

## ***Children, Young People and Families***

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Dear Colleague

### **Re: Stern Structural Arithmetic**

#### **Background**

As an Advisory teacher for SEN, with a specialism in Maths, I am regularly asked by schools to support and aid their assessment process for children who face barriers to their learning in Maths and then recommend interventions and resources to assist classroom teachers in meeting such need within the classroom.

Many of the children and young people raised as a priority by schools have difficulties that arise when the curriculum moves away from using concrete and visual activities. Resources that support a child's Numeracy work become less readily available and, as the curriculum becomes more challenging, pupils are expected to focus on activities that are more abstract in nature. In my experience, this occurs around Year 3 and if early concepts around number are not securely embedded this is where barriers to learning in maths and many errors and misconceptions become more prominent.

#### **Oldham Trials**

Various settings within the Authority have been trialling Stern Structural Arithmetic for over 12 months. These settings differ in context and have differing intake of pupils. The studies have focussed on groups of children from Nursery to Secondary age. We have come to believe that because Stern's apparatus are developmental and not age specific, they can be used across a wide age and ability range.

During this time it has proved to be an invaluable resource for teachers and teaching assistants working to address the fundamental errors, misconceptions and stumbling blocks

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faced by older pupils who have a long standing history of facing barriers to their learning in Maths and set firm foundation, in the Early Years, on which to build further arithmetical knowledge.

Stern works for both of these groups of learners because the early and crucial stages of mathematical thinking and exploration are supported by the structured hierarchical activities which focus on concrete and visual resources. The Montessori centred philosophy (experiential learning) employed by Catherine Stern promotes learning by discovery and investigation. This leads to a deeper understanding of concepts and processes related to number and the number system. The way in which structured activities develop through the use of concrete and visual activities to the abstract representation of concepts leads pupils to a greater understanding of the number system which is more deeply embedded.

### **Cognition and Learning**

When considering how Stern Structural Arithmetic contributes to the development of cognition and learning for children exposed to the resource, the settings working with Stern have reported noticeable improvement in many skills which can be directly linked to the introduction of the resource:

- Early concept development of colour, size, ordering and matching
- Self checking nature of the resource means that knowledge is experiential and embedded before the next steps are introduced.
- The size of the equipment and nature of the activities within the programme promote the development of hand-eye coordination, 1:1 correspondence, manipulative skills and a better understanding of left to right directionality.
- Spatial development has been enhanced.
- Improved auditory and short term memory noticed
- The strong imagery and multi-sensory nature of the resource make the number system visible; this helps the child commit new learning to memory.
- The long term memory of children using Stern has also been improved with no or very little regression in knowledge and skill over the more lengthy holidays.
- Logic, reasoning and thinking skills have shown development and the children work more collaboratively.

### **Language**

Language skills are a focus throughout the Stern activities and promoted. The clear instructions and language used by the facilitator supported by actions, demonstration and

visual materials proves to be of great benefit for children **learning English as an additional language** or those with speech and language needs, for example. Activities do not rely on verbal understanding and each activity is modelled by the facilitator who stresses the appropriate language and vocabulary. Practitioners feel that the small steps approach, turn taking activities and built in opportunities for repetition and revisiting, promote the development of speech and language skills and the interactive nature of the programme allows for improvement in expressive and receptive language skills especially through, as trial settings have reported, being motivated to problem solve and take on the role of the teacher which enables the student to practise and develop skills in language and memory.

### **Attention and Concentration**

There is no doubt that the Stern materials are engaging to those who come into contact with them. They help to develop concentration and motivation, both of which can easily be sustained through the interactive V-A-K (Visual, auditory and kinaesthetic) nature of the activities and the short focussed sessions by which they are delivered.

The learning opportunities associated with taking the role of the teacher here are crucial as the children are afforded the opportunity to communicate what they have learnt which enables them to commit it more firmly to memory.

### **Problem Solving**

Problem solving skills are also promoted through the Stern materials, as mentioned above, the learner is actively encouraged to explore the resources in order to learn for themselves. The resulting experimentation and investigation coupled with the self-checking nature of the materials means that only correct learning is reinforced and fewer errors and misconceptions develop. Pupils are provided with the opportunity to work collaboratively and turn take which also aids their social development.

Because of our initial and ongoing findings, we will continue to use and promote Stern Structural Arithmetic as an invaluable resource in promoting early mathematical learning for Foundation Stage children and perhaps more pertinent to my role, as a tool to overcome barriers to learning in maths for children and young people who have a history of these difficulties.

I hope that this has provided an insight into our findings relating to the Stern Structural Arithmetic trial which has been running in the Authority and our reasons for continuing to use and promote these resources to colleagues seeking advice.

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Oldham AEN Service