figure 4

Note that in the example of the spelling card (Figure 4), it is the writing at the top of the card that is for the learner to read i.e. the written graphemes that are associated with the phoneme. The reference word at the bottom is not so important early on, but later when mantras get more complex, the teacher needs a reference to the particular example word the learner is using to specify the spelling choice so that spelling choices can be differentiated where necessary. In the example given (Figure 4), the teacher would be able to clarify that /d/ was written using the letter <d> in the exemplar word 'dog'. Later on, another spelling choice for

the phoneme /d/ will need to be added (/d/ as <ed> in words like ‘grinned’, ‘filmed’ etc.) in this later case, because of the presence of the reference word at the bottom the teacher would be able to cite both instances. The mantra would then run something like: /d/ is <d> (as in ‘dog’); /d/ is <e…d> as in ‘grinned’. See Figure 5 for an example of this. Note that the < > symbol encloses the grapheme – how the sound is written, when saying the mantra it is always the letter names that are said to represent the grapheme.

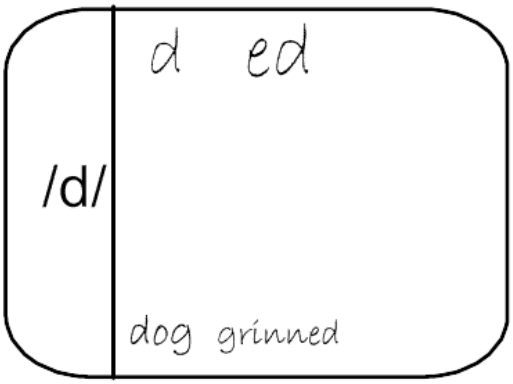

Figure 5

Place Value Sorting Game

Maths, especially aspects of arithmetic, can be seen as sublimated actions or events…. So, in a sense some of the more active types of arithmetic tasks could be considered as explicit explorations of the original actions that have been captured in the mathematical procedures (for example, addition and subtraction), which we use in our everyday lives. If we think of Dienes Blocks or a place value chart or an abacus, they are schematic representations that promote understanding because they reflect relationships implicit in the numbers they represent (Pimm, 2003). So, they make implicit relationships explicit. They also involve series of actions that group things together – the forming of sets.

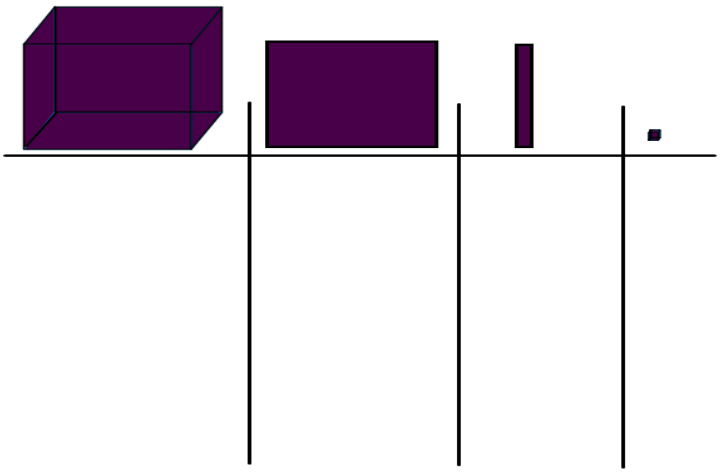

Figure 6

Figure 6 shows a simple place value board, which can be used to promote understanding of the place value system using an active game format. Initially you can just play a collecting game with one rule. Only nine items can stay in each column. When ten of any sort of tokens are amassed, they need to be swapped for the token that is above the column to the left. This example uses Multibase blocks for column headers, which gives a direct link to the structure of the number system. The key thing for learners to understand is that you can swap (working right to left) ten tokens in one column for one token in the next column. Gradually units, tens hundreds etc vocabulary can be used. This simple format produces immense understanding.

Personification

Another way of enhancing knowledge through creative and lateral thinking about what is already known is to use personification (Zwiers, 2013; Skemp 1989). Personification is similar to role play in that it involves taking on the perspective of an object or other entity and imagining the experiences and thoughts of that person or thing. Think how powerful this might be for stimulating thinking, exploring vocabulary. How could such activities promote understanding through exploration of detail and by perspective shifting? Imagining that you were a virus looking for a body site to infiltrate for example?

Using Gestures to Advance Understanding

Systems of gestures can be developed to enhance understanding. An example of this is given in Table 2, which features a system set out by Zwiers in his book Building Academic Language (2013, p. 56). It was developed to encapsulate elements of the meaning of the academic phrases/argument indicators they represent. For example, 'in conclusion; in essence' is represented by both hands starting spread and then closing into a ball-like shape. Simpler systems could be developed to prompt for 'synonym', 'opposite', 'something in the same category' etc. to boost vocabulary.

Table 2

Academic Language Examples	Example Action or Expression
For this reason, because of this, thus, hence, therefore…	Hands make forward pushing motion.
And, furthermore, moreover, in addition …	Hands make a rolling motion forward.
In conclusion, in essence …	Both hands start with fingers spread, then close to make a ball.
For example, for instance, to illustrate, let's say…	Put index finger at the tip of little finger on other hand.
On the other hand, nevertheless, on the contrary, then again, even though, despite, granted, of course, however, but, yet …	Move hand, palm down in one direction and then make a 180-degree arc to palm up; walk one way and turn around; look at the hand that is out and then put out the other and look at it.
Similarly, likewise, in the same way …	Put both hands up with crossed fingers.

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Appendix

I tend to focus on memorising the things I need to learn.	
Finding the key facts and ideas in the text books/lecture notes is not easy for me.	
My notes end up being too long because I try to jot down as much as I can in case, I miss something important.	
I don't have time to read anything beyond what is required to pass.	
I concentrate on learning the information that I have to know to pass.	
When I'm reading, I like to stop from time to time to think about what I am trying to learn from it.	
When I'm working on a new topic, I try to see in my own mind how all the ideas fit together.	
I often find myself questioning things I hear in lectures or read in books.	
I usually set out to understand for myself the meaning of what we have to learn – that's important to me.	
It is important for me to be able to follow the argument, or to see the reason behind things.	

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