The interplay of language and thought in learning

"How do I know what I think until I see what I say"

The teaching of thinking is an increasingly important part of enlightened curriculum documents. Some schools find their students thrive and progress well, becoming better metacognitive learners. In other schools the task is much more difficult. Our proposition is that success in teaching thinking skills is firmly rooted in language development and that the economic circumstances of children have a powerful effect on the sophistication of their language skills.

Lev Vygotsky (Wells & Claxton, 2002) saw the linguistic and cognitive development of children as growing out of social interactions. It was these interactions, initially within the family and later in the wider community, which would drive intellectual development as it was mediated by language. We know that metacognitive thinking is one of the preconditions for successful, independent learning (NRC, 2000). The metacognitive learner is able to control his own learning by becoming aware of his own thinking, reflecting on it, understanding the strategies that are being used, evaluating their success and adapting them as necessary. In "Aspects of the Novel" , E. M. Forster wrote "How can I know what I think until I see what I say?" In order to reflect on one's own thoughts, one must first have the language with which to describe and reflect.

The English sociolinguist Basil Bernstein (Bernstein 1971) proposed that there were two codes of language – restricted and elaborated. The codes themselves were not necessarily tied to social class, but the ability to switch between them was, according to Bernstein. The elaborated code was described as highly specific, frequently abstract with nothing left to intimation or suggestion. Sentences were carefully structured and complete and words were chosen with great care and accuracy. Typically it was the language of formal communication. Restricted code, on the other hand, required a great deal of shared knowledge between communicators because much meaning was hinted at, suggested, implied and supported by a great deal of non-verbal scaffolding. Restricted code tended to be concrete, about the here and now. Typically this is the code of informal family discourse, the language of the pub and the playground as well as the language employed by members of the same profession where you need to be an insider to fully understand.

The linguistically proficient individual is the one who has access to both of these codes and is able to switch readily between them as the need arises. The difficulty that Bernstein saw was that children from

economically stressed homes tended to have access to only a restricted code. He argued that facility with these codes was the result of the socialization process which determined their upbringing and the pressures in lower socio-economic households were such that children did not develop the elaborated use of language.

Other researchers in the USA have supported Bernstein's contentions. Louisa Cook Moats (Moats 2001) tells us that the linguistically advantaged child in grade 1 knows approximately 20,000 words whereas the linguistically disadvantaged child knows only 5,000. Beginning the school year with a disadvantage means that the further through the school the child progresses, the greater the gap becomes. Linguistic disadvantage is closely tied to economic disadvantage. Ruby Payne in the USA (Payne 2003) describes a formal register and a casual register that are very similar to Bernstein's restricted and elaborated codes. And she comes to a similar conclusion – children from poor communities do not have access to the formal/elaborated code.

Ratey (Ratey 2001) tells us that the infant children of professional parents hear on average 2,100 words per hour whereas the children of working class parents hear only 1200 words per hour and the children of welfare parents hear only 600 words per hour.

Poverty creates very specific stresses. The single mother of three toddlers struggling to provide for the material needs of her children and herself simply doesn't have the time or energy to explain why a child ought not to play with matches. The child is simply told 'no' and a rap across the hand is likely if the matches are not put down. There is no explanation of consequences, no reference to previous discussions or earlier experiences. Language is a tool of the here and now.

Economic need means that fewer children today are at home with a principal care giver. Many more very young children are in family day care, nursery school, crèche or something similar. The average child to adult ratio in preschool groups in the USA for three year olds is between 10:1 and 15:1 (NCCIT 2008). We know that with groups of this size most of the language used is largely organizational and directive. There is very limited time for the one to one, exploratory and explanatory linguistic interactions that lead to rich language development in children.

Thought is mediated through language and thought can only become more complex and sophisticated to the extent that language is available to reflect upon thought. Researchers have demonstrated the linguistic disadvantage faced by children from poverty. The successful teaching of thinking, and metacognition in particular, is rooted in the level of language development and tied to socio-economic class. Until children have the language to express their thoughts they will not become metacognitive learners.

It is not enough to focus on any single stratum of society for our next generation of innovative thinkers. The future of any country as a vibrant contributor on a global stage is dependent on its ability to produce a well-educated, creative and productive generation of thinkers. China now dominates the results in international measures of student achievement such as the OECD's PISA of 2009. No country can afford to be left behind. The pool within which we discover the intellectual leaders of tomorrow must be as large as possible and so it is imperative that we find ways to ensure that our students living in difficult socio-economic circumstances are able to contribute and this must of necessity begin with language. We need to focus on the development of the elaborated, formal language that makes metacognition possible. Attempts to teach thinking before addressing language deficits are counter-productive and may well account

large part for the frustrations experienced by many teachers of thinking in disadvantaged schools. We also need to understand how the movement from elaborated to restricted code can aid in the students understanding of difficulty concepts.

Firstly, how do we encourage the development of the elaborated language that facilitates thinking?

The greatest obstacle teachers face is finding time. The emphasis on accountability and results based, data driven practices mean that curriculum and testing have become very closely coupled. Schools teach concepts, skills and content that they believe will be tested by means of a single or a series of standardized instrument. The needs of children from impoverished backgrounds differ profoundly from the needs of children raised in more comfortable circumstances. But everyone needs to pass the same test and so it is precisely those children with the greatest linguistic needs who find themselves being confined in their learning more and more strictly to the tested curriculum. Because the children lack the language to explore concepts and their own learning at a metacognitive level, teachers resort to intensive drilling in teaching factual information and routines. The test scores may rise since much of the testing process is amenable to this sort of memorization and routine application, but these students are not becoming self-regulating, innovative independent learners or thinkers.

The building of vocabulary is fundamental. For vocabulary to be incorporated into a student's usable lexicon it needs to be rooted in experience, linked to previous known vocabulary and used regularly in student engendered spoken and written language. Rote learning of words will not do. Words must grow from experience and children of poverty typically have limited experiential opportunities. Many have never been outside their own communities, have homes with few books and often no access to newspapers. They self-select television programs and rarely discuss them with any adults, and they are unlikely to have visited such places as museums, art galleries, zoos, concerts and the like. These are the experiences that provide the fertile ground for the development of language and thought. Building an experiential base takes time and isn't covered by the tests.

Research shows us that simply encountering new words in reading is not an effective strategy to build working vocabulary. Students need to be exposed to a new word at least six times before they are confident in its use. Instruction in specific words will increase vocabulary provided the words are encountered in a suitable context according to research by Jenkins, Stein and Wysocki (Marzano 2001 p 125) and learning is further enhanced by the attachment of visual images or symbols (Marzano 2001 p 126). When direct experiences are not possible, indirect experiences mediated by reading can be effective means for building vocabulary provided these words are presented in an explicit, elaborated fashion through direct instruction on words encountered in context.

Thinking takes time, for clarification, for rehearsing, rephrasing, exploration and thinking about our own thinking. Dialogue is at the heart of language development. Gordon Wells at Bristol University extensively studied early language development by recording the daily language of 128 young children over two and a quarter years and analyzing the data accumulated. He came to the following conclusion:

"the child who is treated as an interesting conversational partner and whose contributions are taken up and extended by his or her interlocutor is likely to gain greater confidence in his or her own ability to contribute to collaborative meaning making." (Wells 2009)

As Michael Halliday said:

"Language has the power to shape our consciousness; and it does so for each human child, by providing the theory that he or she uses to interpret and manipulate their environment." (Halliday 2003)

If the school does not find the time to provide the opportunities for rich dialogue that are essential to the development of language and meaning making, who will?

It is interesting to note that students in the United States perform very differently in two different international measures of achievement. In the Trends in International Mathematics and Science Study (TIMSS) where the average score is 500 US 8th grade students achieved a score of 508 in mathematics in 2007 – above average. In 2009 the OECD Program for International Student Assessment (PISA) had an average score of 496 and US fifteen year olds scored 487 in mathematics – below average. One of the significant differences between these two measures is that TIMSS evaluates the taught curriculum and PISA evaluates the ability of students to transfer their learning from one context to another. In other words, US students perform differently when the task requires higher order thinking.

Secondly, how does an understanding of the differences between elaborated and restricted codes help in the successful teaching of difficult concepts?

The act of teaching is a social interaction and when introducing new material the teacher is often dealing with a minimum of shared experience. The situation may be even more complex because of the students' misconceptions or confusions over new terminology. The term 'energy' is a good example. Students often have developed a particular understanding of the meaning of this word from common place usage that is very different from its scientific meaning. Their music is described as having energy, when they don't eat their mothers tell them they will lack the energy to play or do homework, the child who is very active is described as having a lot of energy. These implied meanings need to be uncovered and dealt with by introducing the new material in elaborated language in order to make explicit the meanings of words and concepts. As familiarity with the vocabulary and concepts develop the teacher should then shift the language (or switch the code) from elaborated to restricted.

The teachers of young children do this frequently in mathematics. In teaching about multiplication the teacher will begin with word stories that incorporate descriptions of groups and collections of things. Often they will have elaborated the story even further by having actual concrete, physical objects: "I have got two baskets and in each basket there are four apples." The children look at the baskets, count the apples, and talk about the groups and how many groups there are and how many apples there are. The teacher then increases the level of symbolism by drawing the two baskets on the chalkboard and putting the actual apples away. The elaborated language of real objects is now becoming a little more restricted as the shared meaning of drawings is introduced. Eventually the children will be familiar with the implied meanings of 2 x 4 = 8 and will have moved from elaborated code to the more economical restricted code of shared and implied meanings and symbols.

If we are focused on understanding and thinking, and appreciate the importance of the interrelationship of language and thought we will make use of this code switching when teaching any new material, be it simple addition or quantum mechanics. The extent of elaborated language will depend on the amount of shared understandings between the teacher and the students at the beginning of the lesson. Time must be taken to uncover preconceptions and identify misconceptions in order to determine an appropriate foundation for future understanding.

The figure below is a schematic diagram of the interaction between teacher and student emphasizing the ways in which language changes during the learning process.
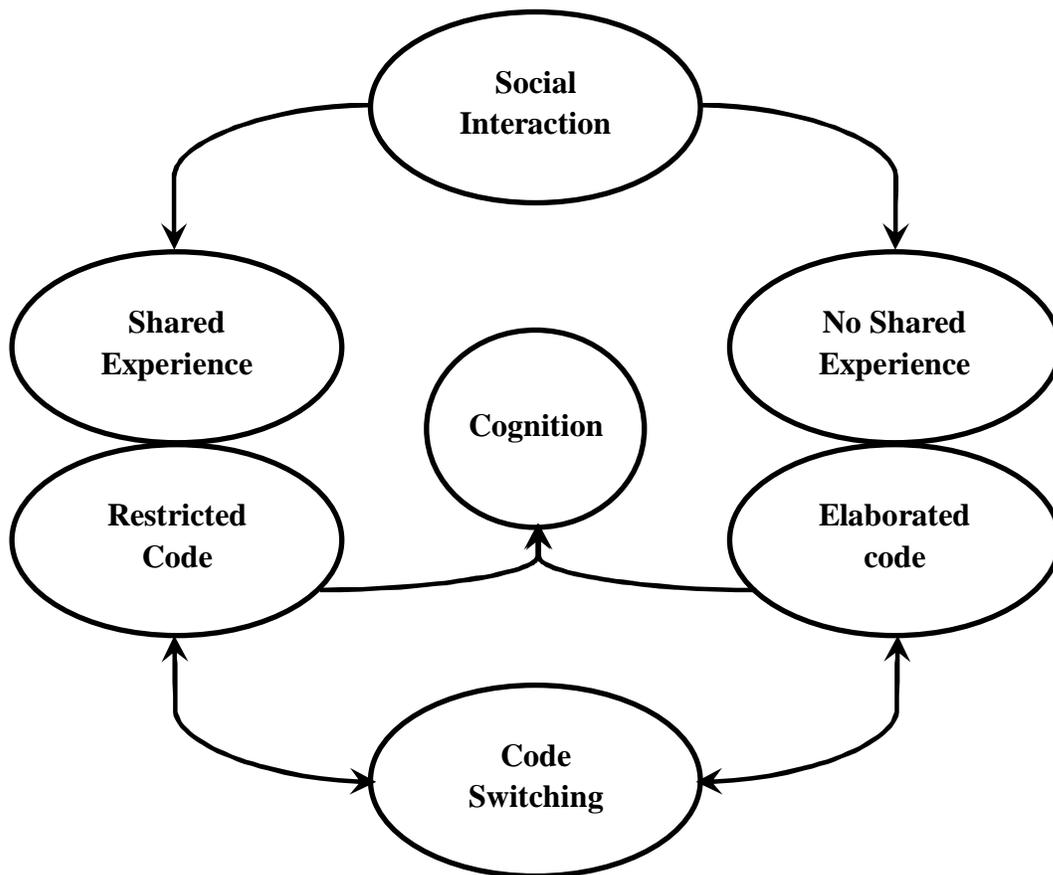

Figure 1. This is a schematic description of switching codes during the learning process. As new material is introduced the elaborated code is used. As the material is mastered the code switches to restricted.

One of the preconditions for successful learning is the uncovering of preconceptions. (NRC 2000) Students do not come to the classroom as empty vessels. They arrive with a wealth of conceptions based on their previous experiences in the world. Some of these understandings may be valid and some may be incorrect or only partially correct. Since each student has travelled a different path in life, the first step in introducing any new concept must be the uncovering of these preconceptions in the interests of

developing a shared understanding of the concept that is free from the differing contexts provided by prior experiences. We know that simply recalling prior knowledge does not produce any significant conceptual growth. It is only when students discuss that we see measurable growth in understanding as different points of view are made explicit. (Marzano , Pickering & Pollock 2001, p 135). The use of explicit, elaborated language is essential in order to build a common context for new learning. Once the teacher is confident that there is a shared set of meanings in the group about the new concepts being taught, it is expeditious to switch codes and move into a more economical restricted code.

A second precondition for successful learning is that there be a cognitive structure within which to integrate new knowledge (NCR 2000). The neural knowledge networks within our brains are only accessible to the individual whose brain it is. If a teacher wants to assist students to make connections between new learning and prior learning and enrich those networks it is necessary to make thinking explicit by the use of elaborated language. A restricted code is initially singularly unhelpful because it is embedded in subjective contexts to which others have no access.

The third finding of the National Research Council (NRC 2000) was that metacognition was an essential factor in successful learning. The development of independent learners rests on their ability to recognize, monitor, evaluate and adjust their cognitive strategies as they learn new material. Both the objects or goals of learning and the evaluative methods used to measure mastery must be made explicit through the use of elaborated language Research by Wang, Haertel and Walberg among many others has shown that metacognitive control is one of the most powerful facilitators of successful learning (Marzano, Pickering & Pollock 2001 p 143).

We know that when we are specific in the explanation of learning goals, and when we provide rewards for the achievement of these specifically expressed goals there is an increase in intrinsic motivation. (Marzano, Pickering and Pollock 2001). This use of elaborated language is essential throughout the evaluative process. Learning goals need to be expressed explicitly and with clarity. While it is not efficient to state learning goals too specifically in behavioral terms (Marzano, Pickering & Pollock, 2001 p 94) it is essential that students have an explicit understanding of what acceptable performance look like if they are to able to carry out a metacognitive reflection on their learning.

McTighe and Wiggins in their *Understanding by Design* (McTighe & Wiggins, 2005) describe the goal of teaching as the growth of understanding and not simply the acquisition of knowledge. Of course one cannot have understanding without knowledge, but the converse is possible. A student might know, for example, that in order to divide one fraction by another one simply needs to invert the second fraction and then multiply. That doesn't mean the student understands. The ability to appropriately apply a concept or skill to a novel situation is an effective demonstration of understanding. They describe six different but interrelated aspects to the design of assessment that will measure understanding – explanation, interpretation, application, perspective, empathy and self-understanding (McTighe & Wiggins 2005). Each requires the use of elaborated language.

Once students are aware of their preconceptions, have found ways to integrate new learning into their existing knowledge networks and are consciously in control of their learning through metacognitive examination, they are able to move into the more restricted codes that rely on a high level of shared meanings. They are able to employ symbolic language in particular, as well as phrases and words that have a high level of embedded, non- explicit content. For example they are able to discuss the various

forms of energy without having to define what is actually meant by energy, they can manipulate mathematical algorithms or they can look into Shakespeare's plays for examples of 'fatal flaws'. Shared knowledge can now be manipulated within a more restricted code while the next step of new knowledge reverts back to the more explicit, elaborated code for initial instruction and the growth of a shared body of experience.

The effective teacher knows when to move from predominately elaborated code to restricted code as a shared foundation of meanings is created.

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