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HOW TO TEACH HANDWRITING

When we learn to write, posture, grip and movement are all involved and the sequence is put together by the motor cortex in the cerebral hemispheres concerned with voluntary movements. If a letter is taught as a whole fluid movement in the air, on a whiteboard, in sand and so on and then written on paper from memory this emphasises the motor memory aspects and gradually the size can be adjusted to fit on the page and the line.

Much copying and tracing is used in early writing but this practice needs to be questioned. These strategies can extend the time taken to establish motor memories and when children are left to their own devices it can lead them to draw the letters rather than to lay down correct motor writing programme.

In order to develop the fine motor control required to produce handwriting there are many stages that have to be reached and developmental phases that have to be achieved in using one's hands and fingers precisely in a skilled activity.

Good fine motor skill stems from solid sensory and motor foundations and it is important to have muscle and joint stability, especially in the neck, trunk and upper extremities. Not least is a consideration of the whole body's posture and the appropriateness of the furniture, especially in the acquisition stages. Accurate tactile discrimination and hand and finger strength aid in the control of pens and pencils. In addition the ability to motor plan, the coordination of the two sides of the body and the development of hand and eye dominance are also involved in establishing pre-writing skills. However, visual control tends to be overemphasised instead of cognitive control.

Handwriting is a motor activity which needs to be taught; it is not a natural skill that will develop like walking. The motor memory controls the direction and

shape of each letter, and therefore a continuous joined handwriting style, established as early as possible, can help to gain automaticity.

Handwriting is regarded by Alston as an underpinning skill, essential of children are to succeed in writing and spelling. Thus any student who has not been able to develop a fast and legible script is at a disadvantage and likely to underachieve in school.

According to Ellis two or three stages of planning intervene between the grapheme level and the movements of the arm, wrist and hand that produce handwriting. The first step involves selecting the particular letter shapes that are to be used. Is it to be A or a? The different forms that the same grapheme can take are sometimes referred to, following linguistic terminology, as allographs. After the allograph has been selected, the writer must then generate the sequence of movements that will result in the letters being written correctly. That movement sequence is sometimes referred to as the 'graphic motor pattern'. It will specify the force and direction of the strokes needed to create the required size as well as the shape of letters. All that is required to complete the writing process is for the graphic motor pattern to be implemented as a sequence of instructions by the necessary group of muscles.

Learning to write however is not the same sort of process as using fluent writing and needing to select allographs. In schools we are first of all dealing with learning to write and the laying down of allographs and Marr has shown that this is dependent on different neurological processes.

Learning to write in the brain. Two areas of the brain are involved in the motor control of handwriting. The first is the voluntary motor cortex in the cerebral hemispheres which lies just in front of the Sylvian fissure in the frontal lobes. The left hemisphere is usually responsible for controlling the right hand and vice versa. Twelve per cent of the population are left handed but only about half of them will have the control in the right hemisphere, thus being 'true' left handers.

When we are learning to handwrite, the voluntary motor cortex is responsible for learning the skill and putting all the parts of it together so that over time it

gradually becomes a fluid and economical form. The representation of motor control in all parts of the body is seen as an 'inverted homunculus' in the brain. There is a huge area devoted to the thumb and fingers for manipulation of objects, and to the lips and tongue in speech. This represents their importance and the amount of control needed to be exerted over them.

Developing motor skills can be a lengthy process in which muscles have to be strengthened and for this spaced practice is the most effective. Guided practice with

the feedback from a mentor, the teacher, is important in the acquisition stage as with a 'sports approach' or coach. This enables the correct penhold, the tripod grip, to be established and the most efficient form of motor movement to be executed. Because cognitive control is involved it is essential that this is exerted from the outset. To do this the child is shown the model, the teacher makes the shape in the air, on the board and so on and then wipes it off. The child should then try to reproduce the movement in the air and then on a board and eventually on paper. All these movements can be supported by singing and painting and drawing activities to strengthen the muscles and fingers.

What we see in classrooms is not always as described above. Children are shown the model and then left to copy or trace over letters. Their pencil grip is not adjusted to the tripod grip and the problems of bendy joints and grasp are not noted and compensated. Thus habits develop which are later difficult to change.

Fluency, automaticity and the role of the cerebellum. All the while that we are learning a new motor skill another area of the brain is shadowing this process and this is the cerebellum (the hind brain). The surface of the cerebellum consists almost entirely of a vast array of 30 million nerve fibres running in parallel with each other fed by a series of cell complexes rather like a wiring diagram in series. It is laid out differently from the rest of the brain, especially the cerebral hemispheres, for its unique purpose.

In essence the cerebellum is a recording machine which memorises all the complex muscular actions involved in a particular skilled movement. It 'shadows' the

skill acquisition and development of the motor cortex in the 'roof of the brain' in the cerebral hemispheres. It soon begins to take over control of the operation and this leaves the main brain free to think about new things. Repeated firing of the parallel circuits in a particular format creates connections between them that fire the whole motor programme. Thus one day when I was putting up ceiling tiles and had a small segment to glue, I spread the glue with the knife and started to put the tile in my mouth. The feeding programme had been elicited and because I was talking whilst I worked my attention was distracted and the wrong programme was activated. When driving we often feel that a large black gap exists in a regular journey where the brain was switched off but if an emergency stop was called for we would still make it. These examples illustrate situations where the cerebellum with minimal perceptual and cognitive cues runs its programmes. It means that once we have learnt to play the piano, swim, ride a bicycle or write, we do not forget how to do them, and even after 20 years it can take a very little exercise to get us back on form.

If the work of the cerebellum is damaged or disrupted in any way then we see persons unable to perform skilled movements easily. They may stagger when walking and be unable to get a cup to the lips without spilling it and so on. In developmental coordination difficulties (DCD) there may be a number of barriers to learning in such a system which inhibit the smooth and easy development of motor skills. These might be difficulties in the cerebral learning areas, problems in the pathways between the cerebral hemispheres and the cerebellum and problems in the cerebellum itself. Difficulties in using tools for eating and in bead threading may be early indicators of a DCD problem which will also affect handwriting. DCD may affect all aspects of movement including gross motor skills or they may just affect fine motor skills when the problem is less likely to be detected before entry to school. It will be shown that we must consider the ways in which we teach handwriting much more carefully because of these dual processes, for many of our methods are creating additional barriers to learning. In addition there are implications for remedial and corrective approaches to spelling and handwriting.

Teaching handwriting in schools. Handwriting for communication needs a 'fast running hand'. Ten per cent or more of pupils have mild handwriting coordination difficulties. They have difficulty in learning to form letters correctly and in producing a neat style on a page at a reasonable speed. Teachers are very concerned that pupils do develop and use neat writing and some can pressurise pupils unmercifully to do so. But it is rare that speed features in the teaching process. There may be such a concern for neatness that it is at the expense of content and studies have shown that neat writers, more often girls, tend to be awarded higher marks in many classrooms. Untidily written scripts were downgraded although the content was exactly the same. The pressure focuses upon the production of a neat print script which is easily readable for the teacher. It is modelled upon the simple style currently found in infant texts. This print script became so popular that throughout England and Wales it replaced the earlier joined 'civil service hand' or cursive.

Handwriting style – print? Because children's stories and reading schemes were in print script it encouraged teachers to teach it in reception and then introduce joining as soon as a neat print had been achieved. A consensus developed that this was at about eight years of age and it became the role of many junior schools to teach joining. However, there was no evidence to support the view that print was easier as children had managed perfectly well before when learning cursive. In fact in the majority of countries throughout the world cursive is taught from the outset and French education focuses more on teaching handwriting in the first two years than on reading and spelling.

Reception class teachers in the UK even adopted the practice of simplifying the print form further so that it became the development of a series of ball- and stick-like forms. This practice was challenged by handwriting experts such as Marion Richardson who included ligatures to help with later joining. Pupils and students who use a print script often prefer to do so because they feel that it looks neater. Occasionally parents have been encountered in my school-based programmes who refuse to permit their children to learn cursive.

Print, even with ligatures, is ergonomically problematic for many children, especially those with mild or more serious motor coordination difficulties. Such children must learn a joined hand. Once the cerebellum has learnt the print form, learning cursive means learning a new set of motor programmes. The former is not a step of the way to the latter and ligatures are not the answer for pupils with difficulties.

Teaching methods that require the copying of letters, whole words and sentences in infant unjoined print should be challenged. Teaching handwriting needs to begin with movement training and penhold exercises and develop into writing letters and simple words from 'inside the head', i.e. from memory. Copying from the board involves holding the spelling in short-term memory for a time and writing from this temporary memory store and thus extra errors can creep in. Even near point copying (writing below teacher's model) can give rise to similar errors.

Tracing does not involve the word memory store; it only involves strengthening exercise in the motor movements which can be more fluently taught in other ways. The NLS insisted that children must gradually learn the 200 basic 'sight' words found in their readers and of course this too encouraged the copy writing approach without phonics or morphemics. Teachers used the 'look, say and write' approach or the 'look – cover – write – check' method but significant numbers do not learn well by this method and remain poor spellers.

Handwriting is essentially a highly complex motor skill and needs to be linked with spelling which is a complex set of cognitive and recall skills. Either we have to recall complete spellings stored in the lexicon (word memory store) or we have to construct them as we go along from 'particles' of other information also stored in the lexicon, or from elements generated from the speech organs. Learning to write the particles such as base words (form, bed) and affixes (-ing, -ed, -s and re-) as whole writing units helps them lodge in the lexicon for that appears to be how they are stored. Writing separate letters as in print methods does not facilitate spelling of particles and leads to omissions of letters and syllables (concatenation) even when ligatures are included.