

Chess in Primary and Preparatory Schools

Defining the Problem

Up until about twelve years ago my private chess tuition had been almost exclusively with children aged about 8 upwards. Then I was asked to give weekly lessons to a 6-year-old boy. We quickly developed a very good relationship and at first he made rapid progress, sharing first place in the London Primary Schools Under 8 Championship. But after a couple of years or so he stopped improving. I couldn't get him to perform tasks which I considered simple. Inevitably I became frustrated with him and he became frustrated with me. His mother switched him to another chess teacher but it made no difference and he soon gave up chess.

I then started teaching another boy and the same thing happened again. And it was also happening with many other children at Richmond Junior Chess Club. Children would start at about 7, improve for a couple of years and reach a certain level. A few of them would continue to improve but the majority seemed to reach a plateau and were unable to make further progress. I also witnessed the same phenomenon in Primary School chess clubs, and, looking at players from other areas the same thing was happening there as well. Playing chess in Primary School chess clubs undoubtedly gave children a lot of short-term enjoyment and perhaps also some academic and social benefits. But those children who were only playing at school failed to progress past the beginner stage. Even those who played regularly at home or at Richmond Junior Club only reached about 400-600 strength. Only a very small number of players, who were playing regularly in tournaments and studying the game seriously at home, attained a reasonable level and continued playing when they left their Primary School. What was going on?

To find out I started reading about how children's minds work – a subject that had interested me for many years – and soon came across the work of Jean Piaget.

Piaget identified four stages of children's cognitive development:

1. *Sensorimotor stage*: from birth to age 2 years (children experience the world through movement and senses)
2. *Preoperational stage*: from ages 2 to 7 (acquisition of motor skills)
3. *Concrete Operational stage*: from ages 7 to 11 (children begin to think logically about concrete events)
4. *Formal Operational stage*: after age 11 (development of abstract reasoning).

Piaget's views have been subject to criticism and modification over the years, and many other researchers have proposed alternative models. Much of it, however, still stands and has been validated by recent research using brain imaging techniques. A particular part of the brain called the prefrontal cortex is responsible for, amongst much else, reasoning, making judgements and impulse control, all of which are important if you want to play good chess. Neurologists have discovered is that there is a growth spurt in the development of the prefrontal cortex shortly before puberty – at about age 11 in girls and age 12 in boys.

It is my opinion that the delay in the development of the prefrontal cortex is a major reason why children who start chess at about 6 or 7 often make little progress between the ages of 9 and 11.

Before we go any further perhaps we should also take into account the growing evidence of a decline in children's cognitive skills. In January 2006 a paper was published written by a team led by Michael Shayer and Philip Adey proposing just this.

The *Sunday Times* reported: "After studying 25,000 children across both state and private schools Philip Adey, a professor of education at King's College London confidently declares: 'The intelligence of 11-year-olds has fallen by three years' worth in the past two decades.'" Shayer and Adey's study involved tests very similar to those used by Piaget to measure children's cognitive skills.

It is not clear whether this decline is caused by delayed neurological development or whether there are social and/or educational reasons behind the decline – changing diet, the growing influence of visual media or the increased emphasis of teaching for tests in schools for example. For an investigation into what might lie behind the apparent

decline in educational and behavioural standards in children I would recommend a recently published book by Sue Palmer, *Toxic Childhood* (Orion Books 2006), which, in my opinion should be read by all teachers and parents.

From my experience of working with both groups and individual children over that period I can well believe Shayer and Adey's conclusions. My own observations suggest that children in Y3 (aged 7 to 8) are on average significantly less mature than, say, ten years ago, and this is borne out by discussions with Primary School teachers. Even 9-year-olds of average intelligence often have major conceptual and perceptual problems understanding the game. Conceptual in that they fail to grasp the underlying logic and perceptual in that they don't seem to be able to see what's in front of them on the board. Even reasonably intelligent 11-year-olds appear to be incapable of stopping to look at what their opponent is doing before making a move. I should add that I am fortunate enough to work in an affluent area of London, where most of the children I teach come from aspirational families with academic backgrounds.

Combining Piaget's theories of cognitive development with the latest neurological research we can start to make intelligent decisions about when children should start to learn chess, what we can expect from children playing chess and how they should be taught at different stages of their development.

At some point before the age of 7 children will be able to learn the moves. They will not, however, be able to understand an abstract logical concept like checkmate until they have reached the concrete operational stage.

After a couple of years playing 'concrete operational' chess, during which they will develop fluency and sight of the board, and acquire some basic technical knowledge, it is hard for children to make much progress until they reach the formal operational stage where they are able to cope with complex logic and abstract reasoning.

A concrete operational player will, typically, only take one criterion into consideration when choosing a move and will select the first move he finds which meets that criterion. He will also have difficulty thinking ahead, especially in unfamiliar positions, and will find it hard to accept the idea that his opponent is going to try to find the best move.

In his book *Gödel Escher Bach* Douglas R Hofstadter lists some essential attributes of intelligence:

- to respond to situations very flexibly
- to take advantage of fortuitous circumstances
- to make sense out of ambiguous or contradictory messages
- to recognize the relative importance of different elements of a situation
- to find similarities between situations despite differences which may separate them
- to draw distinctions between situations despite similarities which may link them
- to synthesize new concepts by taking old concepts and putting them together in new ways
- to come up with ideas which are novel

This, it seems to me, is precisely what a good chess player is trying to do and also precisely what a 'concrete operational' player cannot do.

Of course some children are able to play 'formal operational' chess before the age of 11, in some cases even as young as 6 or 7. But these children are exceptional and have four things in common – they are extremely bright, very mature for their age, have very supportive parents and regular access to a knowledgeable and empathetic older chess player. My experience is that the second of these, maturity, is often the stumbling block. It is interesting to speculate on whether this is caused by unusually rapid development of the prefrontal cortex or by their subconsciously finding ways to circumvent the prefrontal cortex while playing chess. The Norwegian prodigy Magnus Carlsen, for instance, demonstrated at an early age an exceptional spatial awareness and a photographic memory. He learned the moves at 5 but didn't really understand the game. Eighteen months or so later his father tried again, but still with no success. At the age of 8 he was still falling for Scholar's Mate but by 9 he was reading advanced chess literature.

It seems to me that schools (and parents) have two ways to approach chess. They either start chess when children are ready (and if they really want children to develop a long term interest in the game that means NOT when they reach the concrete operational stage but when they are a year or two away from the formal operational stage). Or they use chess as a means of enhancing cognitive development. This would involve homework (quizzes or worksheets, either written or online) specifically designed to lead children forward by means of carefully worded questions.

We need to break down the macro skill we know as chess into micro skills and then decide at what point children will be capable of performing each micro skill. These micro skills will include understanding the moves of the pieces, the ability to see which pieces can move to which squares, understanding check, checkmate and stalemate, the ability to understand the basic logic of the game (winning material, avoiding losing material, understanding that if a rook is worth 5 points and a knight 3 points it's worth losing a knight to win a rook), the ability to look ahead, the ability to memorise sequences of moves, the ability to follow a simple plan or algorithm (for instance how to force checkmate with two rooks against a king) and so on.

Once we understand this we can start looking at ways of teaching chess and running school chess clubs which are appropriate to the age and cognitive development of the children.

Preoperational Stage

This will cover Infant Schools in England (up to Y2) and children up to Y1 in the USA.

At this level it is not appropriate for most children to be introduced to competitive chess through chess clubs. Schools might, however, want to make exceptions for children who have played a lot at home and can demonstrate that they are playing concrete operational chess.

If schools want to use games to develop logical and strategic thinking there are many games other than chess which might be more suitable for children at the preoperational stage. Children could, for example, start with Noughts and Crosses (Tic Tac Toe) and continue with other games in the same family (Connect 4, Teeko). Board games such as Draughts (Checkers) with simpler rules and objectives could also be used. There are also many other games of skill suitable for children of this age. Don't think for a moment that chess is the ONLY game that is good for children.

Some schools who are ambitious to achieve success in competitions and who have an intake of potentially high achieving children might want to introduce chess to children of this age. As we have seen, children of this age are unlikely to understand abstract concepts like 'check' and 'checkmate' unless they have already had a lot of help at home. But there are plenty of chess-related activities to choose from that don't involve check or checkmate. They could play games which use only some of the pieces and have a simpler aim, for instance capturing all your opponent's men or getting a pawn to the end of the board.

Chess could also be used to develop skills such as eye-brain coordination, visualisation, concentration, accuracy, thoroughness and memory. Children could be given worksheets or computer-based quizzes in which they have to: say whether or not a move is legal, count the number of possible moves with a particular piece, count the number of captures and so on. You can then introduce the concept of check and produce quizzes or worksheets asking questions such as Is it check? Is it checkmate? How many checks are there? How many ways are there to get out of check? (I'm currently planning a new section of chessKIDS academy specifically designed to cover this sort of material and take children from preoperational to concrete operational thinking. Lessons on a demonstration board at this point should be very short – probably 5 minutes at most – and geared to the level of the children.

At this level children are not being taught to play chess well so no great chess skill is required. The best teachers will probably be those who are skilled at working with young children and have a basic knowledge of the game. The material available for teaching at this level is available at chessKIDS academy (www.chesskids.com). By means of an interactive whiteboard the lessons and quizzes can easily be broadcast to a whole class.

Concrete Operational Stage

This covers Junior Schools (Y3 to Y6) in England and children from Y2 to Y5 in the USA.

In the past it has been safe to assume, at least in the area where I teach, that most children of this age will have reached the Concrete Operational Stage. However, it may well be, if Shayer and Adey's study is to be believed, that many children in Y3 are still in the Preoperational Stage, and this should be borne in mind when schools decide at what age children should be encouraged to start chess.

At this level children should be able to learn the following: checkmates with two rooks against king, king and queen against king, king and rook against king, basic king and pawn endings (king and pawn against king, winning with one or two extra pawns), basic tactical devices (forks, pins, skewers, discovered attacks, discovered and double checks, decoy and deflection), basic positional concepts (rooks on open files etc), Scholar's Mate and how to prevent it, one or two basic king's pawn openings (including the Fried Liver Attack), general opening principles, the en passant rule, rules for tournaments including touch and move, the 50 move rule, repetition of position.

However, children at this stage will not remember this information without reinforcement and repetition. At present we teach the same thing week after week and they never remember it. If schools really want their children to reach a high standard of play and to gain a significant long-term academic benefit from the game they need to encourage homework to reinforce what has been learned and tests to ensure that it has been understood.

My view is that most of the teaching done at this level is not very useful. Firstly, if preoperational chess players are included in the lessons, as they often are, they just won't understand them. The whole concept of one move being better than another for some logical reason will be foreign to them. Secondly, stronger teachers in particular tend to teach specific openings. While there are a very small number of openings that children need to know to play competitively, most teaching of openings at this level will be largely forgotten without reinforcement and lead to confusion. Children will, typically, forget whether the moves were played by White or Black and whether they were played on the left or the right side of the board. They will also forget whether they were told they should or should not play a specific move. The big problem, in a sense, is this. You show a class (or an individual child) a position and tell them that in this position they should play move x. There will also be many analogous positions where you should also play move x. But there will also be many similar positions where move x will lose you the game. This sort of concept is far too advanced for concrete operational chess players.

At this level schools will probably benefit from a specialist chess teacher of at least club standard. There is no need for your teacher to be stronger than this – an ability to work with children is more important. Schools should also be aware that titled players (International Masters and Grandmasters) usually charge much more than club standard players. Having said that, I know several titled players who are excellent with children and, if you can afford it, well worth what they charge.

Formal Operational Stage

It will only be in exceptional circumstances that there will be more than one or two players of this age within a primary or prep school. They have very different requirements which cannot and should not be catered for within a school chess club. However, they may be encouraged to help with teaching younger children.

At this level children will start to learn detailed opening theory, will be encouraged to solve harder tactical puzzles, will learn more about strategy, and will learn to master more complicated endings.

They will also benefit from spending time discussing games and ideas with top level chess players (International Masters and Grandmasters).

Coaching at this level should usually be arranged through chess clubs, not through schools.