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Is There a Crisis in the Lower Secondary School?

Tony Pell

This opening chapter presents evidence that Key Stage 3 schooling in England is under pressure despite the official view of increasing success and rising standards.

Attitudes in the three core subjects of English, mathematics and science are poor. International studies suggest that attainment and attitudes are both in decline. Motivation to school is much lower than motivation towards academic achievement, which questions the nature and delivery of the curriculum in the schools. While subject attitudes deteriorate over a typical year, attitudes to working in groups remain steady.

The decline in attitudes and performance in science is attributed to loss of specialist physics and chemistry teachers, the prevalence of a 'balanced' science and a target-driven test-oriented curriculum. Pupils now seem much more extroverted, which has implications for teaching strategy and the supply of physical scientists and engineers.

Classroom research with predominantly able and average ability pupils has identified four pupil types. Two of these are classified as 'anti-school'. In a sample of 39 classes, 13 classes had more than 50 per cent of pupils in this category. This finding alone begs serious questions about existing pedagogy.

All governments are fond of claiming that it is their reforms that have transformed the educational scene for the better, and the present Government is no exception to this rule. When, as in the present case, the main criterion

for success is largely to be determined by a school's performance on public examinations some important questions emerge. Is it wise to judge schools on this basis? Are the measures used an accurate reflection of pupils' attainment? How far should one be more concerned with the student' general wellbeing where the World Health Organization's 2001–2 survey of *Health Behaviours in School–aged Children* (HBSC) shows that the decline among UK pupils is steeper than in most other countries. Is this decline exacerbated by the present 'performance culture'? If so what can schools do about it without falling foul of the inspectorate? These are some of the issues this book seeks to address. In this first chapter we look at several sources of evidence in an attempt to provide a more 'rounded' viewpoint than presented in 'official' government documents and reports.

In a survey of the professional lives of working secondary teachers, MacBeath and Galton (2004) found that the issue of greatest concern was poor pupil behaviour. An increasing amount of time is spent dealing with the behaviour problem, the sources of which the authors believe are to be found in today's challenging social context, the inability of many parents to cope and the nature of the curriculum. Behaviour problems, which are particularly acute in mathematics and science, apply a continuous pressure on teachers 'to maintain control'. As a consequence, the quality of teaching delivered and hence learning acquired suffers. Ofsted (2005) reports that the percentage of inspected, secondary schools failing to reach its 'good or better' behaviour criterion increased from 24 per cent in 1996–7 to 32 per cent in 2004–5. The most common form of pupil misbehaviour, according to Ofsted, is the low-level disruption of lessons, which hinders teaching and is a persistent stress factor. In recommending a flexible curriculum to deal with challenging behaviour, Ofsted finds that few schools attempt this with the Key Stage 3 strategy unlike at Key Stage 4. As the most recent study by Galton and MacBeath (2008) shows, teachers revisited three years on, feel that the disaffection problems among Key Stage 3 pupils are increasing.

A measure of disaffection with school is provided by the rate of truancy. The Government has been coordinating the regular 'truancy sweeps' conducted by around 90 per cent of Local Education Authorities in England. Children found at large in the community when they should have been attending school have been stopped and questioned. Data collected from these 'sweeps' are readily available from 2002 to 2006 (DCSF, 2008). From the data, it is possible to calculate the percentage of children truanting from secondary school with no valid reason for absence. Figure 1.1 shows the year-on-year rise of secondary truanting. Given the demonstrated value of the 'sweeps', the Government's decision to end its coordinating role after publishing the data for 2006 would appear questionable.

It has been argued that schooling as currently presented to youngsters is so heavily constricted by the National Curriculum introduced in the late 1980s

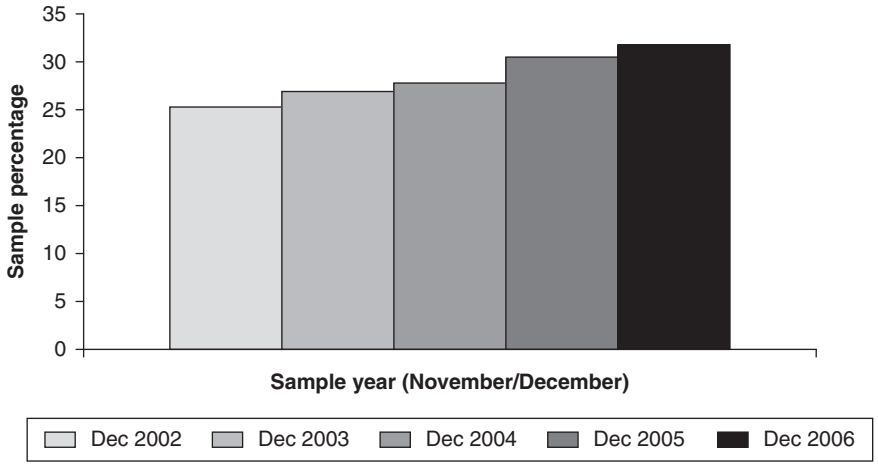

Figure 1.1 Secondary truancy rates as a percentage of 'sweep' sample over five years

and its associated testing programme (Standard Assessment Tasks or SATs) for all pupils at the ages of 7, 11 and 14 years, that teachers have found it necessary to adopt a minimalist approach to education not least because of the 'high-stakes' involved in the competitive 'league-table' world (Macbeath and Galton, 2004; Galton and MacBeath, 2008). In a 42-country international survey of pupil engagement for the OECD, Willms (2003) found that 15-year-old pupils in the UK reported higher classroom pressure levels than anywhere else apart from Iceland. A study for the World Health Organization (Currie et al., 2008) confirms these above-average pressures, which are particularly strong for girls.

Teachers themselves have suffered professionally within this pressurised environment. Teachers' ratings of their status in society over six, specific time-points has fallen alarmingly as is shown in Figure 1.2 (Hargreaves et al., 2007), although the fall has now 'bottomed out'. This 'status' research shows that teachers are possibly becoming more compliant with the changes required of them as three years after the initial survey of 2003 scores are not quite so negative (below 3.0 on a 5-point scale). Teachers' loss of autonomy in having to carry out mandated curricula, which has been called professional 'intensification', has contributed to many of the more creative teachers leaving the schools, which has only reinforced the difficulties of those remaining. By both directing curriculum content and assessing the cognitive outcomes, the Government has become the sole arbiter of attainment 'standards' which, unsurprisingly, have shown for the most part year-on-year improvements. Yet when external criteria are applied, international measures show a decline in the attainment levels of students relative to those from other countries, and in some instances the decline is not just relative but is in raw scores (Martin et al., 2004; OECD, 2007).

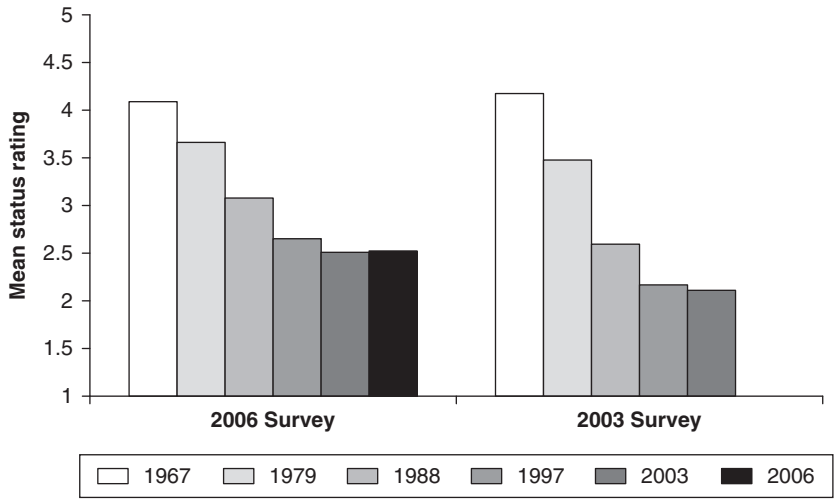

Figure 1.2 Decline in teacher status ratings from two surveys

Have the National Strategies resulted in improved performance?

For example, the Progress in International Reading Literacy Study (PIRLS) 2006 evaluation of reading comprehension (Mullis et al., 2007) lists 45 countries and provinces at the level of Grade 4 (Year 5 in England). England appears in 19th position on the list, although it is one of the five countries actually testing after five years schooling rather than four. Significantly fewer English pupils reached the PIRLS 'advanced international bench mark' in 2006 than did so in 2001 (respective figures are 15 and *20* per cent). Similarly, the drop in the percentage of English pupils reaching the 'high international benchmark' in 2006 (*48* per cent) also declined significantly from 54 per cent in 2001. In 2006, England was one of the six countries, also including The Netherlands and Sweden, which recorded significant losses in reading comprehension achievement since 2001. The decline has affected girls as well as boys and is applicable to reading for information as well as literacy. So here is international evidence that reading comprehension 'standards' are most unlikely to be rising and at the very best are unchanged, taking into account sampling problems in England in 2001 round (House of Commons, 2008b).

A second international reading study is PISA (Programme for International Student Assessment) 2006, which is part of a regular series conducted by the OECD (Bradshaw et al., 2007). After testing 15 year-olds from 57 countries, England was given a significant ranking of eighth. Girls scored higher than boys in all countries, but in England the gender gap was smaller than most. Earlier official PISA reports for 2000 and 2003 omitted data from the UK and England specifically, because of a failure to meet sampling requirements, but the Department for Education and Skills did report on the data collected in

2000 for England alone (Gill et al., 2002) and a later OECD Summary Report placed the UK and England in seventh place in the list of 27 OECD countries with a score of 523 (standard error 3.0) for reading literacy (OECD, 2004a). Using the same reading tests in 2003, the score for the UK is deduced to be 512 (standard error 3.7; OECD, 2004b), which is a significant fall. By 2006, scores had dropped considerably again to 496 for England and 495 for the UK placing England/UK in 13th place in the list of 29 OECD countries (Bradshaw et al., 2007). Here, then, this time from the secondary stage, is news of falling reading literacy and of England losing ground to other countries.

If we look at what is available as evidence within England, the problem to which we return time and time again is that the same authority that is responsible for the curriculum and its development is also responsible for its evaluation, so it is in the interests of this authority to show itself in the best light possible. Thus, Key Stage 3 results for English do not show up the same falling 'standards' for reading at the international level but rather the reverse. For example, the recently published *Getting Back on Track* (DCFS, 2007) refers to the progressive improvement in Key Stage 3 English since 1997 with what is a 30 per cent increase in those achieving Level 5. This is not to say that government policy makers are complacent. *Getting Back on Track* looked at the 5 per cent of pupils who either do not progress from the nationally defined standard in English at Key Stage 2, which is Level 4, and fail to reach the standard (Level 5) at Key Stage 3, or having achieved Level 5 or 6 at Key Stage 2 fall back to Level 4 at Key Stage 3. The recommendations address the key areas of reading and punctuation, with check lists for both pupils and teachers including the opportunity to discuss their reading with others and letting their peers review their punctuation. It is recommended that these activities should be interesting and enjoyable.

Turning to attainment in mathematics, the PISA 2000 study of learning and achievement of 15 year-olds, showed England occupying eighth place in the list of 27 OECD countries with a score of 529 (standard error 2.9; OECD, 2004a). By 2006 the raw score had dropped to 495 (standard error 2.5) with 18 other countries recording significantly higher mean scores (Bradshaw et al., 2007). Boys did better than girls and the overall spread of marks was less than in science, for example. The difficulties experienced in the UK in meeting the sample requirements for these international studies once more means that there are no PISA mathematics scores available in 2003 for an intermediate comparison.

In the second international study, the Trends in International Mathematics and Science Study (TIMSS) evaluation of achievement in mathematics across 49 countries at Grade 8 (Year 9 in England) (Mullis et al., 2004, 2005) shows England in 18th equal place in 2003. This puts England behind most of the countries of the Pacific Rim. The performance of boys and girls is identical this time in being above the international average. English pupils, like those in Australasia and Scandinavia, tend to be better at mathematical reasoning than mathematical knowledge. Comparing achievement in 2003 with TIMSS 1995 and TIMSS 1999 shows no change, which is typical of most other

countries over this period. An important point, almost always overlooked when looking at the TIMSS tables, is that England together with Scotland and New Zealand are virtually alone in starting formal schooling at 5 years, while more than 90 per cent of the participating countires have a starting date one year later (Joncas, 2008). This means that puplis from England have had an extra year's schooling when taking the TIMSS tests. This effect might be expected to be greatest with the youngest pupils and contributes to a seventh-place position in the TIMSS Grade 4 maths table in the recently published data for 2007 (Mullis et al., 2008). The placing of England in seventh position in the latest TIMSS Grade 8 mathematics table has led to some excitement in government circles and the media (Mansell, 2008b), however the placings rely on scores with sizeable standard errors, so statistically the scores of 2007 do not differ significantly from those of 2003.

So the international results, taken together, at the best interpretation point to little change and to a fall of in mathematics performance at the worst. But again the government statistics for England and Wales tend to convey upwards progression at Key Stage 3 (Year 9) as the years go by. For example, *Getting Back on Track* (DCFS, 2007) draws attention to the official improvement in the proportion of the age group achieving Level 5 in mathematics from 60 per cent in 1997 to 77 per cent in 2006.

In terms of science attainment, the TIMSS studies show that English Year 9 students compare favourably with other countries, where student have one year less schooling. Attainment is stable, even if attitudes to science are dropping. Science scores for English students are high enough to occupy seventh place in the list of countries in 2003, seventh in 1999 and eighth in 1995. The most recently published figures are for 2007 (Martin et al., 2008) and appear to give England a comfortable rating of fifth, just behind four countries of the Pacific Rim. Taking into account the error in the scores, however, England becomes one of six countries where the statistical overlap places the countries equally in a shared band from places 5 to 10.

Science attainment measured by PISA 2006 showed seven countries with significantly higher scores than the UK/England (Bradshaw et al., 2007; OECD, 2007). The spread of achievement of UK science students, though, is particularly large, with only New Zealand and Israel showing a wider range. As in most other countries, boys are better than girls at explaining phenomena in scientific terms. In terms of overall raw scores in 2006, the UK occupies 14th place, having fallen from 4th in 2000 (Gill et al., 2002), and has now been overtaken by Canada, New Zealand, Australia and Germany. Technical problems with the UK sampling in 2003 caused PISA to omit UK data from international comparisons for that survey (OECD, 2004) but even so there is still evidence that UK performance has been falling since 2000.

Just as in mathematics, the findings from the two international surveys are mutually supportive in science only in so far as ruling out rising achievement levels. The differences in the results from the two surveys appear to lie in the nature of the test questions. Those of the PISA survey require a high level of reading comprehension, while those of TIMSS more obviously and directly

test knowledge, understanding and the application of scientific concepts and principles. Given that PISA has reported a significant fall in reading comprehension for UK/English pupils, the discrepancy between the two international studies might be explained by the reading comprehension in 2006 being less likely to unravel the intricacies of the questions despite the level of scientific understanding remaining unchanged.

The view on science attainment from within England and Wales in the *Getting Back on Track* Report (DCFS, 2007) is unsurprisingly much more positive with data presented to illustrate an apparently clear improvement at Key Stage 3 with the 59 per cent achieving the National Curriculum defined Level 5 in 1998 becoming 72 per cent in 2006. Nevertheless, the report does reveal that science creates more problems for 'failing' students than do either English or mathematics. Not only do a greater proportion of Key Stage 3 students (as many as 7 *per cent*) find that they are still marooned at Level 4, but a further 1 per cent actually go back one or more levels from those achieved at Key Stage 2 to subside to Level 4 at Key Stage 3. These 'failing' or slow-learning pupils, characteristically, liked being active, learning through practical experiments and working in groups. In reality, these pupils spent most of the lesson time copying from textbooks or the blackboard. They have poor reading comprehension and, needless to say, find the subject hard. Among the recommendations of this report are the need to provide more investigatory practical work and to provide learning in groups and pairs, where the pupils can discuss ideas and understanding, and demonstrate their scientific skills.

There is psychological evidence from research that the cognitive levels at which English pupils operate today have declined over the last 30 years. Using Science Reasoning Tasks developed in the 1970s (Shayer and Adey, 1981), Shayer (2008) has recently shown that a sample of 800 English 14 year-olds have the higher-level cognitive thinking skills of the 12 year-olds of 1976. Shayer atributes this decline to the introduction of the National Curriculum testing and target setting; passive multi-channel TV viewing, and especially for boys, much less time spent playing with gadgets and other mechanisms. Shayer's latest study follows an earlier one (Shayer, 2006) that found that the cognitive abilities of 11 year-olds in handling the physics of mass, weight and density has shown a general decline since 1975 with present-day youngsters up to three years behind those of 30 years ago. Indirect evidence to support Shayer's findings comes from the failed attempt of the standards in science, which was resisted by the government's examinations regulation department, Ofqual (Mansell, 2008a). To add further weight to the hypothesis of a decline in levels of intellectual achievement, the Royal Society of Chemistry (RSC) has pointed to the lack of rigour in science testing, teaching to the test and a dramatic decline in school standards for the failure of today's 16 year-olds when faced with exam papers from 40 years ago (RSC, 2008a). The RSC suggests that the illusion of rising standards in England resulted from easier tests amd better examination preparation (RSC, 2008b).

The evidence of rising achievement levels of pupils in England, which is questioned by the findings from PISA and TIMSS and the recent research evidence,

rests upon the reliability and especially the validity of the Government's Standard Assessment Tasks (SATs). The impact of these tests of English, mathematics and science in England has been recently thoroughly reviewed by a House of Commons Committee (House of Commons, 2008a). The Report Summary, in pointing out the negative effect of 'teaching to the test', refers to the type of English, mathematics and science now being taught in the schools as being not necessarily synonymous with education but rather a prerequisite of what can be conventionally tested. Thus, achievement of prescribed targets might not be indicative of a deep understanding and wide breadth of learning in these subjects. A particular point is made about the research evidence for the superficiality of learning at Key Stage 2 (House of Commons, 2008a). This would seem to explain why SATs' scores can 'drive up standards' at the time of testing while conceptual, subject mastery at a deeper level proceeds in the opposite direction. This hypothesis has been supported at Key Stage 3 by Fairbrother (2008), who has shown that the science SATs do not test at the higher cognitive levels at all, thus weakening the base for later studies as well as 'giving a poor image of science'. Yet in a Government report the Office for Standards in Education (Ofsted, 2008) continues to support the claim of rising achievement in science at Key Stage 3. The House of Commons Committee Report, in calling for substantial reform in the testing system, goes on to say that the present multiple purpose use of SATs for both individual pupil and 'system' evaluation leads to some pupils being unprepared for employment and higher education, which is a powerful indictment of recent changes from our elected representatives. The rhetoric employed by the Goverment in defending its SATs testing Programme now appears to have been exposed by its sudden reversal in policy. Which will see the end of compulsory testing of 14 year olds at Key Stage 3 although teacher assessments will continued (DCFs, 2008b).

In the remainder of this chapter, therefore, the case will be made that despite the centrally driven changes in the curriculum of the last decade or two in England, which include Numeracy, Literacy and Key Stage 3 strategies among others, not only has attainment in the core subjects remained static or, in the worse interpretation, has fallen, but that the education it offers to Key Stage 3 pupils is failing to arrest declines in motivation and in attitudes, especially in the important core subjects of mathematics and science. Evidence will be drawn from recent attitudinal and motivational research carried out at the University of Cambridge, and from the deliberated findings of the Royal Society and a Select Committee of the House of Lords. The evidence will show how the personalities and motivational styles of English pupils have apparently altered in the last 30 years or so. Classrooms now contain far more extroverts than in days gone by. Pupils today seem to be more motivated by external factors such as getting good marks and getting a good job, and the concept of 'intrinsic motivation', that is, of wanting to know and understand for its own sake has virtually disappeared. In addition, by using a technique known as 'cluster analysis', we have begun able to identify a range of stereotypical pupils who respond and achieve in characteristic ways to the learning on offer.

Collecting pupil data on motivation, personality and subject attitudes

Questionnaires can be used to gather information about attitudes. This technique has been used widely to monitor how students feel about their school subjects, their motivation and their personality. At Cambridge, two recent projects (Galton et al., 2003; Pell et al., 2007) have produced a wealth of information from the Key Stage 3 years. Typical questionnaires used in these projects appear in Appendix I. Data were collected from samples of several hundred to several thousand pupils. After statistical analysis, various factors were identified such as *liking mathematics* and *enjoyment of school*. Scores were then computed for each of these attitudes and dispositions and, referring to the response scales, average scores were expressed as a percentage of the maximum possible obtainable score, which might vary from 0 per cent to 100 per cent. A score of 50 per cent represents a neutral attitude. Above 50 per cent the attitude or disposition is positive: below 50 per cent it is negative. Outcomes from the research are reported as charts for maximum clarity, but this approach does not readily present the random errors that are always present in measures of this kind. Just because one bar in a chart is taller than another one does not necessarily mean the two bars indicate different scores! When this difficulty is likely to arise, the commentary in the text will refer to the differences as being *significant* or not, as the case may be.

Measuring motivation in the classroom

The concept of motivation is somewhat dependent on one's starting point and, in terms of schooling, on the current context. For instance from theories of behaviour, motivation is seen as *intrinsic* to the act of learning, where satisfaction is gained from within the study itself. Ernest Rutherford's motivation to push back the boundaries of physics in the early 20th century, for example, was so powerful that he was contemptuous of other scientific disciplines and, according to Wikipedia reportedly once said that 'in science, there is only physics; all the rest is stamp collecting'. Alternatively, motivation is seen as *extrinsic*, which is a response to certain external demands such as learning to secure a specific job. In pursuing a task, *achievement* motivation is a drive for success by reaching a goal, which for some pupils might be further enhanced by *fear of failure* motivation if the goal is not reached.

A student's perception of his or her ability will thus determine the form of motivation to learning in a given situation. Students who feel that they can achieve through their own efforts will be displaying high levels of *mastery* motivation. These students will not be concerned about their progress in relation to others. Conversely, students who conceptualize their ability as fixed, use other more able students as reference points and become enveloped by thoughts of failure and develop task-avoidance strategies including *learned helplessness* and strong teacher dependence. Others with low mastery motivation will reject the values of school learning to varying degrees, becoming 'oppositionals' (Hargreaves, 1982) or the 'dossers and shirkers' of

Rudduck et al. (1996) and will see the other more successful learners as 'boffins'. The direction in which a learner will proceed in school will be governed to a degree by innate ability and motivation qualified by personality. Anxious students are particularly 'at risk' from fear of failure in a competitive, target-driven culture (Covington, 1999) and the more extroverted can well retreat to the 'security' of a peer-group culture which derides success and part, if not the whole, of the school experience (Marsh, 1989).

The current emphasis on performance in schools in the form of target setting, Standard Assessment Tasks and school performance 'league tables', all tend to inhibit the growth of mastery motivation and discourage intrinsic motivation. Where outcomes are rigidly prescribed, and where freedom to explore alternative approaches in seeking solutions to problems is severely restricted as a result, intrinsic motivation is not going to flourish (Brophy, 1999).

Pell et al. (2007) investigated the nature of motivation in the present-day classrooms of the lower secondary school. Questionnaires were assembled using items from existing instruments measuring *intrinsic-extrinsic* motivation and *mastery* motivation, supplemented by items arising from student interviews with the target groups of Years 7 to 9. These questionnaires were further tried out with other samples of student before being administered in a 'before and after' (pre-test/post-test) study over two school years. On the final administration, several additional 'anti-school' items were added. The actual items decided upon appear in Appendix A.

Two forms of motivation

An initial analysis of these questionnaires showed no sharp division into intrinsic and extrinsic motivation, but instead tended to distinguish classroom environments as being either *learning* or *performance* oriented (Watkins, 2003). The two motivation factors which appeared were (a) *achievement mastery* and (b) *academic satisfaction*. The former was measured by a scale of 5 items such as:

- Item 3. I am pretty confident in doing the tasks I am set.
- Item 5. I try to learn as much as I can.

Academic satisfaction motivation places the emphasis on performance and the satisfaction derived from doing outstandingly well. It is measured by a scale of 5 items such as:

- Item 4. I do my best to get the highest level in SATs.
- Item 10. I feel proud when I get good marks.

Academic satisfaction expresses a self-image very much in keeping with today's school climate. The full scales appear in Appendix A.

The two new scales, which showed stability when readministered after a short time period of a few weeks, show a transition from the classical *intrinsic-extrinsic* motivation to the drive to personal achievement (*mastery*) through

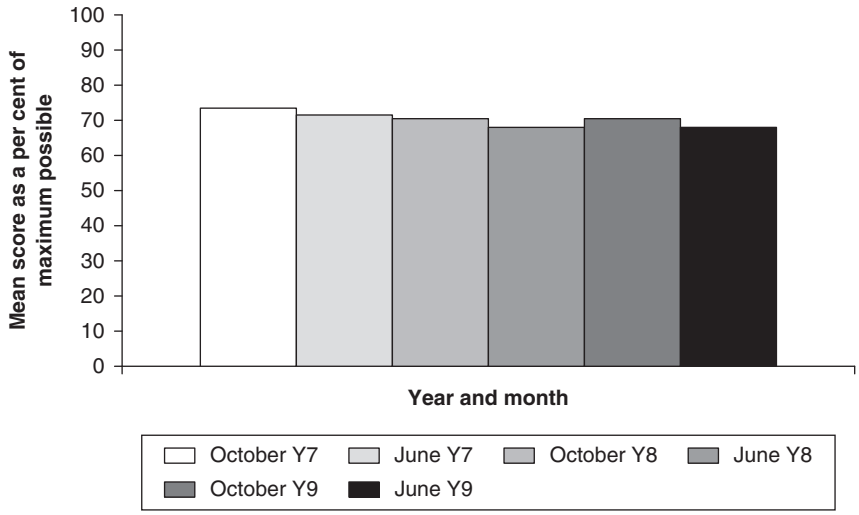

Figure 1.3 Achievement mastery motivation: Year 7 to Year 9

effort in the classroom and the need to get (*academic*) satisfaction by reaching external standards (pleasing parents and getting to university). While *academic satisfaction* is a form of *extrinsic* motivation, *achievement mastery* has shifted the *intrinsic* focus from the nature of the learned material to the prescribed task. According to this hypothesis, whether or not one finds a subject interesting has little or no effect on progress or achieving one's goals.

The pupil's view of ability determines the depth of *achievement mastery* motivation (Dweck, 1986). Only pupils with a strong belief in their own competence will be highly motivated. Such pupils will believe that hard work and extra effort will allow them to succeed. Contrast this with low-mastery motivation pupils, who see ability as fixed, which they can do little to alter, and who see the strong performance-oriented classroom of today with its regular assessment and target setting as a threat to their self-esteem. These pupils will seek support from their like-minded peer group and form the core of Hargreaves' 'oppositionals'.

Motivation in the lower and middle secondary years

Figure 1.3 shows *achievement mastery* motivation scores at the beginning and end of the school year for Years 7 through to 9. There are no differences between the boys' and girls' scores and these are not shown. Mean scores fall significantly with age.

Although mean scores drop significantly at the transition to Year 8, when comparing Figure 1.3 with the later subject attitude charts, it is clear that *achievement mastery* motivation holds up extremely well in the secondary school, while subject attitudes tend to be neutral to poor. This supports the hypothesis that subject attitudes are subsidiary to the stronger driving force of

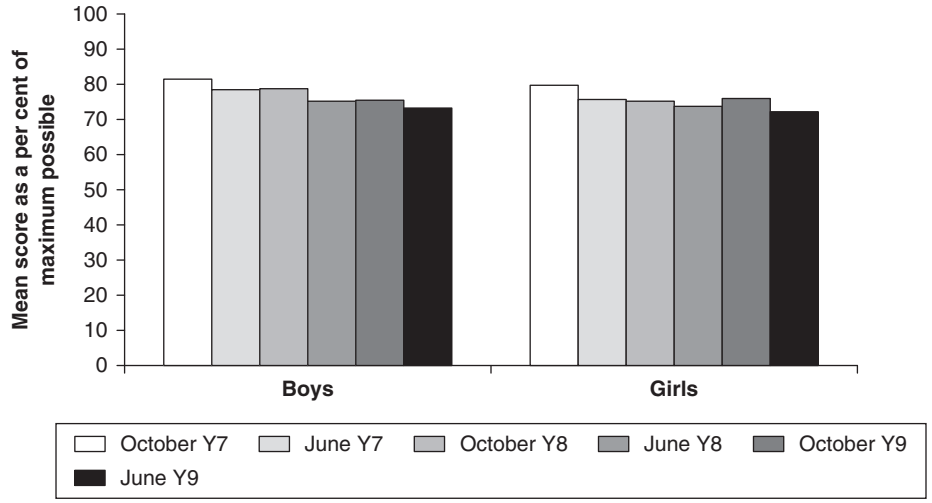

Figure 1.4 Academic satisfaction motivation: Year 7 to Year 9

mastery motivation. Our research at Cambridge shows that the correlation between attainment and *achievement mastery* motivation increases during the school year, especially for girls, suggesting that a motivation gap between the more and less able widens as the school year progresses.

Figure 1.4 shows *academic satisfaction* motivation scores at the beginning and end of the school year for Years 7 through to 9. For each age group, the boys' scores are significantly higher than the girls'. Mean scores fall significantly with age, but again, scores are very high compared to those for subject attitudes. Unlike *achievement mastery* motivation, being proud of what one is succeeding in at school is not restricted to the most able so the correlation of *academic satisfaction* motivation with attainment is very weak.

At the start of Year 7 the correlation between the two forms of motivation is 0.72 for boys and 0.70 for girls. By the end of Year 9, the correlation has dropped to 0.56 for boys and 0.63 for girls. This slight weakening of the association between the two forms of motivation as students move through the secondary school points to either *academic satisfaction* being achieved with lower levels of *achievement mastery* or high *achievement mastery* pupils showing less *academic satisfaction*. One interpretation of this is that the lower achievement mastery motivated pupils are becoming more reconciled with their position and are taking some satisfaction in what they are succeeding in. In the context of the general decline in motivation referred to in the opening part of this chapter, this interpretation is more doubtful than a second possibility. This is that the higher achievement mastery motivation pupils are becoming less enamoured by the extrinsic rewards that are part of academic satisfaction motivation. The second hypothesis fits more easily with the perception that academic success at school is of lessening significance by the end of Year 9 as the pupils attempt to come to terms with adolescence.

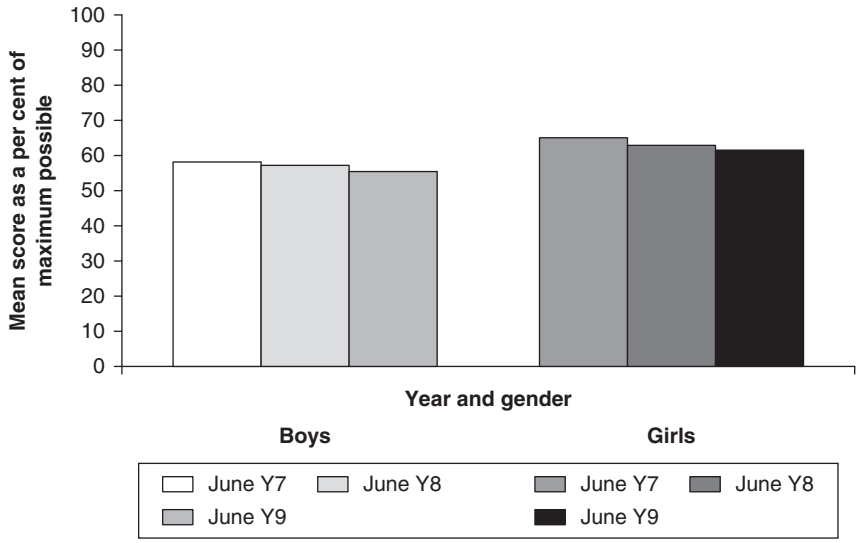

Figure 1.5 Pro-school motivation: Year 7 to Year 9

Motivation towards school

The evidence presented in the Introduction is that standards of behaviour in secondary schools are deteriorating. Supporting evidence comes from the measurement of attitudes to school by such studies as the ORACLE research into transfer into Year 7 over the period 1997–2004 (Galton et al.,1999a; Hargreaves and Galton 2002; Galton et al. 2003) and from the later secondary years by Berliner (2004), who reports that only 27 per cent of a sample of 1000 secondary pupils rated their overall school experience positively. Both of these studies found disturbing evidence that the higher attaining pupils might have the less positive attitudes about their experiences. Internationally, the outlook is not too good either. The recent World Health Organization study (Currie et al., 2008) places both boys and girls in England below average on their respective ranked scales of 41 countries, when asked whether school was well liked.

The negative effect of low motivation towards school was detected in the initial pre-testing in the Cambridge study of group work, which will be discussed in greater detail in Chapter 3. The 6 items for this scale arose from pupil interviews and the work of Rogers (1994) and Rudduck et al. (1996). The strongest items are:

- Item 11. I am often in trouble at school
- Item 13. I don't do much homework.

The scoring on this scale was arranged so that the final score was a measure of a pro-school attitude. The full scale appears in Appendix A.

Figure 1.5 shows the percentage scores on the scale. Girls are significantly more positive about school than are the boys. Mean scores appear to decrease with age,

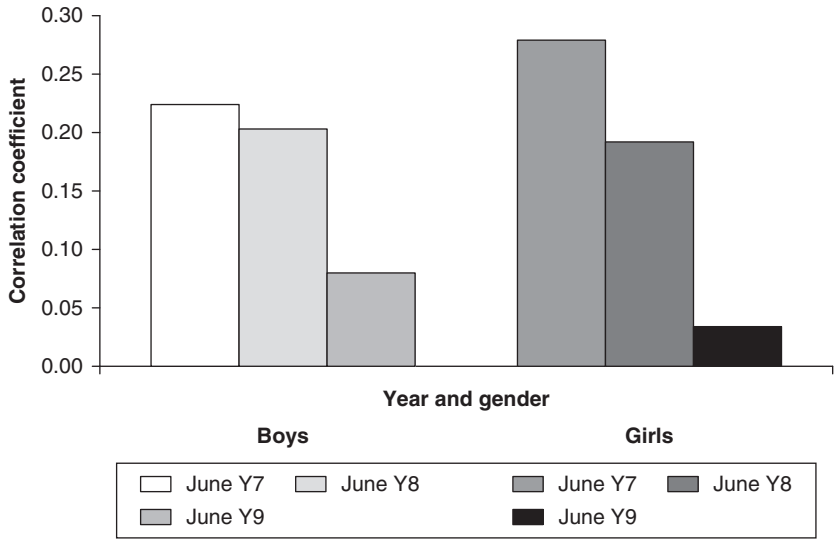

Figure 1.6 Correlation of pro-school motivation with attainment: Year 7 to Year 9

that is, older students become less positive about school, but in statistical terms the differences are not significant. What is of interest is that *motivation towards school* is less pronounced than either *achievement mastery* or *academic satisfaction* motivation. It is as if the students have to some degree separated their need for cognitive development from the institution that is charged with providing it.

Pro-school motivation correlates at around 0.5 with the other two forms, but the pro-school raw scores are much lower. In the Cambridge research, 22.9 per cent of 857 Years 7 to 9 pupils were classed as having negative attitudes to school (scoring below the mid-point of the scale). The proportions having negative *achievement mastery* and *academic satisfaction* motivation were just 6.4 and 4.2 per cent respectively. Of the 196 students with negative attitudes to school, 68.9 per cent had positive *achievement mastery* motivation and 81.6 per cent had positive *academic satisfaction* motivation.

Figure 1.6 shows that the correlation between pro-school motivation and teacher estimates of attainment decrease for both boys and girls as they get older. The correlations become insignificant in Year 9. This implies that the more able pupils become less positive towards school as they move up through the lower secondary school. However, this finding does need to be treated with caution because the teacher estimates of the pupils' ability may not always be accurate.

Subject attitudes in the lower secondary years: attitudes to English

Combining the results of both the transfer and group work projects, Figure 1.7 shows school attitudes to English for year groups from Year 6 to Year 9. Key items on the *Liking English* scale, which appears in full in Appendix A, are:

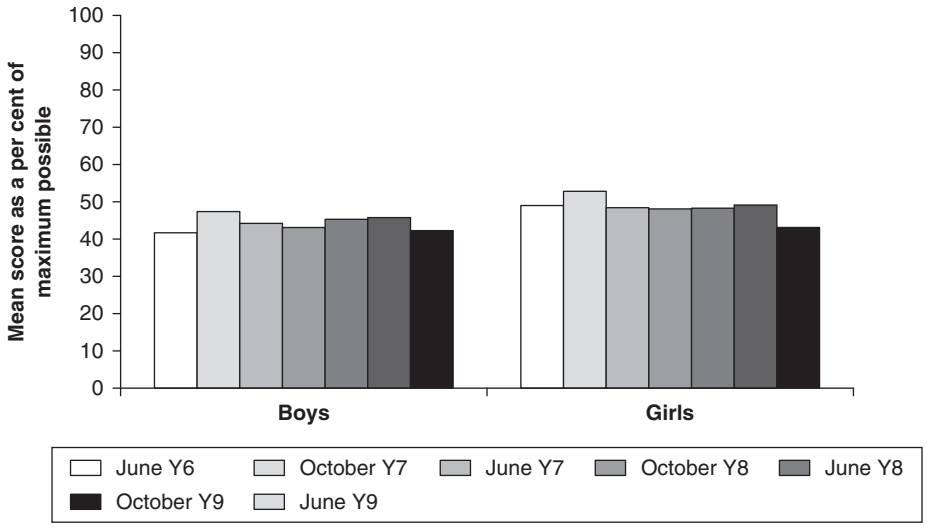

Figure 1.7 Linking English: Year 6 to Year 9

- Item 11. I always look forward to English lessons.
- Item 13. Learning English makes me think better.

Girls' attitudes are seen to be always more positive than boys'. The typical girl pupil just manages to display a positive liking for English after transfer to secondary school in Year 7, otherwise attitudes hover just below the neutral level (50 *per cent* of the maximum possible). The average boy's liking of English remains in the negative half of the chart, although transfer to secondary school cause a slight positive surge, which is soon dissipated. By the end of Year 9, girls' attitude scores have subsided to the level of the boys, although over the three-year period the change in attitude in English is relatively small when compared with the changes in attitudes to maths and to science.

It is difficult to put the trends in attitudes to English in the wider context of the recent development of the National Curriculum and its associated changes or in the context of other international languages. The two major international studies of attainment, the PIRLS reading literacy evaluation (Mullins et al., 2007) and the PISA reading studies (Gill et al., 2002; Bradshaw et al., 2007), did make some secondary measures of attitudes to reading and reading literacy. The PIRLS study of primary pupils used four reading statements scored on a 4-point agreement/disagreement scale. Statements included 'I would be happy if someone gave me a book as a present' and 'I enjoy reading'. Pupils were then effectively assigned to positive, neutral or negative categories. Over all 40 countries and five Canadian provinces, the 2006 data show 49 per cent of pupils with positive and 8 per cent with negative attitudes. The corresponding figures for England are 40 and 15 per cent. Not only are English pupils' attitudes below the international average, England is one of the five countries where both the percentages have changed for the

worse since 2001. When asked to rate their own reading ability, pupils in England were less confident than the average 'international' pupil. After drawing attention to the relationship of attitudes to reading and reading comprehension achievement, the authors of the PIRLS report 'It may be a matter for concern that a greater number of participants had decreased percentages of students at the high (positive attitude) level, including … England. (Mullis et al., 2007: 140) comment that this is a worrying trend:

For 15 year-olds, the PISA 2001 international study (OECD, 2004a) places the UK equal 19th and below average on a list of 27 OECD countries ranked according to reading engagement, which is a composite measure of attitude to reading, reading widely and reading for pleasure. There have been no other PISA evaluations of reading attitudes since 2001, but the results from PIRLS 2006 for the primary pupils suggest that the secondary situation is unlikely to have improved.

Our attitude results shows that English is hardly rated a popular subject by boys, with the mean score never even reaching a neutral level for Year 6 to Year 9 pupils. The attitudes of the girls are slightly more positive and actually cross the neutral line briefly upon transfer to secondary school in the Autumn term of Year 7. Even if the international evidence on attitudes is somewhat piecemeal it is reasonable to assume that attitudes to English in this country are not outstandingly high. Adding the evidence from Figure 1.7, which shows a progressive fall in attitude scores with age, questions need to be addressed about the nature of English being taught in our schools and what might be done to make it more enjoyable and interesting. At the very least, enjoying the subject more is worthwhile intrinsically, but more importantly, greater enjoyment leads to greater motivation to learn and to improved achievement as PIRLS and others have pointed out.

Subject attitudes in the lower secondary years: attitudes to mathematics

Again, by combining the results of several of the Cambridge projects, Figure 1.8 shows school attitudes to mathematics for year groups from Year 6 to Year 9. Key items on the *Liking mathematics* scale, which appears in full in Appendix A, are:

- Item 1. I like maths more than any other school subject.
- Item 3. I like doing maths projects.

There is plenty of evidence that mathematics has a polarizing effect on people. In its worst manifestation, this appears as a fear and dislike of the subject (Cockcroft, 1982). Mature adults training to be primary teachers, have reported being frightened and terrified by mathematics and according to Haylock (2001: 3) 'several recalled having nightmares' about the subject.

In comparison with English, one would expect pupils' attitudes to be even more negative and drop more rapidly as school experience lengthens.

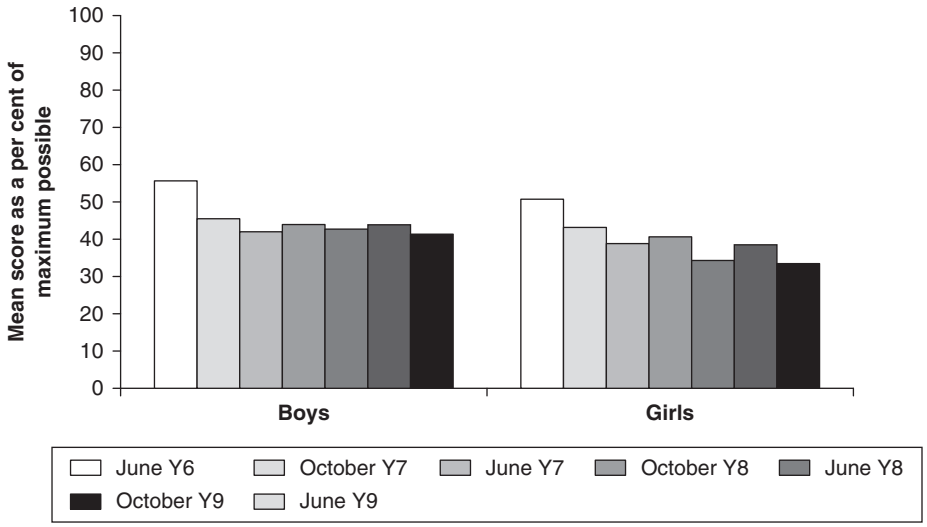

Figure 1.8 Linking mathematics: Year 6 to Year 9

Figure 1.8 shows this supposition is correct, but the sudden dip at transfer from primary to secondary school is perhaps surprising. The average boy or girl at the end of primary school in Year 6 seems to have a slight positive affection for mathematics, but a month after transfer attitudes show a sharp drop.

What is it about secondary mathematics in Year 7 that can cause such an abrupt change? Is it, as the next chapter dealing with transfer will argue, because the subject content and its teaching in the secondary school is very similar to the Year 6 curriculum in the primary school so pupils become bored? *Getting Back on Track* (DCFS, 2007) identifies the lack of discussion in pairs and groups and lack of enjoyment as two of the characteristics of the 2 per cent of Key Stage 3 pupils who become stuck at Level 4 in maths in the secondary school. But how true is it of the pupils in general that more pair or group work would improve outcomes in Year 7?

The TIMSS 2003 study (Mullis et al., 2004) reports that English pupils are much less likely to spend time on maths homework during the week. If such time is taken as a measure of motivation towards maths, then English students might be well below the international average on attitudes. Later the TIMSS 2003 report looks specifically at attitudes to reveal that the proportion of English Year 9 pupils in the highest 'liking/valuing maths' category fell significantly below the international average in 2003. Indeed, since 1995, the percentage of English pupils disagreeing with the statement, 'I enjoy learning mathematics' has increased from 20 to 47 per cent in comparison with a relatively static international level of 34 per cent. A similar disenchantment is recorded by English Year 5 pupils from 16 to 30 per cent. The latest TIMSS study of 2007 (Mullis et al., 2008) shows the deterioration in 'liking' mathematics even more starkly. In the 2007 Report. England occupies 35th position

out of 59 countries on the Year 9 list. The English pupils show the largest fall of all the countries from the testing of 1999 and 1995. Despite this boys in England have the highest self-confidence in learning mathematics of all the boys from the other countries. Perhaps this asks questions about the rigour of the current mathematics curriculum?

For mathematics, teachers' subject expertise does not seem to be such a strong factor as it can be, for example, in science. The National Foundation for Educational Research reports that around 24 per cent of secondary maths teachers are non-specialists, but, as the Mathematical Association has argued, it is the *way* mathematics is being taught rather than degree of subject knowledge possessed by teachers that is the main problem. According to the representatives of the Association, giving evidence to a House of Lords committee, 'the present system has elevated "teaching to the test" to a position that now biases all classroom activity towards the goals of maximum test results and achieving the governmental prescribed "standards"'. (House of Lords, 2006: 157). Ofsted appears to support this view in lamenting the poor ability of students above Key Stage 3 level to apply the mathematical knowledge that is essential for further study (House of Commons, 2008: 45).

Subject attitudes in the lower secondary years: Attitudes to science

The combined attitudes to science results of the several of the Cambridge projects are shown in Figure 1.9 for year groups from Year 6 to 9. Key items on the *Liking science* scale, which appears in full in Appendix A, are:

- Item 1. I like science more than any other school subject.
- Item 3. I should like to be given a science kit as a present.

In recent years governments, of whatever persuasion, have attached particular importance to the attainment and attitudes in science of our young people, because of the role of technology in our society and the need for national economic goals to be established on a vibrant and extensive bedrock of scientific manpower. The fact that all was not that it should be in science education was the rationale for an extensive enquiry under Professor Fred Dainton (1968) during the 1960s, which identified a 'swing away from science' in the schools. In the intervening years, success in arresting the 'swing away' has proved elusive. Despite the introduction of a core 'general science' into the curriculum for all from the primary school, the output from the school system of scientifically literate specialists has seen the closure of many university physics and chemistry departments. In those that remain and in the departments of engineering, typified by Mechanical Engineering at Imperial College, London, such is the poor quality of even the highest-grade students arriving from the schools that three-year degree courses are being expanded to four years to allow a first year to repair and supplement the learning from the schools (Paton, 2008).

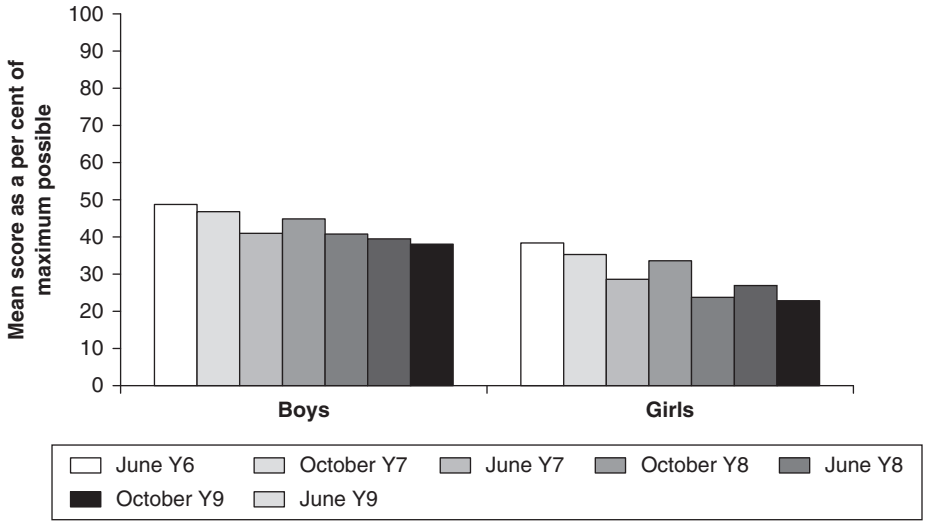

Figure 1.9 The decline in liking science: Year 6 to Year 9

Figure 1.9 shows the attitudes to science in the schools based on data collected in the various Cambridge studies. At no time during a school life from the end of Year 6 to the end of Year 9 is the average 'liking science' score able to struggle out of the negative domain and even become neutral. The situation for the girls is particularly sad, especially as there has been so much research in this area and many initiatives undertaken (Kelly, 1981, 1987; Kelly et al., 1987; Opportunity '2000', 1996).

Internationally, the TIMSS evaluation of achievement and attitudes in the sciences across 47 countries in 2003 (Martin et al., 2004) shows that for most countries, attitudes improved significantly from 1995 to 2003, with students equivalent to Year 9 in England almost doubling their rating on the enjoyment of science item. In 1995, 23 per cent of all students 'agreed a lot' that they enjoyed science. By 2003, this figure had increased to 44 per cent. Over the same period, the attitudes of students in England in this category has remained static at around 27.5 per cent, while the percentage of English students disagreeing that they liked science increased from 18 to 32 per cent. Over all countries, the average per cent 'disagreement' decreased from 28 in 1995 to 23 in 2003, so an international observer might well be asking, 'What has been happening in Year 9 science education in England since 1995 to make it less popular?' The Commentary on the 2003 TIMSS results for England by the DfES (Ruddock et al., 2004) is of little help here as it doesn't comment on the longer-term trend. The latest TIMSS Report of 2007 (Martin et al., 2008) shows that the doubts raised are fully supported by the latest data. England shares bottom place with Denmark on the 36-country list of 'liking' other of the 36 countries. Unlike mathematics in 2007, self-confidence in learning science is well below the international average (28th out of 36), and there is no significant difference in the ratings of boys and girls.

The PISA survey of 57 countries in 2006 focused on science, and unlike other studies in the series, was able to monitor, indirectly, pupils attitudes to science. Bradshaw et al. (2007: 42) point out that when English 15-year-old pupils in the UK classification are compared with those of other OECD countries

> students [*in England*] were in general similar in their attitude to learning science, and more positive in their enjoyment of doing science problems, they appear to be more negative about enjoyment of science for its own sake. They find science less fun and report less enjoyment of reading about it, compared with the average response in other OECD countries.

The PISA survey concludes that although English pupils acknowledge the importance of science in today's world, the majority do not see science as something of personal value in their future lives.

Both international studies detect lower enjoyment levels in UK/English pupils. The attitude measures of the TIMSS study were the more quantitative in terms of response categories to a specific item over a time period, while the PISA results were inferred from responses to more general science questions on a single occasion. The conclusion from the two studies is that attitudes to science in England/UK decline over time and are less positive than those of the average student in the other OECD countries.

The decline in attitudes to science

There are various hypotheses that can be put forward to explain the steep decline in attitudes to science. The first of these is centred on the nature of the subject in a 'one size fits all' curriculum. The second is the capability of the teachers to make the subject material they have been directed to teach both relevant and interesting so that the teacher's enthusiasm for the subject can be conveyed to the pupils.

Most continental European countries teach separate subject sciences in Grade 8 (Year 9) while Australasia, the Far East and the USA, for the most part, integrate the sciences as is the case in England (Martin et al., 2003). The National Foundation for Educational Research (NFER) estimate that 44 per cent of all secondary science teachers in England are biologists, 25 per cent chemists and 19 per cent physicists (House of Lords, 2006). In some schools, there are no physicists or chemists. Given that the physicists and chemists are most likely to be teaching in the upper school at GCSE or A-level, it is reasonable to assume that pupil attitudes to the 'general' science of the Key Stage 3 years arise in science classes taught by biologists, who might be lacking confidence in the knowledge and rules of the physical sciences, and who are unable to show that enthusiasm and excitement in putting over what they know and *feel*.

Arguably, the bias in the teaching force towards biology is responsible for the intriguing finding from PISA 2006, that English/UK students express a particularly strong interest in human biology when compared with other OECD

students. The PISA survey reports achievement in the three science content areas of Earth and Space, Living Systems and Physical Systems. For English/UK science students' mastery is strongest towards Living Systems, while The Netherlands leads in Physical Systems and the USA in Earth and Space.

The need for good-quality science and mathematics education in our schools has been acknowledged in a recent report by The Royal Society (2007). The present state of science teaching in schools has itself been the subject of an enquiry conducted by the Select Committee on Science and Technology of the House of Lords (2006). The Royal Society (RS) Report makes the point that the knowledge and understanding gained from learning and enjoying mathematics and science prepares students for the demands of life in the modern world and allows them to 'discover the rich heritage from centuries of global experimentation and adventure' (RS, 2007: 13). The role of the teacher of science/mathematics is seen as particularly critical because parents tend to be able to offer less support in these subject areas than in others. The best teachers will show a ready enthusiasm for their subject in passing on their own knowledge and passion for learning, leading to many students making life-changing decisions.

The Royal Society Report then addresses the role and requirements for subject specialism in the secondary school, for which there is a long-standing history (Hirst, 1968; Musgrove, 1968). From the point of view of science in particular, it is somewhat ironic that the evolution of a 'science for all' in the National Curriculum of the 1980s led to the 'marginalizing' of the separate disciplines of physics, chemistry and biology (RS, 2007) in favour of general science, or as renamed in some professional science education circles, 'balanced' science (ASE, 1979). This was despite psychological evidence that, while sharing a common organizational structures of inductive thought, experimentation and deduction, the three traditional disciplines required different cognitive learning profiles (Shayer and Adey, 1981).

The Government's inspectorate has also highlighted the links between specialist subject knowledge, teaching and students' enthusiasm and imagination, interest and attainment (Ofsted, 1998). Nevertheless, the biggest growth area in initial teacher training for the sciences today is in general or 'combined' science. In terms of advertised science teaching posts, 80 per cent of all posts in England in 2006–7 were for 'combined' science (RS, 2007). The Royal Society report points out that it is not clear whether the prevalence of 'combined' science in recruitment is because it is intrinsically attractive or because it is a practical requirement of the National Curriculum in most schools. The Royal Society Report also makes the recommendation that post-graduate teacher training in the separate sciences is needed wherever universities have strong reputations in the sciences. Meanwhile, many science teachers have shown a preference for the Independent sector, where they are more likely to be able to teach their specialist science subject (Oversby, 2006; NUT, 2006), and Kinchin (2004) has questioned whether science teachers still maintain their enthusiasm and pride in the job that they had prior to the coming of the National Curriculum. The Confederation of British Industry is quite specific in locating today's shortage of graduates in physical science and engineering to too few

studying the three sciences; too few specialist physics and chemistry teachers and too little time spent doing experiments (House of Commons, 2008b).

The importance of making separate subject sciences available is now officially acknowledged by the Government. Future policy now includes the stated entitlement that all pupils reaching Level 6 at Key Stage 3 should be allowed to study science as separate disciplines (DfES, 2006: 3). This move has been welcomed by both the House of Lords and the Royal Society (House of Lords, 2006; Royal Society, 2007). Reading between the lines of the House of Lords Report, there seems to be a general criticism of Government policy, which has instituted too many curriculum changes, too rapidly and without proper piloting and evaluation (House of Lords, 2007).

This last comment brings the discussion back to Government's implementation strategy for the National Curriculum and in particular the key role it has assigned to the Standard Assessment Tasks (SATs). At the beginning of this chapter, the negative influence of SATs on science attainment was pointed out. The professional association of science teachers, the Association for Science Education (ASE) is also clearly of the opinion that the SATs and their associated targets impact on the enjoyment of learning science (House of Commons, 2008a).

Peer relationships

Our work at Cambridge has involved investigating how pupils related to each other in the secondary classroom. The social behaviour undercurrents in school have been well documented elsewhere and it is from the work of Coopersmith (1967) Covington (1992), Rudduck et al. (1996) Marsh (1989) and Rudduck (2003) that we were able to build up a wide range of possible questionnaire items that described the interactions of the pupils with their peers. These items were supplemented and revised in the feedback from visits to classrooms. A trial or pilot use of the questionnaire identified 10 relevant items, which were shown to be statistically valid and which when used subsequently in the main study, clearly split into two sub-sets. One set were seen to be measuring the degree of passivity towards *active participation* in classroom activities, while the second set referred to the *anti-boffin sub-culture* of denigration of academic success.

A high-scoring *active participant* is keen to participate in discussion and debate. The *active participation* scale consisted of 3 items:

- Item 3. I like to make my point of view.
- Item 4. I have lots of ideas to share with others.
- Item 7. I keep quiet about my ideas (reversed scored).

The two key items on the *anti-boffin, sub-culture* scale are:

- Item 1. If I don't like working with someone, I won't work with them.
- Item 5. It's cool not to be too smart.

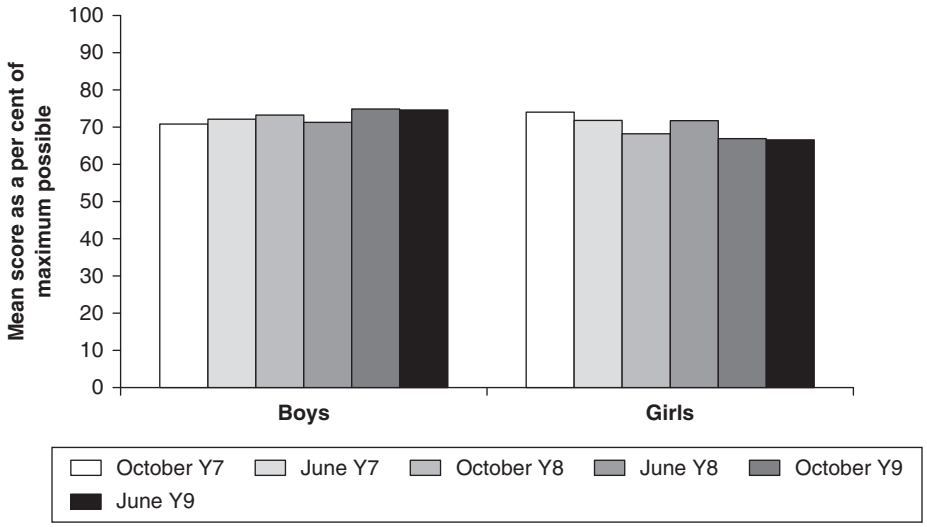

Figure 1.10 Active participation: Year 7 to Year 9

This scale reflects an anti-school, social sub-culture among secondary pupils giving rise to what Rudduck et al. (1996) describe as the 'dossers and shirkers' and what Hargreaves (1982) termed 'oppositional'. Scores on the *anti-boffin, sub-culture* correlate negatively at around 0.3 with *motivation to school* as might be expected.

As Figure 1.10 shows, *active participation* scores are high, with the boys' ratings being significantly more than the girls'. Scores at the end of the year are the same as at the beginning. Boys' scores tend to remain unchanged from Year 7 to 9, but girls' scores drop significantly. In Year 7, the more able boys and girls tend to rate themselves high on active participation but this distinction disappears as the students get older.

Figure 1.11 shows *anti-boffin, sub-culture* scores for boys and girls. The boys' mean score is significantly higher than the girls', as might be expected. Scores tend to remain unchanged over the course of the year. Girls' scores do not alter significantly from Year 7 through to Year 9, but boys seem to become more 'oppositional' as Year 7 progresses but then mend their ways somewhat in Years 8 and 9. Averaging over all three Years 7 to 9, for a sample of 393 boys, 55 per cent scored above the neutral mark on this scale in October and 47 per cent remained above in June. The corresponding figures for 387 girls are 45 and 39 per cent. These proportions of relatively disaffected students are substantial and must limit the quality of learning in many classrooms. When *anti-boffin, sub-culture* scores are correlated with teacher estimates of attainment, we found a consistent negative association at around 0.25 for the three age groups. This means that, unsurprisingly, pupils who exhibit disaffection with school and who identify with an anti-learning counter-culture, are likely to be poor achievers.

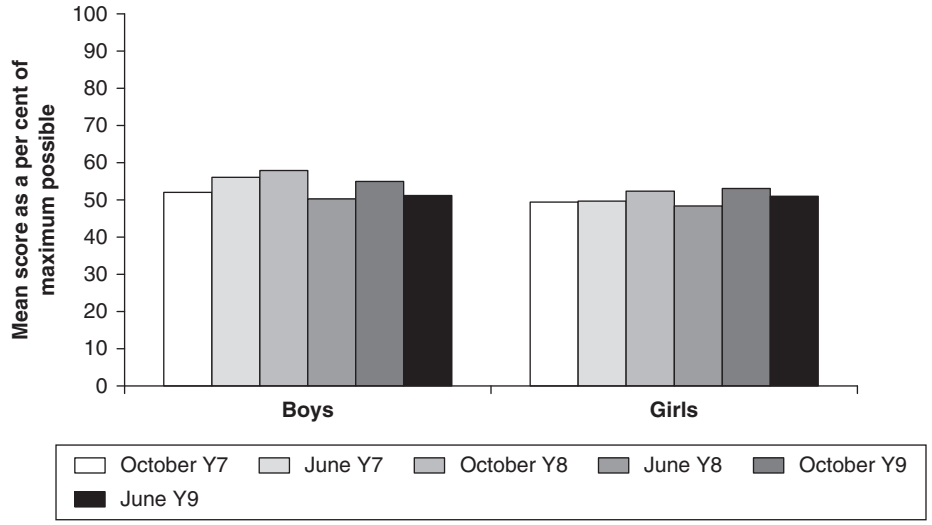

Figure 1.11 Anti-boffin sub-culture: Year 7 to Year 9

Hargreaves (1982) argues that these alienated pupils are supremely indifferent to most school lessons, but regard the school day as an excellent opportunity for social interaction with friends. This socialization takes place against a background 'noise' of lessons which the participants occasionally 'switch [*in*] on'. This creates a strong anti-school counter-culture among these 'oppositionals', which is marked by strong peer loyalty. Rudduck's extensive classroom research into pupil behaviour (Rudduck et al., 1996; Rudduck, 2003) has shown how friendship can, nevertheless, be an important source of learning support for many Key Stage 3 pupils. Rudduck distinguishes between the social and academic friendship patterns of pupils. With increasing maturity and independence, pupils are able to use their friends in different ways to achieve their goals. Not all youngsters who have joined the anti-school, anti-learning culture, wish to remain part of it for ever. Rudduck sees Years 8 and 9, in particular, the Years where 'nothing much is happening', as fertile ground for the growth of this school counter-culture.

Personality in the lower secondary years: measuring personality in the classroom

In England the Junior Eysenck Personality Questionnaire (JEPQ; Eysenck and Eysenck, 1975) has typically been used to measure personality factors such as extroversion and anxiety. Given the elapse of time since the instrument was first constructed, for the Cambridge projects it was revalidated by combining items from the original JEPQ, which still seemed relevant in the 21st century, with those from the anxiety dimension of other, self-esteem questionnaires of Coopersmith (1967) Lawrence (1981) and Marsh (1989). Additional items

were added based on the comments from interviews with today's Key Stage 3 pupils. Pilot testing showed up the two factors of anxiety and extroversion with a similar, slight negative correlation to that found by Eysenck 40 years ago. However, there were problems with a number of Eysenck's extroversion items in that the Key Stage 3 pupils resolutely refused to associate these with others that were otherwise clearly strong extroversion indicators.

The analysis showed how easy it is for some terminology to go out of fashion so that piloting of even well tried and well respected measuring instruments is always advisable. In this present case anxiety is measured by 9 items of the type:

- Item 2. Do you always feel under pressure?
- Item 6. Do you find it hard to sleep at night because you are worrying about things?

After pilot testing, just 6 extroversion items remained of which:

- Item 8. Can you let yourself go and enjoy yourself a lot at a lively party?

This particular item came from Eysenck's JEPQ. Eysenck was particularly keen on using an item such as going to parties as a measure of extroversion. However, another two of the JEPQ extroversion items were clearly not interpreted by the pupils as Eysenck had intended. These were:

- Item 5. Would you like parachute jumping?
- Item 14. Would you call yourself happy-go-lucky?

Item 5 was another Eysenck favourite, while the term 'happy-go-lucky' in Item 14 confused today's pupils. In the event, the computed extroversion scores relied on just 4 items which are listed in Appendix A.

Unlike the other sections of the questionnaire, where a 5-point scale was used, the items measuring personality were answered by either 'Yes' or 'No' in keeping with the procedure used by Eysenck and Coopersmith. Despite the relatively truncated scales the reliabilities comfortably exceeded the 0.7 figure usually used as the minimum criterion for judging the internal consistency of the measure.

Changes in pupils' anxiety

When used with a sample of about 450 pupils in Years 7 to 9 (Pell et al., 2007), anxiety was found to remain relatively stable over the school year, although by the end of the Summer Term a small but significant gender gap had opened up with the girls slightly more anxious (Figure 1.12). The 50 per cent line in the figure separates 'being anxious and worried' (above 50 *per cent*) from being 'calm and stable' (below 50 *per cent*). On the whole, these pupils in the lower secondary school are stable rather than anxious.

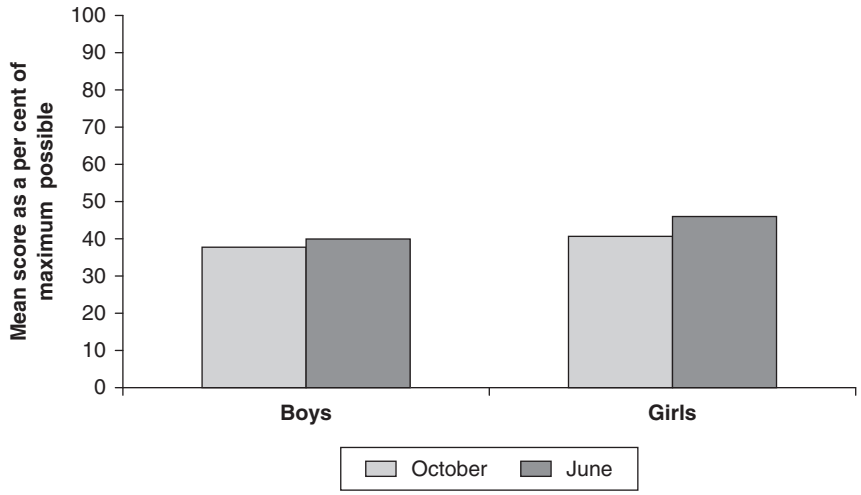

Figure 1.12 Change in anxiety over the school year

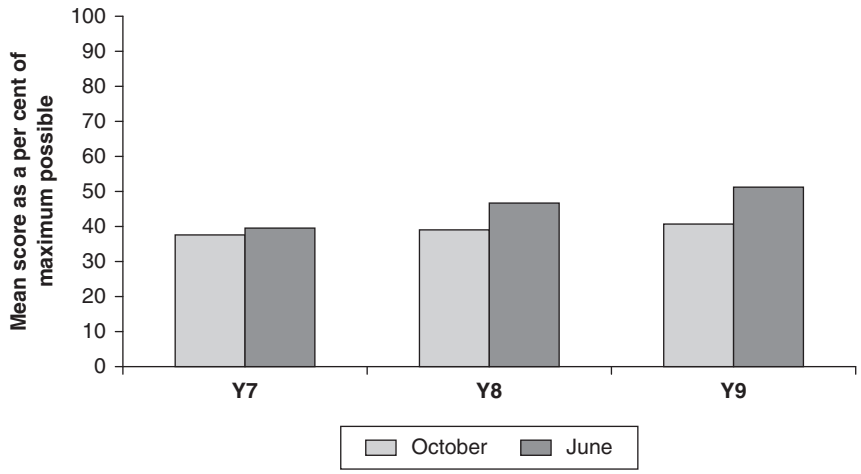

Figure 1.13 Change in girls' anxiety over the school year: Year 7 to Year 9

When anxiety scores are analysed by year group, boys' scores tend to remain steady, but, as Figure 1.13 shows, girls' scores increase with age and by the end of Year 9 have just entered the 'anxious-worrying' domain. During Year 7 girls' scores are steady, but in both Years 8 and 9 girls' scores increase significantly over the school year. The overall increase in girls' anxiety scores is in keeping with Eysenck's original research findings (Eysenck and Eysenck, 1969). Rudduck (2003) refers to the strong intensity of girls' friendship attachments during this period of school life. An interesting feature pf Figure 1.13 is that the long holiday from school in the summer appears to allow for some emotional 'recovery'.

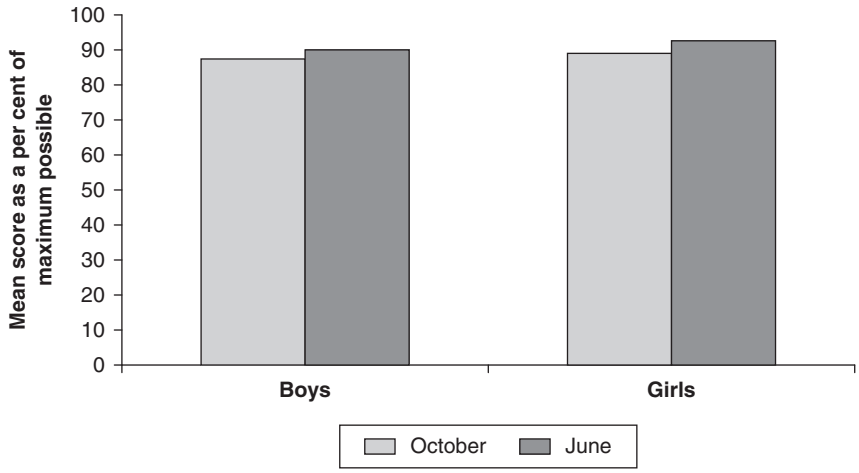

Figure 1.14 Change in extroversion over the school year

Changes in extroversion among lower secondary school pupils'

Figure 1.14 shows the extroversion scores for the pupils. The most striking feature is the extremely high values for both boys and girls. As the 50 per cent line represents the cross-over from introversion (being 'bookish' and happy to learn by oneself) to extroversion (being sociable and outward-going), these high mean scores suggest classrooms of today probably present difficulties that were not present during Eysenck's active research time. One must be conditional here, because the extroversion scale, though based upon Eysenck's work, differs in detail. The Eysenck JEPQ (Eysenck and Eysenck, 1975) presents extroversion scores for boys and girls at Key Stage 3 age of around 75 per cent. The anxiety scores are typically 50 to 55 per cent, so there has been little change in the anxiety levels of pupils over the 30 years or so. If the extroversion measure we used at Cambridge is comparable to the earlier Eysenck one, then teachers today are faced with more voluble and less compliant pupils than in days gone by. This does not necessarily mean that classrooms have become more disruptive because of the higher extroversion levels since pupil anxiety remains steady. It is the anxious, unstable extraverts whose personality tends to push them into disruptive and anti-school behaviour (Fontana, 1977). The results of the Cambridge research point to a possible increase in the amount of relatively benign, stable extravert pupil behaviour, which as Fontana remarks, can contribute to a cheerful and cooperative classroom. However, this leads to three possible consequences.

First, if extroversion levels overall have increased, there will likely be an increase in the proportion of the anti-school, neurotic extroverts in the classes. As teachers are fully aware, any increase in the number of this type of pupil is not good news. Second, if Key Stage 3 pupils are becoming classified

in personality terms as stable extraverts, what are the implications for teaching and learning? Earlier personality research in the 1970s identified stable extroversion as the key to success in the primary schools. As pupils mature intellectually, the prerequisite personality disposition for success in the secondary school gradually shifts towards introversion (Eysenck, 1972). A possible implication here is that majority of Key Stage 3 pupils today respond to their classrooms as primary children did 30 years ago. Thus an approach based mainly on individualized working within a whole-class framework may not be appropriate for pupils whose predominant extravert personality is associated with an affinity for group work (Fontana, 1977). If, as the earlier studies suggest, an element of introversion is needed for academic success in the secondary school, does Figure 1.14 indicate that the criteria for this success should be redefined whereby pupils would perhaps be judged by the breath rather than the depth of their knowledge with the achievement of a Baccalaureate taking precedence over three 'gold standard' Advanced Levels?

Third, further maturation in the secondary school and in higher education leads to career choices where introverts can succeed even if they are anxious (Entwistle, 1973). There is strong evidence that pure scientists, especially those of physics and chemistry, as well as engineers tend to be introverted (Eysenck, 1972; Entwistle, 1973; Entwistle and Wilson, 1977; Fontana, 1977). A decline in the proportion of introverts in Key Stage 3 classrooms is therefore a possible predictor of the difficulties facing those policy makers seeking to increase the supply of professional scientists and technologists over the next decade.

Despite the high extroversion scores of Figure 1.14 in both October and June, it is possible to detect a small but significant increase in girls' scores over the school year pointing to some classrooms where girls retain a robust extroversion at least equal to that of the boys. There is no variation of extroversion scores over the three Key Stage 3 year-groups, supporting the idea that the high proportion of extraverted pupils is a stable feature. The Cambridge personality study was unable to follow the same pupil from Year 7 through to Year 9, so it is uncertain whether high extroversion scores remain steady for *individual pupils* throughout the Key Stage 3 years, but if they do, this could reflect a significant shift in sociological demographics as children grow up in a community where juvenile–adult attitudes are becoming more highly polarized (Mayer, 2008) and family life shows increasing signs of breaking down (Resolution, 2008).

Attitudes to working in groups in the lower secondary school

Part of the Cambridge research addressed attitudes to the use of group work in the Key Stage 3 years (Pell et al., 2007). The research required pupils' attitudes to be monitored both before and after a teaching sequence in one of the three core subjects, which made use of working in groups to achieve the learning objectives. Already in this chapter, the lack of group work has been cited as a contributory factor in the Government's *Getting Back on Track* report for the failure of some Key Stage 3 pupils who are failing to make progress in mathematics and

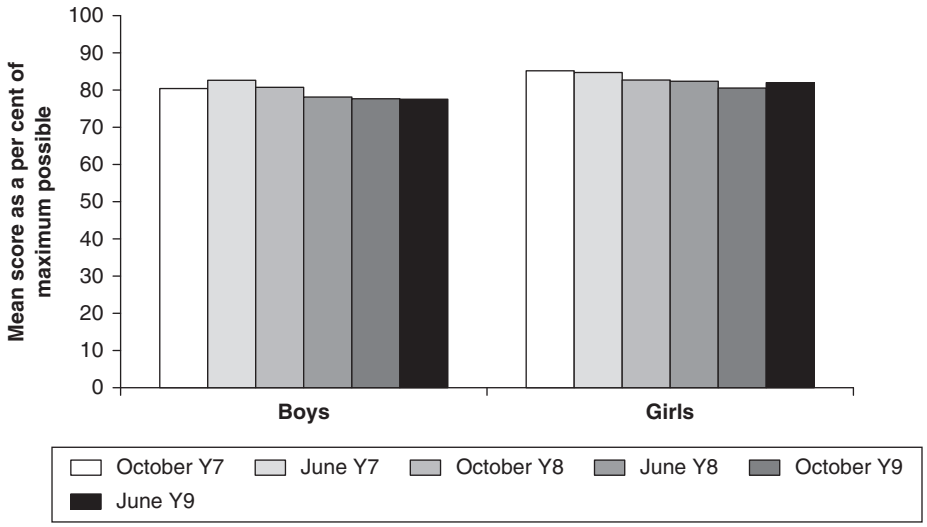

Figure 1.15 Attitudes to co-operative group working: Year 7 to Year 9

science (DCFS, 2007). The evaluation of new Key Stage 3 curricula by Stoll et al. (2003) report that 90 per cent of Year 8 pupils surveyed expressed a preference for working in groups compared to whole-class teaching. As we have shown previously, the typical personality profile of today's Key Stage 3 pupils suggests a preference for belonging to socially interacting groups.

To measure pupils' feeling about working in groups, the Cambridge researchers piloted three specific scales, which were to investigate (a) *co-operative working*, (b) *liking group work*, and (c) *the quality of the group working environment*.

Attitudes to cooperative working

Five items remained on this scale after piloting a range of statements from the literature and pupil interview responses. Key items of the scale, which appears in full in Appendix A are:

- Item 4. If we don't all agree, we should look for common ground.
- Item 13. We should all have a say in the decisions made.

Figure 1.15 shows the mean scores at the pre-test in October and the post-test in June.

Mean scores are significantly higher for the girls. Comparing end-of-year June testing with October testing for all age groups shows no significant attitude falls, indeed for Year 7 boys scores show a significant rise. The more able pupils in Year 7, according to their teachers' ratings, record higher scores. For the other age groups, attitude scores are not related to ability. Thus pupils in the anti-school, anti-learning sub-groups appear to value working together as well as their generally more able peers.

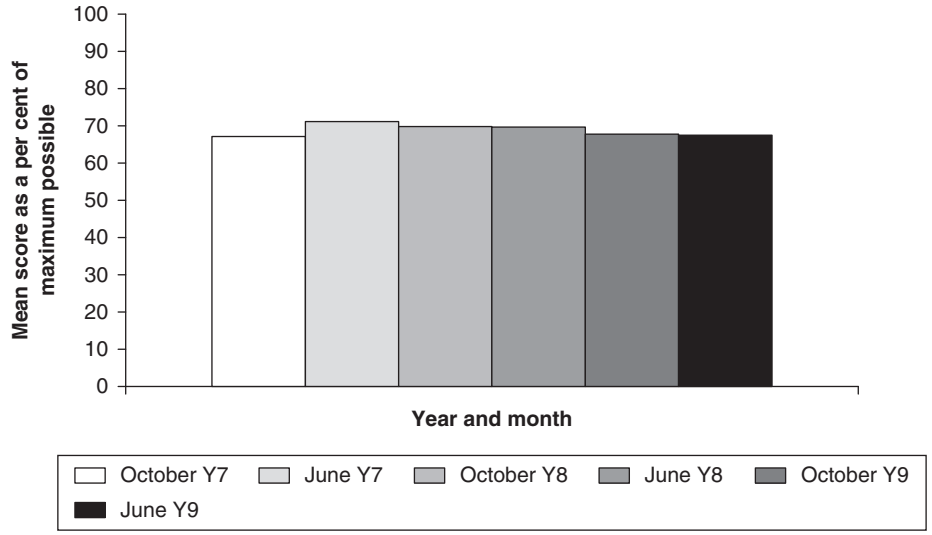

Figure 1.16 Liking group work: Year 7 to year 9

Liking group work

A substantial number of items measuring *liking group work* remained after piloting statements from the literature and pupil interview responses. Just 5 items were selected to keep the length of the scale reasonable for administration in the main research study. The scale appears in Appendix A. Key items are:

- Item 2. Learning is more interesting in groups.
- Item 5. Groups encourage you to work hard.

The pre-test and post-test scores at the beginning and end of the school year show no significant gender differences so Figure 1.16 compares the changes in 'liking' across the year groups for all pupils.

Year 7 pupils actually achieve a significant gain in *liking group work* over the year. The Year 8 and 9 pupils' scores remain steady. When teacher estimates of pupil attainment are taken into account, able boys score significantly below other boys on the scale, with the gap widening over the school year. Able girls, although initially less positive than other girls about group work in October of Year 7, reach parity with other pupils by June but fall back again in Year 9.

Quality of group working environment

Again more items were generated from the literature and student interviews than were needed in the questionnaire and, after piloting, only the 6 items that gave the highest internal consistency of an *attitude to the group-working environment* were selected. The scale appears in Appendix A. Key items on this scale are:

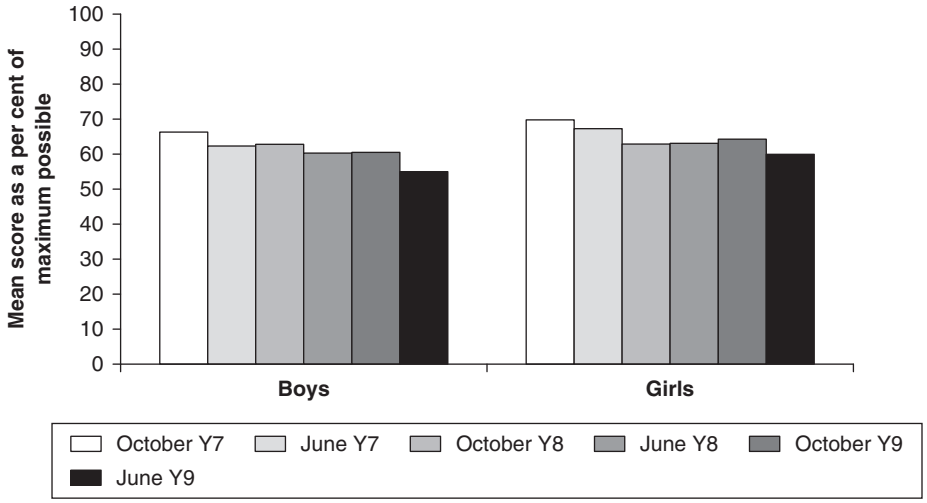

Figure 1.17 Quality of the group-working environment: year 7 to year 9

- Item 2. We take turns in talking.
- Item 5. There is interrupting or cutting off. (scores revered)

Although, *liking group work* scores remain remarkably steady over the school year, which is against the common trend of subject attitudes' fall-off, Figure 1.17 shows that *the quality of group working* appears to decline in the same period, because the pupils' rating of their experiences in groups drops significantly by June. The fall is the same for groups in English, mathematics and science, and is shown by both boys and girls. Boys' scores tend to fall more than the girls', although this does not necessarily mean that scores fall in every class. In seven of 38 classes studied mean scores were actually higher in the June test, pointing to a strong teacher effect.

Teachers' ratings of pupil ability suggest the decline in the quality of group working is greatest among able boys in science classes. These pupils' ratings in the June post-test show particularly noticeable and significant drops.

Group working in the lower secondary school: a summary

The rationale for group working in the secondary school has tended to be pragmatic rather than being based on psychological evidence. According to Blatchford et al. (2001) the rationale for grouping in both primary and secondary schools appears to be dominated by issues of classroom organization rather than pedagogy or possible benefits to students. For instance, Stoll et al. (2003) found that teachers would often set up groups in science based on the numbers of items of equipment available and in English on the amount of written resources.

The value of group work for addressing some of the quantitative losses in attitude and attainment at Key Stage 3 will be discussed in the following chapters of this book. At this point already though, there is justification for an expanded role for group work in that there is strong research evidence that students do not think they get enough of this form of teaching approach. In the Cambridge research mean *'liking group work'* attitude scores were around 70 per cent and did not fall over the school year, unlike subject attitudes, and mean *attitudes to cooperative learning* were over 80 per cent and also remained steady. This positive disposition towards working cooperatively together is maintained despite a fall in the quality of what takes place inside the groups.

Pupil stereotypes inside the secondary classroom

So far in this chapter, mean scores and correlations have been used to draw certain inferences which emerge from attainment and attitudinal data collected from students in various national and international contexts. Such an approach gives a valuable broad picture. Over time, positive and negative trends can be picked out and, if necessary, macroscopic policy changes can be introduced. In this way, if a case can be made for a greater use of group working at Key Stage 3 to arrest attitude decline, for example, then future national programmes would be expected to reflect this approach. In reality, the broad picture of the average student is an over-simplification. Looking at the characters who make up a typical class, how many fit the profile of the average as illustrated by the charts of this chapter? There will be some who react positively to group discussions, others will do the opposite. There will be some who are pro-school and introverted. There will be others who are anti-school and extraverted. For some of these *types* of pupil, correlation coefficients for ability and attitudes will be positive, for other types the correlations will be negative, while for other there will be no correlations at all. This complexity has led some researchers to withdraw from any attempts to quantify what is happening in classrooms.

Statisticians have attempted to deal with this problem by means of the technique of *cluster analysis*. This produces a profile of each student in terms of their attitude, motivation and attainment scores, and indeed any other measures which are reliably available. *Cluster analysis* puts the students into specific types, in each of which the students have relatively similar scores on each of the different variables such as *attainment*, *academic satisfaction motivation*, *anxiety* and so on. Each type though differs significantly from all the others on the mean scores for most of the variables. Granted that a class of 30 pupils comprises 30 different individuals, there will be sufficient similarity in test scores, and by implication in behaviour, for these 30 students to be separated into, say, five or six groups, each group having broadly similar characteristics.

In our research at Cambridge, full data from 818 pupils in the classes of 44 Key Stage 3 teachers of English, mathematics and science in 22 schools of two education authorities were cluster analysed to identify the student types.

Table 1.1 Characteristics of the four pupil types

Scale	Mean Scale Scores				Change over the year for all pupils
	Type 1 (N = 264)	Type 2 (N = 338)	Type 3 (N = 153)	Type 4 (N = 163)	
Cooperative group working	L –	H+	L –	H+	Nil
Liking group work		H+	L		Sig. rise
Group work quality	L –	H+	L –		Sig. fall
Anxiety		L –	H+	L+	Sig. rise
Extroversion	H+	H+	L –	L –	Sig. rise
Active participation	L –	H+	L –		Nil
'Anti-boffin' sub-culture	H+	L –	H+	L	Sig. fall
Liking mathematics	L –	H+	L –		Sig. fall
Liking English	L –	L	L –	H+	Sig. fall
Liking science	L –	H		H+	Sig. fall
Achievement mastery motivation	L –	H+	L –	H+	Sig. fall
Academic satisfaction motivation	L –	H+	L –	H+	Sig. fall
Pro-school motivation˙	L	H	L	H	
Percentage of Boys	45.5	49.4	58.5	52.1	
Teacher's attainment estimate in October	L	H	L		

L = significantly below other mean cluster scores
H = significantly above other mean cluster scores
+ = significant residual gain since pre-test
– = significant residual loss since pre-test
˙ No pre-test scores available

Table 1.1 shows the characteristics of the four main types that the analysis could pick out. Thirty-five pupils were impossible to 'classify' because of their uniqueness. Should there have been sufficient time and resources available these unique pupils could have been followed up as individual 'case studies'. The letters L and H are used in the table to denote whether the scale score in the June post-test was statistically significantly lower or higher than scores in the other clusters. The final column indicates the October to June change for all 818 pupils on each scale, so the positive (+) or negative (–) signs indicate whether the June score was an improvement or a deterioration of the October one. For example, for *liking mathematics*, attitude scores fall significantly for all pupils, but for Type 2s the post-test scores are above average and do not fall by as much, possibly even increasing over the year.

Type 1 pupils, forming 32.3 per cent of the total sample, are below average in attainment and motivation but exhibit a strong streak of extroversion. Their subject attitudes in the October pre-test are the least positive of the four types. Over the course of the year their attitudes to all three subjects continue to deteriorate. These pupils express strong *anti-boffin, sub-culture* characteristics and these feelings increase during the school year. At the end of the school year, scores on the *pro-school* scale are significantly lower than those of the other pupils. They present mixed attitudes to group work. While not opposed to being in groups they appear to attach little value to working cooperatively, the inference being that they like the groups for social rather than academic reasons. They report that the quality of activity within the

group declines over the year, and for the most part these pupils choose to adopt a passive approach, being content to let other group members perform the required tasks or actively contribute to the discussion. The highest achieving Type 1s are likely to be those who are not as negative about the classroom learning culture, and who are of a stable personality disposition. Type 1 pupils have been referred to as '*dossers* or *shirkers'* by Rudduck (2003). As Hargreaves (1982) has commented, this type of pupil subverts traditional school culture so that hostility to teacher and school gives the feeling of status and dignity.

Type 2 pupils form the largest cluster and are *active collaborators*. Their estimated attainment levels are above average; they are highly motivated, and their positive attitudes towards cooperative learning in groups increase over the course of the year. They tend to have a preference for mathematics and science rather than English and for the most part are confident pupils (low on anxiety and high on extroversion) and this disposition improves over the course of the year. They have sound attitudes to school and increasingly positive ones to classroom learning as measured directly by *pro-school motivation* and inversely by *anti-boffin, sub-culture*.

Type 3 pupils form the smallest cluster. Having some of the characteristics of Type 1s, they differ in personality terms being *anxious introverts*. This means a lack of confidence in comparison with the extraverted *shirkers* of Type 1. Rather than being part of a social mix within a class, Type 3s are *struggling loners*, who do not wish to get involved. Like the *shirkers* they are among the less able; display anti-learning *(anti-boffin, sub-culture)* characteristics, anti-school tendencies and are poorly motivated. The World Health Organization survey (Currie et al., 2008*)* intriguingly reports that peer support ratings for 13 and 15 year-olds in England are in the bottom three of the list of 41 countries. This suggests that the Cambridge research might well have underestimated the proportion of Type 3s in our classes. Attitudes to science for Type 3s are not as negative as are those towards English and mathematics, possibly because of the subject's practical aspects, and the higher achievers in science tend to be much less anti-school.

Type 4 pupils demonstrate the classical personality characteristics of learners who traditionally have done well in secondary education and above, especially in the physical sciences (Eysenck, 1972; Entwistle, 1973; Entwistle and Wilson, 1977; Fontana, 1977). These are the *stable introverts*. Motivation scores are high both towards personal achievement and to school. Type 4s are supportive of cooperative learning but are less prepared to become involved in the cut and thrust of group-work discussions. They have a preference for English as a subject compared to the other types, and this positive effect must be very strong, given that the average attitudes to English were the highest of the three subjects initially for all the pupils. Type 4s can be found at all ability levels, but in mathematics and science, the higher achievers tend to be particularly cool towards working in groups. Type 4s are not dissimilar to the *quiet collaborators* first identified in earlier studies of primary pupils (Galton et al. 1980).

Given that each classroom is likely to contain more than one type of pupil, and an 'average' mixed-ability class of 30 could comprise 10 Type 1 *shirkers*,

12 Type 2 *active collaborators*, 2 Type 3 *struggling loners* and 6 Type 4 classical learning *quiet collaborators*, the task facing the teacher is laid out for all to see. In 31 of the 39 classes studied, the relative proportions of the student types did not differ significantly from this typical profile. In an ideal world, classrooms are populated with Type 4 students and a sprinkling of their more sociable and extraverted cousins, the Type 2s, yet of eight classes with significantly different Type profiles, four were dominated by the 'anti-school', more difficult to teach Type 1s and 3s. In all, 13 of the 39 classes had more than 50 per cent of their class members drawn from the anti-school, anti-learning Types 1 and 3.

Conclusion

It is interesting to compare Hargreaves's (1982) subjective view of four pupil types in the secondary classroom of 30 years ago with the outcomes from the Cambridge study of today. Hargreaves's 'oppositionals' (similar to our Type 1s) remain and make up about one-third of the Cambridge sample, although the criteria used by the two studies are not identical. Teachers rated around 85 per cent of the Cambridge sample as being of average ability or above, which is supported by the depth of intensity in motivation towards personal success shown by most of the pupils. What this most recent research suggests is that the delivery of the present largely prescribed curriculum within the institution of the school is highly problematic since clearly 'one size' cannot fit the needs of all these varying types of pupil.

Curriculum delivery is undoubtedly being affected by the imposition of Standard Assessment Tasks and the Government's target culture. 'Teaching to the test' appears to be distorting the learning taking place across the core curriculum so it is possible for internal 'standards' in England to have risen over the last decade, while internationally achievement has for the most part dropped. It is of some interest that another Government department, that of the Police Service, which is also 'target driven', is now questioning the direction in which it has been compelled to move (Hope, 2008). Teachers must live in hope that there will be a change in direction in the schools that will restore them a measure of professional autonomy.

In this chapter a case has been made that pupils' feelings, personal adjustment to society and attitudes should be of more than a passing concern in a school system focused on attainment. The evidence presented in the previous pages has shown that current attitudes to the core subjects of English, mathematics and science at Key Stage 3 are poor and are continuing to decline over time. The international studies cited support this assessment that attitudes have deteriorated. Motivation towards school and to learning is only moderate, and in any class with a range of ability there are likely to be problems for teachers as a result. In the Cambridge study Type 2s (*active collaborators*) and Type 4s (*quite collaborators*) are readily identified with those pupils classified by Hargreaves (1982) as being 'committed to school values' in so far as they seem to be relatively comfortable in the surroundings of the

school. The distinction between these two types may be to some degree artificial, being a consequence of the design of the Cambridge study, which was looking into the effect of group work. The pupils with a 'positive disposition to school' were consequently split according to their support for this style of learning. Types 2 and 4 comprise just over 60 per cent of the Cambridge sample, which suggests that around 40 per cent of average and above-average ability pupils are becoming alienated by school over the Key Stage 3 years. When pupils of below-average ability are brought into this discussion, it is not unreasonable to speculate that more than half of today's pupils are currently disaffected with the school experience. There is therefore a need for some radical thinking, not only about current classroom practice (the subject of much of the remaining chapters) but about the structure of secondary schooling itself. We end this chapter therefore with several questions.

Questions for discussion

1. Would it be valuable if schools were to assess the attitudes and motivation of their pupils as well as monitoring attainment? Quick checks might be done at the start and end of the school year using attitude items like those in Appendix A.
2. Given the prominence given by Government to the personalized learning agenda, how valuable is it to identify different types of pupil, as in the Cambridge studies so that the curriculum can be tailored to their different needs as reflected in these profiles?
3. A constant criticism of present policy is that there have been two many initiatives, many of which have not been adequately trialed. In what ways can schools have a greater say in policy formulation so that the impact at classroom level is better understood?

After 20 years of prescription and change driven by the 'education-3' political mantra, the excessive reform agenda of recent years has arguably little to show for all the effort expended. Particularly serious is the decline in pupils intrinsic motivation resulting in poor attitudes to subjects such as science and mathematics. The following chapters will explore further the research into what exactly is happening in Key Stage 3 classrooms and the possibilities for bringing about change in pupils' present dispositions to learning. We will begin by looking at the initial reactions of pupils when they make the move from primary to secondary school.