

Chapter 1

The Zone of Proximal Development

My favourite film is by the Russian director Andrey Tarkovsky. The Stalker is, to my mind a spiritual search that operates at many levels, lifting the audience up to a higher view of the human condition. It is, at first sight, a science fiction story about a forbidden area, called the Zone. At the centre of this Zone is a room which manifests, in the world beyond the Zone, the deepest desire of any individual who enters it. The effects are unpredictable because this wish may not be the one that the visitor thinks it is; the real desire may be hidden from the conscious mind of the seeker.

This mysterious, magical, unpopulated Zone is portrayed in colour while the world outside, our world, is in monochrome, just like in the Wizard of Oz movie. The guides to the Zone are the stalkers and they risk the well-being of themselves and their families when they take parties of seekers into the Zone. The stalker of the film has suffered a great tragedy in his family life. His child, Monkey, cannot walk. Towards the end of the film, after the stalker has returned from the Zone, we hear the sound of footsteps and see the head and shoulders of Monkey as he moves across some obviously uneven terrain. Monkey must be walking: we see the head and shoulders as he jogs along and hear his footsteps. Has the stalker entered the room and been granted his deepest wish, resulting in the cure of his child? No, we are being deliberately misled by Tarkovsky. The shot pulls back to reveal Monkey sitting on his father's shoulders! Interestingly, this shot is in colour, although we are now out of the

colour Zone. Tarkovsky is making a point here about the help which we must give to others to enable them to accomplish things that they are presently incapable of. Monkey is obviously special, hence the use of colour. Stalker's wife would like to go to the Room and indicates obliquely that what she wants more than anything is for Monkey to be cured. Stalker is too wise to allow this, and in the final scene we are told, or rather shown, what is so special about Monkey. The child sits at a marble table and looks across it towards three glasses. He stares at one of these and it begins to move towards the edge of the table; he turns to the second and it too moves; and then the third which is projected off the table. Telekinesis, the movement of objects at a distance, this is the child's special ability. Don't be skeptical, says Tarkovsky in this final shot: the sound of a distant train is heard and the table, glasses, room begin to shake—action at a distance!

This may seem to be a strange way to start a book which is supposed to be about raising the level of achievement of whole nations! But, think about it, if we are to raise the performance of all members of society (and I think you will agree this is a laudable aim), those who are not succeeding at present will need support and help from the more fortunate members of society. And there is a great deal of latent ability which is not tapped; which is, in fact, trapped inside many individuals. This is implicit in the writings of Vygotsky (1962) who developed the notion of the zone of proximal development; a notion that is increasingly being used in the field of computers and artificial intelligence in education (Lajoie and Derry, 1993).

Vygotsky was a Russian Jew, deeply interested in the arts and in language, and was a friend of the film-maker Eisenstein. His objective was to explore how human society provided instruments to aid the developing individual mind, and how the child clumsily takes over the forms and tools of the culture and then learns to use them appropriately. His functionalist psychology was interested in studying how the child uses hints and takes advantage of others helping him organize his thought processes until he can do so on his own. Vygotsky (1962) used the term 'Zone of Proximal Development' to describe the child's potential to use the help of others to gain consciousness and reach higher ground intellectually, transforming the meaning of the lower order concepts. Intelligence tests were inadequate measures of a child's ability, as far as Vygotsky was concerned, because they only show what she is capable of on her own. In the real world children have access to older children and adults to help them solve their problems, and so he argued that we should take into account the capacity of a child to profit from help that others can give when assessing a child's potential. The more they take advantage of an adult's support, the wider

is their 'Zone of Proximal Development.' Two children may both be at the same stage when measured by conventional tests but may differ in the extent of their respective zones. With help one may manage to complete tasks usually completed independently by children four years her senior, whereas the other with similar help may only manage to extend his competence by two years, the limit of his zone. Of course, Vygotsky was writing at a time when advanced technological aids, in the form of calculators and computers, were not available to children, but there is no reason why the concept of a zone of proximal development should not be extended to include help derived from such powerful aids.

Let me give you another example, from Tarkovsky, concerning individual potential. *Mirror* is a wonderful film enigma and what interests me in this case is the opening sequence, rather than the closing sequence of *Stalker*. *Mirror* starts with a boy turning on a tv set showing an educational programme. A young man with a speech defect is being treated by a hypnotherapist. He is shown talking with a dreadful stammer before the therapist puts him into a trance. She says to him, "Now, I'll remove this condition and you'll speak loudly and clearly, freely and easily, unafraid of your voice. If you speak like that now, all your life you'll speak loudly and distinctly." The therapist counts to three as she releases the boy from his trance and his handicap: he starts to talk, the impediment gone. Such transformations are incredible to behold, as I remember from my student days many years ago. I had been skeptical before I had actually witnessed the changes wrought by a medical hypnotist on a patient of mine. During my first stint of lecturing psychology my Christmas treat for my students was a demonstration of how they could remember much more when in a trance state. This demonstrated the latent potential of their minds, a potential we all have.

This leads me to the dedication of this book and to Stephen Hawking: latent potential and its actualisation. In their biography White and Gribbin describe a restaurant scene and wonder what the other patrons must have thought about Stephen's frail and emaciated body, cradled in a wheelchair, totally dependent on the care and attention of friends and family, and his strange, incomprehensible attempts at communication. Would they have believed that there before them sat the modern world's equivalent of Einstein? However, the reason I have dedicated this book to him is not because he is the greatest living mathematician/cosmologist, nor because of his admirable ability to overcome his disability. The reason is that Stephen is reported to have said, in 1984, that his great regret was that he'd not yet run over Margaret Thatcher (Ferris, 1984). Education, literally leading people to fulfil their potential, and politics are

inseparable. Hawking recognised this and directed his anger at the figurehead of a political party which was wreaking havoc with education and scientific study. It is my belief that beneath the surface of Thatcherism there lurked an insidious form of fascism whose aim was the systematic destruction of a decent, fair society and one of their initial targets was education. Working with the media massagers who sustained it, the Thatcher government feigned its concern about the maintenance of national academic standards, while at the same time setting about the systematic destruction of the public education service. The same technique was used in other spheres, particularly the manufacturing industries, with similar devastating, but in some cases more immediate, effects. A senior UK Treasury official has recently admitted that the policy of monetarism, endorsed by Thatcher in the 1980s, was cynically used to increase unemployment. The pool of unemployed was to become a huge, docile underclass, ripe for exploitation. This has been successfully achieved at the time of writing and the wonder is that this vast group is still so silent. I predict that it will not be so for very much longer.

With the adoption of right-wing Reagan/Thatcherism we moved away from the socialist ideals of helping the disadvantaged to achieve their full potential, towards a more selfish society. Indeed, according to the Thatcherites there was no such thing as society. This present divided society, with a small group of hyper-rich individuals controlling a massive, dispossessed unworking class, is inherently unstable and cannot afford, literally, to educate the underclass to its full potential. Indeed, it has no interest in doing so: an educated society would not be so easily fooled by government propaganda. A developed society can within the space of a few years be reduced to virtually a feudal society, the many serving the few. Education in such societies is viewed, and always has been, with deepest suspicion. The ruling elite in this country, through its monopoly of the communication media, will continue to claim to be concerned with raising educational standards, while in reality it proceeds with the destruction of the present system, and refuses to provide the necessary resources or social cohesion necessary for a truly effective system. The lack of resources should not be underestimated because it will prove to be a major factor contributing to the decline of mass education and ultimately the destruction of civilised society. When recently discussing resources with a fellow school governor we noted that there was a huge gap between available resources and those required to fulfil our statutory obligations for the implementation of the National Curriculum. My colleague went on to suggest that, given the lack of resources, perhaps the only way forward was to reintroduce a selective system because, after all, our most successful competitor (Germany) retains a selective system.

Yes, but one of the most successful world economies, Japan, does not have selection in the early years and seems to have a more enlightened attitude to co-operation between pupils.

Japanese pupils are out-performing most other developed countries in maths and science, their staying on rate is 94% and literacy is said to be 99%, and the big question is: how do they manage to do this? Of course, there are the detractors who suffer from a Western arrogance, which assumes that little can be learned from the societies of the East, and prefer a system which produces 'our little, illiterate mites' (as one school governor put it) to the over-stressed, suicidal, but highly effective, Japanese system. There is, indeed, a great deal of competition in the later stages of the Japanese system, which does produce stress, but the suicidal tendency is a cultural rather than an educational feature. In Japan below-average pupils are much more successful than the products of our inefficient system, which denies many millions of pupils the opportunity to maximise their potential, as was commented upon by Bienkowska, principal private secretary to Kenneth Clarke, following their fact-finding tour of Japan in 1991: 'What is most startling is how their average and below-average pupils advance through the system.' Regular testing is used not so that pupils may be streamed, but so that brighter and less bright can be mixed in small groups called *han*, typically six pupils in the primary years. In these groups slower members are helped by other members, so that everyone moves at the same pace. Peer group pressure helps to encourage good behaviour and diligence. 'Children learn how to organise, plan and take responsibility. They are growing up collectively, as they will live in society,' says the headmaster of the London Japanese school. It is often assumed that there is a great deal of streaming in the Japanese system, based on reports in the popular press. In fact, for the nine years of compulsory education students are taught in mixed-ability classes and there are no slow or fast tracks until the age of 15, when exams determine which high school students attend. Japanese pupils who would be considered deprived or less able are helped to succeed because teachers hold the same high expectation of all pupils. There appears to be a strong belief that hard work and perseverance, rather than innate ability, are the keys to educational success. This is coupled with an assumption that adequate support from families, peers and teachers must be available. Indeed, the system is based on helping all students attain a high level of academic achievement and does not single out individual pupils for special treatment. Pupils who are struggling with the Japanese national curriculum can also attend school during the summer vacation — the summer break is seen as an integral part of the school year and so teachers are always on hand to support children needing help. The school year, at 240 days,

is also longer than the UK (by 50 days) and the US (60 days). There is some concern at reports by the Ministry of Education that show that the demands of academic work have resulted in a decline in strength and dexterity of pupils over a ten-year period, and attempts are being made to reduce the school week to five days, although educationalists fear that this will lead to a lowering of academic standards. In Japan, teachers work longer hours and have a much longer academic year, however, they and education are held in much higher esteem in Japanese society than their counterparts in the UK (HMSO, 1992).

I have been suggesting here that many systems of education do not maximise the full potential of their pupils, and that this is doing a great disservice to society. What will the result of this maximisation be, if it can be achieved? Will it be similar to the Japanese experience with their alleged high student suicide rate and declining physical abilities? Or will it lead to a more enlightened, tolerant and productive society? There is an ironic tale by Primo Levi (1991), called the Angelic Butterfly, which suggests that the angels are merely the next stage of human development, rather like the butterfly is to the caterpillar, or more correctly like the axolotl, which seldom achieves its mature salamander form and prefers to reproduce as a larva. However, the axolotl can be induced to change its form to the adult by the administration of thyroid extracts. In the story experiments are conducted on a group of humans in an attempt to change them into angels. According to witnesses the transformation only results in vulture-like beasts with wings like those of roasted chickens! Education can transform an individual and a society; unfortunately its effects are not always predictable. Indeed, McMaster (1991) suggested that although we tend to look at the effectiveness of the Japanese system of education and link this to Japan's economic success, we may not yet have witnessed the full impact of education on Japanese society. He argues that the manufacturing boom did not depend on a highly-educated population. In 1960, with the boom well under way, only 32% of 50 year-olds and 39% of 40 year olds had been educated at secondary school level; the numbers educated at university were 2.5% and 3% respectively. In fact, when comparing education rates and industrial output for Japan the two rise identically, whereas McMaster argues that there should be a delay of perhaps 20 years before the beneficial effects of education are seen in terms of industrial output. Perhaps what it shows more clearly is that as industrial output has increased the Japanese, unlike some other societies, have chosen to invest in education, presumably on the assumption that a highly educated workforce is necessary to continue their industrial success. It will be interesting to look at Japan's position in the year 2,010 to see if this assumption is correct.

I must say a few words about the structure of this book. The next two chapters (2 & 3) are concerned with an overview of some of the research which has looked at educational media as vehicles for increasing the levels of performance of students. It is a disappointing story, many of the media innovations which seemed to offer new hopes in producing more effective teaching proved to be no more effective than traditional methods. I have attempted to explain this lack of effectiveness, in terms of how we process information, in Chapter 4. Basically, we take in a lot of information but pay attention to and process very little of it. Mastery learning strategies, which force students to pay attention to the information presented and insist on high standards of performance, are the exception. Chapter 5 looks at mastery learning methods and demonstrates the educational significance of research in this area. A concise summary of the effectiveness of different media and methods is presented in Chapter 6, and the implications of this research are explored in Chapter 7, which looks at the application of mastery learning approaches to computer-based learning.

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