

Sheffield Hallam University

Faculty of Development and Society

Professional Learning in the Workplace
(PLW)

Matthew Atkinson

Student number: 20054071

2011

Tutor: Reg Tooth

Does horizontal setting of year seven Science pupils improve pupil progress when compared to vertical setting?

Abstract

This project focuses on the setting of pupils in Year 7 Science in the researcher's school. In the past the pupils have been set vertically based on ability. The main outcome of this project was to assess the impact of a change to setting Year 7 Science horizontally. The aims of the project were:

1. Which method of setting allows the pupils to make more progress?
2. Are there any groups of pupils who are adversely affected by the change to parallel setting?
3. Are there any issues associated with parallel setting compared to vertical setting?

Evidence was gathered to investigate these aims by the following means:

1. Comparison of pupil progress made by the vertically set Year 7 Science class of 2009-10 with the horizontally set Year 7 Science class of 2010-11.
2. Peer to peer lesson observation of Year 7 Science lessons.
3. A pupil questionnaire.

The key findings from the research were that on average the pupils made more progress when set horizontally compared with when they were set vertically. When this pattern was examined in more detail it appeared that the girls made better progress when set horizontally, but the boys made more progress when set vertically. Another finding was that the higher ability pupils made less progress when set horizontally, but the middle and lower ability pupils made better progress.

Findings from the lesson observations and pupil questionnaire were that the higher ability pupils help, and enjoy helping the lower ability pupils in lessons. Pupils learn from each other's oral answers and discussions even when they are above their current level of understanding. What came across was that the level of difficulty and

pace of the lessons are essential to get right in order to make horizontal setting a success. The importance of differentiating the lessons was also highlighted, especially because the pupils do not like waiting for slower pupils.

Contents

Abstract.....	2
The contextual statement.....	5
Introduction.....	5
Context of the school.....	7
Relevance of the project.....	9
Personal and professional development.....	9
Research paradigm.....	10
Aims.....	10
Summary.....	10
Engagement with a Knowledge Base.....	12
The big picture.....	12
Principles and Practices of Action Research.....	13
History of setting in the United Kingdom.....	14
Parallel vs. Vertical setting.....	15
Known issues.....	19
Planning a change activity.....	23
Aims of the project.....	23
Timeline of research.....	27
Sample size.....	28
Validity and Reliability.....	28
Ethical issues.....	29
Data analysis.....	29
Carrying out a change activity.....	31
Implementation of the plan.....	31
Aim 1 analysis.....	32
Aim 2 analysis.....	33
Aim 3 analysis.....	38

Positives of horizontal setting.....	41
Evaluating the impact on practice.....	45
Evaluation of the outcome	45
Limitations of findings	48
Evaluation of methodologies	49
Impact on own practice	50
What I could have done differently	50
Further research.....	51
Lasting impact.....	51
Dissemination	52
Accessing peer support, coaching and mentoring	53
Bibliography	54
Appendices.....	57

Does horizontal setting of year seven Science pupils improve pupil progress when compared to vertical setting?

The contextual statement

The first chapter consists of an introduction to the project. This outlines the background and context of the study. It provides a detailed rationale for the study and explains the micro and macro contexts of the research. Constraints are made clear, and a brief justification of the approach is given. The aims of the research are identified and expanded upon, the scope of what is covered and how the research was approached is explored. The impact of the project on the researcher's professional development is stated.

Introduction

The broad area of study that this project focuses on is setting and its impact on the pupils' progress. The focus was deliberately kept narrow; looking solely at Year 7 Science in the researcher's school. This was to ensure that the issue of setting in Year 7 could be looked at in-depth and any unexpected findings could be looked into. Although the findings of this research are in relation to Year 7 Science in the research school, generalisations about what has been concluded can be made and used to inform the setting in other subjects and other year groups

The definition of setting that will be used is where *pupils are grouped differently according to their strengths and weaknesses in different subjects* (Hallam and Ireson, 2001, pvii). Setting by ability, vertical setting, whereby the pupils are ranked

according to their ability in the particular subject, and then placed into a set accordingly is a widespread practice at the researcher's school from Year 7 through to Year 11. In the past this was the same for Year 7 Science and in the researcher's experience this worked well. There were however a few issues in setting pupils from the very beginning of the year:

1. Pupils coming from different Primary schools had covered different amounts of Science to varying degrees. This is an observation that I have made over the last four years of teaching Year 7 Science at the research school.
2. There was unreliability, or complete absence, of Year 6 data that was used to assign pupils to a set. There are two pieces of information that were used to set pupils coming into Year 7; their predicted SAT level in Science which was made by their Year 6 Science teacher, and the Year 7 Science entrance exam. When assigning pupils to sets, some pupils had both pieces of data, some had one or the other, and some had neither. The predicted SAT level is just a teacher prediction, and the pupils' performance in the entrance exam is again determined by the amount of Science the pupil has covered in the past.
3. Some pupils and parents see being in the top set as a necessity in order to do well, resulting in varying levels of correspondence with parents, requesting that their child be moved into the top set. This is something that I have experienced during the four years that I have been teaching at the research school.
4. Pupils who are in the bottom set are switched off from Science by the time they reach Year 8. I know this because I have taught Year 8 bottom sets in both Chemistry and Biology, and they have a negative association with the subject because they think that they cannot do it and that they are no good at

Science and point to the fact that they are in the bottom set as evidence for this.

The impact that this project sets out to evaluate is what effect a change to parallel setting in Year 7 Science has on pupil progress compared with vertical setting. For this year, the pupils in Year 7 Science were set in parallel rather than vertically as they had been in the past. Parallel setting is where the sets are equal in terms of the distribution of boys and girls and the ability ranges of the pupils. This was done on a trial basis for one year, and depending on the outcome of this project, it will either be adopted for future years, or the department will revert back to setting pupils vertically. The project sets out to answer the three questions that make up the aims, and to address the four issues discussed above.

The effect of the change will be observed and evaluated in three ways:

1. Comparison of pupil progress made by the vertically set Year 7 Science class of 2009-10 with the horizontally set Year 7 Science class of 2010-11.
2. Peer to peer lesson observation of Year 7 Science lessons.
3. A pupil questionnaire.

These will be expanded upon in the planning a change activity chapter.

Context of the school

For the purpose of this project the school that the research was conducted in will remain anonymous, and will be referred to as the research school. The school is an independent fee paying school that belongs to a Trust of thirty two schools. Kent still has state grammar schools, so in the surrounding area there are several comprehensive schools, state grammar schools and other fee paying independent

schools. The research school is non-selective, but does offer various scholarships and bursaries to certain pupils.

The research school consists of a senior school and a prep school, although the two are on different sites. The majority of pupils joining the senior school in Year 7 have come from the associated prep school, although there are a significant number of pupils joining from a wide range of other schools. This has an impact on this project, as different primary schools do varying amounts of Science which directly affects the pupils' previous knowledge of Science and results in a wide spectrum of knowledge and understanding of Science in Year 7 initially. Not all the pupils from the prep school move to the senior school, some choosing to go to another senior school.

The senior school has been growing in terms of pupil numbers in recent years, currently there are 450 pupils, with 47 in year 7 participating in this research. This compares to 52 pupils in Year 7 last year who will form the control group for the purpose of comparison. The research school is part boarding; 130 of the pupils are boarders. The pupils at the senior school range from 11-18 in age.

The researcher teaches Science in Year 7; the pupils are taught Biology, Physics and Chemistry topics on rotation through the year, each topic lasting four to five weeks. At the end of each topic the pupils sit an end of topic test, and at the end of the year the pupils sit an end of year exam, consisting of questions on the six topics they have covered. Although the National Curriculum is not strictly followed, the course taught in Year 7 is based on a textbook that follows the National Curriculum. The pupils receive six lessons of Science a fortnight. There are three Science sets in year 7 this year, as there were last year, each taught by a different member of the

Science department. From Year 8 onwards, the Sciences are taught as separate subjects by subject specialists.

I teach Science to Year 7, Biology to Year 8 and 9, and Chemistry to Year 8 to 13. I am the Year 7 Science Co-ordinator at the research school. My other responsibilities include being a Year 7 form tutor, and I am a boarding assistant in one of the boys' boarding houses. I have been working at the school for four years.

Relevance of the project

The micro contexts of this project are that the Year 7 pupils need to be arranged into three groups to be taught Science. Setting directly affects the pupils and changes their experience which is why it is important that the method of setting that allows them to make the most progress is implemented.

The macro contexts to this research are that currently there are a variety of methods being used to set pupils across subjects. The findings of this project may impact upon how other subjects choose to set their classes. This project may also lead to a review of how pupils in other years are set. How pupils are set is a decision that all schools have to make, so other schools in the Trust of schools that the research school belongs may be interested in the findings of this project.

Personal and professional development

Through carrying out the change to the way that Year 7 Science is set and evaluating the impact on the pupils' progress, I hoped to experience some professional and personal development. Through doing this project it will allow me to expand my role as Year 7 Science Co-ordinator and demonstrate that I can implement a fundamental change to the way the whole department organises the running of Year 7 Science, monitor it and evaluate the change. This change will require good communication and cooperation between the year 7 Science teachers

which I will need to manage. The project will involve peer lesson observation which is an area that interests me as I feel a lot can be learnt from other teachers, and it will also require me to have a keen focus on levelling and tracking pupil progress; both are areas I hope to develop through doing this project.

Research paradigm

The research paradigm that will be used is an interpretivist paradigm. This is the process by which the researcher puts their own meaning on the data that has been collected and analysed, and then compares this meaning with those advanced by others (Denscombe, 2007). An interpretivist paradigm was chosen as it allows the researcher to play an active part in the research, which is essential as I will be teaching one of the three Year 7 Science classes. I can then place my own interpretation on the meaning of the qualitative data that will be collected through peer to peer observations and pupil questionnaires.

Aims

The aims of this research are:

4. Which method of setting allows the pupils to make more progress?
5. Are there any groups of pupils who are adversely affected by the change to parallel setting?
6. Are there any issues associated with parallel setting compared to vertical setting?

Summary

Due to a perceived link between how pupils are set and the progress they are able to make, it was deemed an area to investigate that would have benefits to the researcher's practice, the school as a whole and the pupils. In this section the problems of vertical setting have been stated, which led to the change in the way

that Year 7 Science is set. The impact of this change will be analysed in terms of the progress the pupils have made this year compared, to the Year 7 pupils last year, through peer to peer lesson observation of Year 7 Science lessons, and the pupils' perspective will be acquired through a pupil questionnaire. By doing this research, the researcher hopes to assess the impact of the change, evaluate it and make a recommendation for how Year 7 Science is set in future years.

This project is split into chapters as follows: Chapter two is the Engagement with a Knowledge Base which consists of a structured review of the literature relevant to setting. Chapter three is the Planning of a change activity in which the change activity will be explained in more detail, and the methodology of the research methods. Chapter four is where the data and findings will be analysed in detail. Chapter five will consist of the evaluation and recommendations. An overview of the main outcomes linked to the aims and literature will be found in this chapter.

The next chapter reviews recent writing and research work that has been carried out on setting. This will form the theoretical framework for the project.

Engagement with a Knowledge Base

This chapter consists of my engagement with the Knowledge Base relevant to the project. It starts with a look at the big picture in terms of the importance of education in society and to the pupils' futures. I also consider the role schools, teachers and pupils play in improving education before I introduce the topic of Action Research. There then follows a review of research relevant to the project which forms the theoretical basis for this assignment. The literature has been reviewed according to the following themes: a historical review of setting in the United Kingdom, a comparison of vertical and horizontal setting, and problems associated with setting that have been raised by other researchers.

The big picture

Barber (2000) looks at the task that faced the Labour government when they were elected in 1997, the importance of education in the lives of people going forward, and the consequences facing poorly educated adults in the 21st century. He emphasises the importance of reforming the education system in the United Kingdom when he states that:

our task, therefore, is not merely to improve the existing education system but to transform it so that it can achieve a dramatically more demanding goal: to become capable of providing high standards for all (Barber, 2000, p5).

He goes on to give examples of why education is of such importance including its effect on employability, earnings, communication and knowledge, social inclusion and democratic involvement of individuals. The role of education in a person's life is so encompassing that research such as this project on setting are justified, as it could have a positive impact on a pupil's development and education.

Schools and teachers have a key role to play in the realisation of the 'big picture'.

School improvement researchers have consistently stressed the importance of teachers' commitment to change, and a form of professional development that enhances their capacity to deal with it (Stoll et al., 2001, p197).

Stoll et al. also makes the point that:

changing one's practice is notoriously difficult, requires considerable effort, and for teachers to invest the time and energy, they have to see a good reason for doing so (Stoll et al., 2001, p197).

The researcher wants to ensure the setting that is adopted is the best for the majority of the pupils, and that any issues associated with the chosen method of setting are highlighted and addressed. This is the reason for doing this research, and the other Year 7 Science teachers can see the benefits of trialling an alternative method of setting, and are therefore supportive of the change.

Wylle (1999, p186) describes pupils as *coproducers and cocreators of their own learning*. The pupils have a vested interest in how they are set as it impacts them directly and who they interact with in the lesson. This shows that there is strategic importance to this research. A role is played by the pupils, the teachers and the school in improving the level of education to ensure it is of an appropriate level to allow them to be successful in their future lives.

Principles and Practices of Action Research

Action Research was the chosen methodology because it is an interactive inquiry process that involves problem solving and data-driven analysis or research to bring about personal and organisational change (Reason and Bradbury, 2001).

Action Research is characterised by being practical, committed to change and professional development. It is cyclical and participatory (Denscombe, 2007). It is carried out by practitioners in collaboration to solve problems. Action Research

typically starts with a single person identifying a problem; it gains momentum by involving others, and spreads as others reflect on their interventions (McNiff et al., 2003). The issues associated with vertical setting in the research school were observed, so a change to parallel setting was made to try to address these problems. The researcher along with the other two Year 7 Science teachers are involved and play a key part in the research. The impact of the change will be evaluated based upon pupil data, along with peer observations and a pupil questionnaire. Parallel setting may not be the best solution, but due to the cyclical nature of Action Research, another method of setting may then be trialled.

History of setting in the United Kingdom

Selection and streaming were common in the middle of the last century. Streaming is where *pupils are divided into different classes on the basis of their perceived ability* (Hallam and Ireson, 2001, pvii). This was normally done on the basis of intelligence determined by an IQ test, the results of which placed pupils into groups in which they would be taught for all of their subjects. However by the 1980's many local education authorities had abolished selection and most schools had abandoned streaming. By the end of the century, ability grouping appeared to be gaining popularity once again. (Hallam and Ireson, 2001). Setting differs from streaming because in setting *pupils are grouped differently according to their strengths and weaknesses in different subjects* (Hallam and Ireson, 2001, pvii). In setting pupils are placed into different sets for different subjects based on their ability in each individual subject.

This project will focus on vertical setting (also referred to as ability grouping by Hallam and Ireson, 2001) whereby the pupils are ranked based on their ability in the subject and then divided into groups, and horizontal setting whereby each set is

equal in terms of the distribution of boys and girls, and the range of abilities which the group is made up of. A third method of grouping pupils is mixed ability setting, whereby pupils are randomly assigned to a group.

Ability setting (vertical setting) was encouraged by the Labour government when they came to power in 1997 as a way of raising standards. The government White paper 'Excellence in Schools' (DfEE, 1997) and the Green paper 'Schools: Building on Success' (DfEE, 2001) both called for an increase in the use of setting in schools as a way of raising standards. The next section looks at the research supporting and contradicting the use of vertical setting as a way of raising attainment.

Parallel vs. Vertical setting

Setting varies across curriculum subjects, being most common in Mathematics, followed by Science, Modern Foreign Languages and English. It is less common in the Humanities and infrequent in Art, Music, Physical Education and Design and Technology (Ofsted, 2001). In the research school it has been the case that the pupils were set from the start of Year 7 into ability groups in Mathematics, English, Science and the same group for the Humanities subjects, but the classes they were in for other subjects such as Art, Music, Physical Education and Drama was determined by the sets the pupils were in for other subjects.

Pupils are *affected not just by the content of their curriculum but also by the way that pupils are grouped* (Hallam and Ireson, 2001, pvii). This shows that the way pupils are grouped does have an impact on them, and is therefore something that needs to be considered to ensure the best option for the majority of the pupils is adopted.

Reid et al concludes however that *there is no one best way of organising pupils for all purposes* (Reid et al., 1981, p46). Her Majesty's Inspectors of schools in their

report on classroom organisation 'Achievement for All' also concluded that if *used effectively, both mixed ability and setting may be appropriate forms of organisation* (SOEID, 1996, 5.4). The research suggests that the method used to group pupils is important, however there is no accepted best option and under different circumstances both vertical and parallel setting can be used to good effect.

The main advantage of sets for most pupils was the possibility of increased teacher attention appropriate to their needs (Smith and Sutherland, 2006, p74). A suggested reason for this is *if pupils of similar ability are taught together, it should be possible to tailor teaching to meet their needs and thus raise attainment* (Hallam and Ireson, 2001, p1). This supports the government White Paper 'Excellence in Schools' (DfEE, 1997) and the Green paper 'Schools: Building on Success' (DfEE, 2001) mentioned above, as the Government was encouraging the use of setting as a means of raising standards. Ofsted concur with these views: *setting can help teachers to plan work more precisely and select appropriate teaching methods* (Ofsted, 1999). These are the arguments that support vertical setting as it groups pupils of similar ability together, creating classes that have a narrower ability range than mixed ability classes. The teacher can therefore tailor the lesson more to meet the needs of these pupils more closely.

It is a common conclusion in research articles that setting is beneficial for higher attaining pupils (Gamoran and Mare, 1989; Hoffer, 1992; Argys et al., 1996). This may be as a result of the arguments made above, that if the most able pupils are grouped together, they can be taught more appropriately and stretched more effectively. The same conclusion is made by Ireson, J. and Hallam, S, but they say

ability grouping can raise the attainment of those in higher groups, but this is often at the expense of those in lower groups, who do better in a mixed ability environment (Hallam and Ireson, 2001, p13). This mirrors Reid et al. (1981, p46) in suggesting that there is no one best method for grouping pupils that works equally well for all pupils. An important decision has to be made about whether it is correct to set pupils vertically by ability if it raises the attainment of certain groups of pupils, but impacts negatively the attainment of another group of pupils.

There is a *range of evidence that linked ability setting to under-achievement, both for students in low and high sets, despite the widely held public, media and government perception that setting increases attainment* (Boaler et al., 1998, p3). Boaler et al. (1998) goes further than Hallam and Ireson (2001) in suggesting that ability setting can impact negatively on high ability pupils as well as lower ability pupils. Boaler et al. (1998) makes reference to the opinion of the government, as seen in The government White Paper 'Excellence in Schools' (DfEE, 1997) and the Green paper 'Schools: Building on Success' (DfEE, 2001), and the opinion of research, as seen in Gamoran and Mare, 1989; Hoffer, 1992; Argys et al., 1996 but disagrees by saying that setting does not raise attainment. Slavin (1990) came to the conclusion that when students follow essentially the same curricula, ability grouping has little impact on attainment. This is another piece of research that goes against the idea that vertical setting by ability raises attainment, but does specify that this is when all the sets cover the same curriculum, which may be harder to do with a lower ability set to the same standard as a higher ability set in a given timescale.

One of the arguments for an alternative to vertical setting is that *mixed ability grouping is based on the recognition that children have different strengths and weaknesses and develop at different rates* (Hallam and Ireson, 2001, p12). This supports the idea that even within a subject, pupils will have different strengths and weaknesses; depending on the topic for example. Therefore there is no justification for placing the pupils in ability sets. Even within a set, if pupils develop at different rates, the argument for having sets of similar ability to focus the teaching becomes less relevant.

Average attainment in English, Mathematics and Science GCSE scores were compared in three types of school by Ireson et al (2005). The results demonstrated slightly higher average attainment in the Set schools, with a statistically significant difference in Mathematics but not in English or Science. There is very little difference in standard deviations, suggesting that setting is not contributing to a wider spread of attainment (Ireson et al., 2005, p448). This study involved 6000 pupils over 27 schools which is a large sample size, suggesting the results are reliable. They went on to find that the number of years of setting a student experienced from Year 7 to Year 11 had virtually no effect on GCSE attainment in Mathematics, Science or English (Ireson et al., 2005, p450). These findings support the points made earlier, that vertical setting does not raise attainment in Science by a statistically significant difference when compared to horizontal setting.

Ireson et al. (2005) then went on to focus on Science and the effect of setting on different ability pupils. Their research indicated that in Science, lower attaining students achieved slightly higher grades when they experienced more years of setting, in contrast with medium and high ability students who achieved slightly

higher grades in schools with less setting (Ireson et al., 2005, p450). This contradicts the work of Gamoran and Mare, 1989; Hoffer, 1992; Argys et al., 1996 who conclude that setting is beneficial for higher attaining pupils, and also contradicting the earlier work of Hallam and Ireson (2001) who said that *ability grouping can raise the attainment of those in higher groups, but this is often at the expense of those in lower groups, who do better in a mixed ability environment* (Hallam and Ireson, 2001, p13). This just reinforces that fact that grouping of pupils is a very complex issue, and that there must be other factors that have an influence on attainment other than setting.

Known issues

One of the problems of parallel setting is that *mixed ability teaching places greater demands on the teacher and requires good curriculum resources* (Ireson and Hallam, 2001, p12). When there is a larger ability range within a class it becomes more important to differentiate the lesson to ensure that the different ability groups are catered for; this is what the point about mixed ability teaching requiring good curriculum resources refers to. This supports Ofsted who are approaching this from the point of setting: *setting can help teachers to plan work more precisely and select appropriate teaching methods* (Ofsted, 1999).

A study by Suknandan and Lee (1999) concluded that grouping pupils by ability has no influence on their performance but can have a negative effect on the attitudes, motivation and self-esteem of pupils in lower sets. The point about setting having very little influence on attainment has already been pointed out by Ireson et al. (2005). Suknandan and Lee go on to point out a negative effect of setting, in that it adversely affects the pupils' attitudes, motivation and self-esteem. This was one of the observations in the research school prior to the switch to parallel setting in year 7

Science. Pupils who were in the bottom set for Science in Year 7, by the time they were in Year 8, still in the bottom set, they were very disillusioned with Science and many were of the attitude that because they were in the bottom set they were not good at Science and could not do it. This was one of the issues that a switch to parallel setting would hopefully resolve. This argument is also supported by Rudduck and Flutter (2003) who as part of their work with the Economic and Social Research Council project, consulting pupils about learning and teaching suggest that some pupils in lower sets *develop, quite early in their school careers, a negative sense of themselves as learners and feel the system is rejecting them* (Rudduck and Flutter, 2003, p1).

It is suggested that in set classes, because of the narrower ability range, teachers are more inclined to treat students as

not only similar, but identical – in terms of ability, preferred learning style and pace of working ... The restrictions on pace and level of work that are imposed in setted lessons have also been a considerable source of disaffection, both for students who find the pace of lessons too fast and for those who find it too slow (Boaler et al., 1998, p8).

This takes the point made by Hallam and Ireson (2001); *if pupils of similar ability are taught together, it should be possible to tailor teaching to meet their needs and thus raise attainment* (p1) and turns it into a negative point about vertical setting.

Smith and Sutherland (2006) suggest some of the problems that are created by vertical setting pupils. They suggest that one difficulty the pupils find is the rigidity that seems to accompany set arrangements. This rigidity is related to two aspects of the setting arrangement. First is that there is little movement between sets other than for behavioural reasons. Pupils identify this as a negative consequence in that poor behaviour may result in movement downwards. Second is the very narrow

range of criteria utilised when sets are created. This ignores factors deemed relevant and important by pupils in relation to class work and effort (Smith and Sutherland, 2006, p74). The point made about pupils being moved for behaviour reasons is not a common occurrence at the researcher's school. It could be suggested that the pupil's behaviour and attainment are linked, and that it is because of their behaviour, why they are not attaining, and therefore are moving down a set. In the research school it is the case that when vertical setting is used, it is normally end of year exam results that determine the pupils' set for the following year, with only exceptional circumstances resulting in a pupil's set being discussed amongst their teachers, and then factors such as effort and classwork are taken into account.

When placed in the top set girls can be demotivated by the fast pace and pressure to succeed was the finding by Boaler (1997b). Depending on the nature of the pupil, they may respond differently to being in the top set. They may respond in a positive way to being surrounded by people of similar ability and the higher pace that a top set would normally cover work. However, as Boaler (1997b) suggests, some girls respond in a negative way to the fast pace and potential pressure that comes with being in a top set. This may account for why there is conflicting research as to whether being in a top set is beneficial to higher ability pupils, as stated by Gamoran and Mare, 1989; Hoffer, 1992; Argys et al., 1996, or help to explain Ireson et al. (2005) view as to why they do not make the expected increase in attainment from being in the top set.

This Engagement with a Knowledge base started by placing this project into the 'big picture' of educational improvement. I then gave a brief historical context to setting, and recalling that from 1997 the Labour government encouraged the use of setting

as a means of raising attainment. The research suggests that it is not a straightforward argument, with conflicting findings on whether setting by ability does indeed raise attainment. The arguments suggesting grouping similar ability pupils together so that their needs can be more closely met is a solid one, but is countered by researchers who have observed this leads to teachers teaching to a group of pupils rather than seeing the pupils as individuals. Some literature claims that setting helps the higher ability at the expense of the lower ability, whilst other research claims the opposite. Then there are other impacts that setting has on pupils other than their attainment to consider. This includes the effect on their attitudes, motivation and self esteem.

The next chapter looks at the Planning of the change activity. This includes explaining the aims of the project and how the project was carried out, the ethical considerations and how the research methods were chosen.

Planning a change activity

This chapter sets out how I went about implementing the change, the aims of the project and how I investigated them. I will set out a timescale for the project, list the resources that were required as well as discussing the validity and ethics of the project.

Aims of the project

The key change that this project will make is a change from vertical setting in Year 7 Science as has been used in the past at the research school, to horizontal setting. This was in response to the following observed issues that arose due to the vertical setting:

1. Pupils coming from different Primary schools had covered different amounts of Science to varying degrees.
2. There was unreliability, or complete absence, of Year 6 data that was used to assign pupils to a set.
3. Some pupils and parents see being in the top set as a necessity in order to do well, resulting in varying levels of correspondence with parents requesting that their child be moved into the top set.
4. Pupils who are in the bottom set are switched off from Science by the time they reach Year 8.

In my role as Year 7 Science Co-ordinator, in consultation with the Head of Science, I made the decision to adopt horizontal setting for the whole of Year 7 Science for the class of 2010-11 (this year will be referred to as the trial group). I had the full support of the Head of Science along with the two other teachers of Year 7 Science. The previous year's Year 7 (class of 2009-10) which was set vertically will be a

control group for comparison purposes (this year will be referred to as the control group).

The outcome of the project will be to provide evidence as to whether the change has been beneficial to the pupils' progress; if so, then horizontal setting can be adopted for subsequent years. If the change is not a success then alternative methods of setting may be adopted for next year, or the department could revert back to the original vertical setting.

To help reach an outcome, I will address the following aims:

1. Which method of setting allows the pupils to make more progress?

The primary source of data when investigating this aim will come from a comparison of the quantitative data of the pupils' progress within the trial group compared with the control group. Early in the first term, all of the Year 7 pupils sit MidYIS (Middle Years Information System) base line tests. These assess the pupils and make a prediction of their end of Key Stage 3 attainment. This is converted to a National Curriculum level using a conversion table (see appendix 1). The school has a policy that a pupil's target for the end of KS3 is their MidYIS prediction plus two thirds of a National Curriculum level. This target is then divided by three to provide an end of Year 7 National Curriculum target for every subject.

At the end of Year 7, all three classes sit an end of Year 7 Science exam. The percentage the pupils receive is converted to a National Curriculum level which is their achieved end of year level. For the purposes of this project, a pupil's progress will be measured by comparing the pupil's attained end of year level with their end of Year 7 target level which was generated by the MidYIS test.

I decided to use a comparison of the target level with the end of year assessed level as I already had the data for the control group so a comparison could be made. Also because the same end of year exam will be sat by both years, and levels assigned using the same level boundaries, a fair comparison can be made between the two years to determine which year made the greater progress on average.

A secondary source of information for this aim will be from the peer to peer observations. I will set up an observation triangle whereby each Year 7 Science teacher will observe the other two Science teachers teach a Year 7 Science lesson. There are three Year 7 Science classes so this will generate six observations. The observations will be recorded on a standardised pro-forma (see appendix 2). It is hoped that through doing these observations any impact on the pupils' progress within lessons due to the change to horizontal setting will be observed.

Lesson observation is a valid research tool that allows the researcher to witness firsthand the effect of any change in practice.

Observation offers the social researcher a distinct way of collecting data. It does not rely on what people say they do, or what they say they think. It is more direct than that. Instead, it draws on the direct evidence of the eye to witness events first hand. It is based on the premise that, for certain purposes, it is best to observe what actually happens (Denscombe, 2007, p206).

A possible problem of observing lessons is that the pupils and/or teacher do not behave in their normal manner due to the presence of the researcher:

With systematic observation, the issue of retaining the naturalness of the setting hinges on the prospect of the researcher fading into the background and becoming, to all intents and purposes, invisible (Denscombe, 2007, p213).

The Year 7 pupils are familiar with the three teachers that will be doing the observations, and the pupils themselves should be comfortable with other teachers

being present in the classroom as lesson observations are quite common within the research school.

2. Are there any groups of pupils who are adversely affected by the change to parallel setting?

Evidence for this aim will also come from the quantitative analysis of the progress the trial group made compared with the control group. In addition there may be observations recorded that will highlight any groups of pupils who are adversely affected by the change in terms of their participation in the lesson and interaction with other pupils.

3. Are there any issues associated with parallel setting compared to vertical setting?

Sources of information to assess this aim will come from three sources. The quantitative analysis of the pupils' progress may highlight some issues, likewise the lesson observations might. The third source of information will come from the pupil questionnaire. The pupil questionnaire will be sat by all the Year 7 pupils in the trial group at the end of the academic year. The questionnaire will be created using Google Docs and will be accessible online. The questions that will be asked in the questionnaire can be found in appendix 3. The aim of the questionnaire is to get the pupils' perspective on how horizontal setting has impacted them. It will be anonymous to encourage the pupils to be open and honest, and will be sat under supervision during school time to ensure a high return rate, to ensure that the pupils take it seriously and so that I can explain any aspect of the questionnaire they do not understand, I will be present in the room as they do the questionnaire.

A structured questionnaire was used with a mixture of open and closed questions to get the pupils' views on setting. A questionnaire *should begin with straightforward closed questions, leaving open-ended matter of opinion questions to the end* (Wellington, 2000, p104).

The questionnaire was carried out anonymously to collect the viewpoints of all pupils in the sample. *Questionnaires and interviews can be incorporated into experimental design, for example to gauge changes in attitude associated with a particular intervention* (Brown and Dowling, 1998, p59). A questionnaire was used because they are relatively easy to analyse, economical of time and you get greater reliability of data because they are completed anonymously. *Self completed questionnaires hold a number of attractions for the researcher who wishes to collect information from a large number of people but who has limited time and resources* (Brown et al, 1998, p66).

Timeline of research

The research was conducted between September 2010 and July 2011, although the control year's assessment data was from September 2009 to July 2010.

September 2010 Year 7 Science are set horizontally into three groups equal in terms of boys and girls and the abilities of the pupils which they consist of.

June 2011 Trial group sit end of Year 7 exam. Each pupil is assigned a National Curriculum level based on this exam which becomes their end of year attained level.

June 2011 Each Year 7 Science teacher observes the other two Science teachers teach a Year 7 Science lesson.

July 2011

All of the Year 7 pupils in the trial group complete the pupil questionnaire on setting.

Sample size

The control group consisted of 52 pupils, although two of the pupils were not used in the progress comparison because one pupil joined the school close to the end of the year so there was no MidYIS prediction for them and they missed most of the year's work, and another pupil was absent at the end of the year so did not sit the end of year exam.

The trial group consisted of 47 pupils, although one of these pupils will not be used in the progress comparison because they only joined the school at Easter so again they missed most of the years work, and there is no MidYIS prediction for them.

Validity and Reliability

Reliability will be addressed by triangulation of method. This will be used to examine different perspectives on the data collected as advocated by many writers of research methodology (Hitchcock and Hughs, 1995; Denscombe, 2007; Cohen, Manion and Morrison, 2007). Burton and Bartlett (2005, p28) suggest that *in effect, the researcher is approaching the object of the research from as many different angles and perspectives as possible in order to gain a greater understanding.* Bryman and Cramer (1997) believe that reliability is the consistency of results obtained when using a measure in research. The results should be repeatable so long as they are reliable.

Validity is a measure of the extent to which an indicator is a measure of what it purports to measure (Cohen et al., 2007, p105). Although the researcher was involved in the research, everything was done to ensure that the researcher did not influence the outcomes of the research. I taught a Year 7 Science class in both the

control year (the top set) and a class in the trial year. I taught the class exactly the same as I would have had I not been doing the research, so I do not think that myself teaching one of the classes in both years affects the validity of the research. The questionnaires were anonymous so the pupils should have felt free to be honest with their responses, and they were given the option of opting out of the research.

Ethical issues

Mertens (1998, p23) advises *ethics in research should be an integral part of the research planning and implementation process, not viewed as an afterthought or a burden*. During the research there will be no mention of the name of the school or any of the pupils involved on the grounds of confidentiality and ethical issues.

Permission was obtained from the Headmaster of the school, and all the pupils were made aware of what was taking place and the reasons behind the research. The teachers and pupils were given the option to opt out of the research, which none of them did which indicates that setting is an issue that is of importance to both pupils and teachers alike.

Data analysis

Denscombe (2007, p287) warns to:

avoid introducing unwarranted preconceptions into the data analysis. These might be personal prejudices or biases arising from knowledge of previous theories and research in the particular area of investigation.

The use of a thematic data analysis technique will be used as recommended by Robson (2002). The key recurrent themes will be identified in relation to the aims of the research. These will be related back to the literature discussed in the Engagement with a Knowledge Base chapter.

This chapter has stated what the change activity is and how it was implemented.

The aims of the research were set out, and how each of the aims is to be

investigated was explained and the research methods were underpinned by literature. Finally the validity and reliability of the data that is to be collected was discussed, and the ethical issues associated with the project were considered. The next chapter is Carrying out a change activity in which the implementing of the horizontal setting will be discussed and the data from the progress comparison, the lesson observations and the pupil questionnaire will be analysed.

Carrying out a change activity

This chapter looks at the implementation of the plan, presents the results of the research and then I will analyse the results in terms of the three aims of the project to establish common themes.

The aims of this research are:

1. Which method of setting allows the pupils to make more progress?
2. Are there any groups of pupils who are adversely affected by the change to parallel setting?
3. Are there any issues associated with parallel setting compared to vertical setting?

Implementation of the plan

The setting for Year 7 Science September 2010 was changed to horizontal setting as planned. This produced three balanced sets in terms of the numbers of boys and girls in each set and the ability of the pupils making up the sets. In June 2011 the pupils sat the end of Year 7 Science exam. The original plan was for the trial group to sit the same exam that was used with the control group the previous year. A problem arose in that two of the classes had not completed all six topics, so the exam was modified so that the pupils did the questions on the five topics that they had completed. The third class who had completed all six topics had a choice as to which question of the two option topics they chose to answer in the exam. I do not feel this will impact the validity of the research as the option questions made up a small proportion of the exam.

In June 2011 the observations as part of the observation triangle took place. This produced five observations rather than the intended six as one of the teachers could not arrange a suitable time to observe one of the other teachers. This will not impact

the validity of the research as I still have five observations from the observation triangle, and I have supplemented these with an observation made by the Director of the Senior School of myself teaching Year 7 Science.

The pupil questionnaire was sat by the pupils in July 2011 after they had had their last Science lesson of the year. Originally the questionnaire was going to be completed in a Science lesson; due to some technical problems this was not possible, so they completed the questionnaire in form time instead. This will not affect the outcome of the research, and I was still present to explain the reasons behind the questionnaire and to explain anything they did not understand. Not all of the Year 7 pupils were present when the questionnaire was completed, but I still obtained 40 out of a maximum of 46 (one pupil had left the school), which is a response rate of 87%.

Aim 1 analysis

The first aim of this project was to investigate which method of setting allows the pupils to make more progress? The raw data used to make the progress comparison can be seen in appendix 4. A summary of the analysis of a comparison of the progress made by the control group and the trial group is shown in the table below:

	Control group	Trial group
Number of pupils	50	46
Average progress of pupils relative to their end of year target	+0.25	+0.32
Range of pupil progress relative to their end of year target	-1.1 to 1.5	-1.3 to 1.7
Standard deviation of pupil progress relative to their end of year target	0.70	0.65
Percentage of pupils exceeding their target	68	59
Percentage of pupils who met their target	0	24
Percentage of pupils below their target	32	17

The results show that the average progress made relative to the pupils' target level by the trial group was greater (+0.32) compared with the average progress made by the control group (+0.25). This shows that the average progress in addition to their target levels made by the pupils was greater when the pupils were set horizontally rather than when they were set vertically. When an effect size analysis is carried out on the progress the pupils made relative to their target levels, a result of +0.07 is obtained. This suggests that horizontal setting has had a positive effect on the progress the pupils make relative to their target levels, but it is a very small effect. An effect size in the range of 0.2-0.3 would be categorized as a small effect.

The standard deviations for the two groups are similar (control 0.70, trial 0.65) suggesting that the change to horizontal setting has not caused a widening in the spread of progress the pupils make relative to their end of year target. A smaller percentage of pupils exceeded their target in the trial group (59% compared with 68%), but what is encouraging is fewer pupils failed to meet their end of year target in the trial group (17% compared with 32%). Overall 83% of pupils in the trial group met or exceeded their end of year target compared with 68% of pupils in the control group. This is a very positive outcome as on average it shows that pupils have made better progress when they have been set horizontally compared to when they were set vertically.

Aim 2 analysis

The second aim of the project was to investigate if any groups of pupils are adversely affected by the change to parallel setting? I will first use the progress comparison data looking at the effect on boys relative to girls, and then looking at the effect on high, middle and low ability pupils. A summary of the analysis of the

progress comparison data looking at the progress made by boys and girls relative to their end of year target is shown below:

	Control group		Trial group	
	Girls	Boys	Girls	Boys
Number of pupils	25	25	25	21
Average progress of pupils relative to their end of year target	+0.19	+0.31	+0.47	+0.15
Range of pupil progress relative to their end of year target	-0.9 to 1.3	-1.1 to 1.5	-0.4 to 1.7	-1.3 to 1.3
Standard deviation of pupil progress relative to their end of year target	0.60	0.78	0.56	0.71
Percentage of pupils exceeding their target	64	72	64	52
Percentage of pupils who met their target	0	0	28	19
Percentage of pupils below their target	36	28	8	29

Within the control group, the boys on average made more progress relative to their end of year target than the girls (+0.31 compared with +0.19). The opposite was the case within the trial group; the girls on average made more progress relative to their end of year target compared with the boys (+0.47 compared with +0.15). The same trend is evident when comparing the percentage of pupils below, meeting or exceeding their target. In the control group 72% of the boys exceeded their target and 28% failed to meet their target. With the girls 64% exceeded their target and 36% failed to meet their target. In the trial group 92% of the girls either met or exceeded their target, whilst with the boys 71% of them met or exceeded their target. This shows that as well as the girls making on average more progress relative to their end of year target in the trial group compared with the control group, a greater

percentage of them managed to meet or exceed their target. In the boys' case, the percentage of boys meeting and exceeding their target was very similar, it was just that on average they made more progress in the control group than the trial group.

The results show that it is the boys that were adversely affected by a change to parallel setting as they did not make as much progress relative to their end of year target on average compared to the year that were set vertically. The change to parallel setting appears to have benefitted the girls, with more of the girls meeting or exceeding their end of year target, and on average making more progress relative to their end of year target.

The next analysis will look at a comparison of different abilities, and how they have responded to the change in setting arrangement. In order to make a comparison between high, middle and low ability pupils, when doing this part of the analysis I grouped the trial pupils into three theoretical ability sets based on the original data on the pupils that was available in July 2010, and which was used to place the pupils into the horizontal sets, and what would have been used to place the pupils into vertical sets had the old setting method have still been in place. The data that was used was the pupils' predicted Science SAT levels and the pupils' Science entrance exam percentage. Immediately I came across the same problem that was stated in chapter 1; not all the pupils have this data, which makes reliably placing pupils into ability sets very difficult. The data that was used can be seen in appendix 5. 19 of the 46 pupils did not sit the entrance exam, and 14 of the pupils did not have predicted SAT levels. In addition to this, sometimes the entrance exam and predicted SAT level gave conflicting impressions as to which set the pupil should go in. This may be related to the fact that different pupils coming from different feeder schools have studied varying amounts of Science.

A summary of the analysis can be seen below:

	Higher ability		Middle ability		Lower ability	
	Control group	Trial group	Control group	Trial group	Control group	Trial group
Number of pupils	18	19	17	13	15	14
Average progress of pupils relative to their end of year target	+0.9	+0.3	0.0	+0.3	-0.2	+0.5
Range of pupil progress relative to their end of year target	0.3 to 1.5	-0.7 to 1.0	-1.0 to 1.0	-1.3 to 1.3	-1.1 to 0.6	-1.0 to 1.7
Standard deviation of pupil progress relative to their end of year target	0.31	0.43	0.54	0.78	0.62	0.74
Percentage of pupils exceeding their target	100	58	53	54	47	64
Percentage of pupils who met their target	0	26	0	23	0	21
Percentage of pupils below their target	0	16	47	23	53	14

When comparing the average progress relative to the end of year target level that the higher ability pupils made, the pupils made better progress when they were set vertically (+0.9) compared with the group that were set horizontally (+0.3). This is supported by the fact that when set vertically 100% of the pupils in the top set exceeded their end of year target, compared to 58% of pupils in the theoretical top set. 26% of pupils met their target in the higher ability range when set horizontally, and 16% failed to meet their end of year target. The highest progress in excess of their end of year target was also made by a pupil in the control group (+1.5) compared with the trial group (+1.0). This suggests the higher ability pupils make

better progress on average when set vertically and therefore are disadvantaged by being set horizontally.

When analysing the middle ability pupils the situation is less clear cut. The range of progress made is greater in the trial group, as is the standard deviation compared with the control group, showing that there is more variation in progress in the trial group. However the pupils in the trial group in the theoretical middle set did have a higher average progress of +0.3 above their end of year target level compared with the average progress of 0.0 in the control group. This is equivalent to a National Curriculum sub-level (see appendix 1). What is more significant is that in the trial group, only 23% of pupils failed to meet their end of year target, compared with 47% in the control group. This resulted in 53% of pupils exceeding their target in the control group, whereas 77% of pupils met or exceeded their target in the trial group. This suggests that pupils of middle ability are better served by being set horizontally rather than vertically.

The same trend, but to a much greater extent is shown by the progress comparison of the lower ability pupils. The average progress made by pupils in the bottom set in the trial group was +0.5 which far exceeds the average progress made by pupils in the control group; -0.2. This equates to a difference of two National Curriculum sub-levels. The ranges of both groups show that there are wide variations in the progress made by the pupils, but the standard deviation of both groups is similar. In the control group 47% of pupils exceeded their target, whereas 53% of pupils failed to meet their target. In the trial group only 14% of pupils failed to meet their target, but 64% of pupils exceeded their target and another 21% of pupils met their target. The largest progress, relative to their end of year target level, made by any pupil in either of the groups was made by a pupil in the trial group theoretical bottom set

(+0.7). This suggests that pupils of lower ability make much better progress when set horizontally compared to being set vertically.

The lesson observations did not highlight any specific groups of pupils that are adversely affected by horizontal setting. The data comparison suggests that horizontal setting causes the boys to make less progress on average compared to if they are set vertically, but horizontal setting causes the girls to make better progress on average. When making comparisons in terms of ability, the high ability pupils made less progress on average when set horizontally, but the middle ability and especially the lower ability made better progress compared to if they were set vertically.

Aim 3 analysis

The third aim of this project was to investigate whether there are any issues associated with parallel setting compared to vertical setting? To start with I will discuss the evidence for this aim that came from the lesson observations. The lesson observations can be found in appendix 6.

There are a lot of positive comments made in the observations that I will consider later, as these are other less quantifiable benefits of parallel setting other than pupil progress. This section will focus on the issues observed that are a result of parallel setting. In observation 1 it was noted that 'Hands up questioning is dominated by confident and more able pupils initially'. This could be seen as a disadvantage of parallel setting as the less able pupils will not get a chance to answer questions and participate orally if the more able pupils get there first and dominate the teacher's attention. The observer did later comment that the teacher used focused questioning to incorporate other pupils into the discussion. Pupil 25 commented that being in a set of mixed ability 'helps because I learn from them when they answer a

question' (see appendix 7 for the pupil questionnaire responses). Pupil 31 commented that 'it's good to learn in mixed ability because you get to see other people's opinions'. This suggests that the less able pupils benefit from being around more able pupils in a lesson environment.

The same observer also recorded that the 'less able struggle to continue the activity whilst discussion and questioning continues. More able were able to focus on both'. This to some extent highlights the difference in ability between the various pupils. It could be argued that although the lower ability pupils are struggling to concentrate on everything that is going on, they may not be exposed to the higher level of discussion that was taking place had they been in a vertically set lower group. This was witnessed in observation 5; 'The style of the lesson allowed pupils to engage at their level of ability'. Observations 2 and 5 both comment that 'the more able pupils were stretched and allowed to show their interest' (observation 5).

The results of the pupil questionnaire suggest that this year the level of difficulty has been pitched at the appropriate level:

Q3 On average how difficult are your Science lessons?

	Very easy	Easy	About right	Difficult	Very difficult
Number of responses	0	8	27	5	0
Percentage of pupils	0	20	67.5	12.5	0

The pupil questionnaire also suggests that the pace at which the work has been covered this year has also been appropriate:

Q4 On average how quickly do you cover work in your Science lessons?

	Very fast	Fast	About right	Slow	Very slow
Number of responses	0	11	24	5	0
Percentage of pupils	0	27.5	60	12.5	0

Eleven out of forty pupils (28%) in the pupil questionnaire commented that they have to wait for slower pupils to catch up, or to understand a point; some of them described this as frustrating. One example was pupil 36 who said that 'it is alright but sometimes when the lessons need to go on you can't because we all have to wait for the slow people'. Pupil 5 said that 'sometimes it's quite quick which I find quite hard'. There were three pupils who made a comment that the pace of the lessons was too quick for them to understand the work fully.

This suggests that the balance between the level of difficulty and pace is difficult to get right when teaching classes that have a large ability range such as is created by having horizontal setting.

Observation 3 points out that 'parallel setting at its best needs work to be fully differentiated within a class. With pupils being supported at the lower end and challenged at the top end.' There was little evidence of differentiation observed apart from during the starter activity witnessed in observation 5 and in observation 6. Other examples of differentiation that were observed during observation 1 and 5 involved extra work for the more able pupils rather than different work. Pupil 3 commented that 'sometimes we have to wait for the slower pupils in the class but we do other work whilst we wait'. This suggests that there is always extension work for the faster working pupils to move onto.

In some activities, such as the experiment witnessed in observation 3, differentiation was 'not appropriate', or there may be differentiation by outcome. Observation 1 and 4 both comment that the different ability pupils made different levels of progress because the lesson allowed for this. The lesson observations suggest that the

lessons need to be differentiated to a greater extent than they currently are, but point out that sometimes it is not appropriate to do so.

There were no major issues that arose during the course of the year as a result of the change to horizontal setting. No parents complained and the teachers and pupils were fully onboard. Issues that were highlighted in the observations and questionnaires were specific to certain groups of pupils, and were not issues for all of the pupils. The questioning and class discussion may at times be dominated by the more able pupils, but some pupils commented that they can learn from this. The level of difficulty and the pace of the lessons are difficult to pitch at the correct levels. No pupils said they found the lessons too easy or too difficult, nor the pace of the lesson too fast or too slow. Some pupils commented that they got left behind at times due to the pace, whilst other pupils got frustrated at having to wait for the slower pupils to understand or catch up. It was also commented that there is a need for differentiation, which may help alleviate the level of difficulty/pace issue.

Positives of horizontal setting

The impact of changing to horizontal setting in terms of pupil progress has been discussed in relation to aim 1. Other positives that came about through horizontal setting are listed below:

- All pupils gain a good understanding of the work, despite getting to different places (observation 1 and 4).
- Pupils work together well and help each other; often the more able helping the less able (observation 2, 3, 4 and 6).

Q7 How often do you help other pupils in your Science lessons?

	Never	Once a term	Once a month	Once a week	Every lesson
Number of responses	5	3	6	17	9
Percentage of pupils	12.5	7.5	15	42.5	22.5

Q8 How often have you been helped by another pupil in your Science lessons?

	Never	Once a term	Once a month	Once a week	Every lesson
Number of responses	4	7	4	19	6
Percentage of pupils	10	17.5	10	47.5	15

Pupil 7 commented that one of the advantages of being in a set of mixed ability is that 'you learn from the more able students and it helps you to learn because you help the less able students'. This is supported by pupil 19; 'some people are better at Science than me so I find it easier as some people can help me if I need help'.

- Horizontal setting allows pupils to find their own level and have access to all of the material (observation 3 and 5).
- The pupils appear to enjoy their Science lessons (observation 4 and 5).

One unexpected finding from the pupil questionnaire was that eleven out of the forty pupils (28%) said they enjoy Science and being in mixed ability sets because they are with different people and different friends to the people they are with for their vertically set lessons. One example was 'it has made it more fun because it means you can have people you don't usually work with, that makes it nice to learn more about people' (pupil 21).

The pupil questionnaire sought to get the pupils opinion on how they would have liked to have been set for Year 7 Science, and how they would like to be set for Year 8 Science if they were given the choice.

Q9 If you were given the choice at the start of Year 7, how would you like to have been set in Science?

	In mixed ability sets (like Science this year)	In sets with pupils of similar ability (like Maths this year)
Number of responses	20	20
Percentage of pupils	50	50

The reasons the pupil gave for wanting to be in mixed ability groups (horizontally set) included; 'it gives everyone the chance to compare themselves to others and say 'I need to work on that so I can become as good as it as that person'' (pupil 29). Pupil 16 said that 'I think it may improve social abilities and help other people to get a better understanding of science'. Pupil 29 introduces the notion that pupils are competitive as to who is the best, and they like being set horizontally so they can get an idea as to how good they are within the year group. Pupil 16 makes a very astute point, that mixing with pupils of differing abilities is good on a social level and again raises the point the pupils help each other.

One reason for wanting to be set vertically in Year 7 revolved around the fact they struggled with the pace, saying that 'then I can work at my own pace and get though the questions with someone else and they won't leave me behind' (pupil 34).

Q11 If you were given the choice, how would you like to be set for Year 8 Science?

	In mixed ability sets (like Science this year)	In sets with pupils of similar ability (like Maths this year)
Number of responses	12	28
Percentage of pupils	30	70

Pupil 33 justified their desire for horizontal setting; 'I would like this because I am with a mixture of people who both could find some of the topics that we cover hard and others easy'. This pupil recognises the fact that throughout the year different pupils have different strengths and weaknesses, and being in a mixed ability class is beneficial because the pupils can help each other, as pupil 17 said 'I think it should be in mixed abilities because some people enjoy being helpful to others'.

Although there was a 50:50 split of opinions as to how the pupils would like to be set in Year 7, this changes to 70:30 in favour of being set vertically for Year 8. Some of the reasons for this included: 'I don't want to be with someone smarter or not smarter than me because I don't want to feel like a boff or feel left out by people smarter than me' (pupil 6). Pupil 38 made the point that

'I think they should put us in sets of the same ability next year then the people in the top set can crack-on, and the people in the bottom set can get the help and attention they need from the teacher, that way they can get better at the subject because of the help from the teacher.'

These comments suggest that the pupils think that although horizontal setting worked in year 7 as it allowed them to settle in and make friends, as the subject content gets harder, they think they are going to need to be taught with people of similar ability to prevent them from being left behind, or constraining the amount of progress they are capable of making.

The next chapter will evaluate the impact of the project on my practice and point out any limitations of the findings.

Evaluating the impact on practice

In this chapter I will evaluate the outcomes of the project and how they were achieved in terms of the effectiveness of the methodologies used. I will also evaluate the impact of the project on my own practice and on the pupils. Finally I will look at the limitations of my findings and suggest what I would have done differently if I were to repeat the research.

Evaluation of the outcome

The ultimate outcome of this project was to investigate the effect of the change to horizontal setting in Year 7 Science and to make an informed decision as to how Year 7 should be set for the following year. I went about this by setting out to answer the following aims:

1. Which method of setting allows the pupils to make more progress?
2. Are there any groups of pupils who are adversely affected by the change to parallel setting?
3. Are there any issues associated with parallel setting compared to vertical setting?

Through analysis of the progress comparison I have concluded that for the majority of the pupils horizontal setting allows the pupils to make more progress. On average the pupils made more progress relative to their end of year target when they were horizontally set compared to when they were set vertically. There were exceptions; the boys did not do as well compared to when they were set vertically, and the most able pupils also did less well. Overall I feel this is outweighed by the positive impact the change had on the middle ability pupils and especially the lower ability pupils in allowing them to meet and exceed their end of year target.

The issues that were raised were that the more able pupils could have a tendency to dominate aspects of the lesson, it is difficult to set the level of difficulty and pace to a level that satisfies every pupil's needs and differentiation needs to be used to a greater degree than it is currently. The positives that were raised included the fact that the pupils enjoy their Science lessons, they enjoy, and feel they benefit from helping one another and they like being in classes with different people than they are with when they are set vertically. They also enjoy learning off of each other's discussion points and answers to questions.

I feel that I have successfully provided answers to all three of my aims. I have decided to keep horizontal setting for Year 7 Science next year as I am confident that the benefits it brings outweigh the potential issues that it raises. The change to horizontal setting was in response to the following issues we had when we set vertically:

1. Pupils coming from different Primary schools had covered different amounts of Science to varying degrees.

Setting pupils horizontally gives every pupil a year to settle in and develop their scientific knowledge and understanding to the level that is expected, regardless of how much science they have done in the past, therefore no one is disadvantaged.

2. There was unreliability, or complete absence, of Year 6 data that was used to assign pupils to sets.

There is still unreliability/absence of Year 6 data, but now it is of less importance as now it is only used to ensure the three sets are balanced in terms of gender and ability.

3. Some pupils and parents see being in the top set as a necessity in order to do well, resulting in varying levels of correspondence with parents.

No parents took issue with the fact that the pupils were set horizontally rather than vertically. Pupils that will be in the top set for Year 8 will be there on merit as we have a year's worth of data for them, and we know the pupils having taught them for a year so we can justify to parents why a pupil has been placed in a particular set for Year 8.

4. Pupils who are in the bottom set are switched off from Science by the time they reach Year 8.

Many of the pupils commented on how much they enjoyed Science this year, and it was also commented on in the observations. Also several of the pupils commented in the questionnaire that the pace was too quick for them in the mixed ability set, or that the people they worked with left them behind. They will hopefully welcome being in a set that is suitable for their ability and can address their needs more closely.

Changing to horizontal setting has addressed these issues that were created by vertical setting. The issues that horizontal setting has raised are:

- Confident/more able pupils sometimes dominate questioning and discussions. This can be countered by asking focussed question to specific individuals.
- The balancing of the level of difficulty and the pace of the lesson is difficult if not impossible to achieve. Differentiation of activities can help here, and also managing how long pupils spend on an activity so that they do not drop too far behind the rest of the group can help. Careful planning of seating plans and

partners could prevent mix matched pairs preventing one partner racing off leaving the other floundering.

- The need for an increase in differentiation can be worked upon and incorporated through lesson planning and introducing more independent learning. Both of these could be areas for professional development training for Year 7 Science teachers to go on.

These issues can be managed and dealt with, and are things that can be focussed on next year, using the year's worth of experience teaching horizontal sets gained this year.

Limitations of findings

The findings of this research are specific to the research school and the two cohorts of Year 7 pupils that were involved in the research. When making the comparison of pupil progress of the control group with the trial group I am comparing two different sets of pupils which affects the reliability of the results. I did measure pupil progress by comparing the pupils end of year achieved National Curriculum level which was obtained using the same method for both years with the pupils' end of year target level which was generated by MidYIS data. This should limit the impact of the two years being made up of different pupils as their progress was their individual relative progress.

The pupils' end of year achieved level was generated from a single end of year exam, which places a lot of emphasis on this exam. If a pupil underperformed in this exam it would influence their end of year target, swaying the results affecting the accuracy of the analysis of the pupil's progress.

The sample size was small, with 50 and 46 pupils involved in each year, although including all of the Year 7 pupils in the research school improves the reliability of the findings. Two out of the three teachers that taught the Year 7's in the control group were different to those that taught the trial group, so there is inconsistency there, and I have made no allowance for the effect of different teachers and their impact on the pupils progress.

Evaluation of methodologies

I feel the three research methods I employed did collect the evidence I wanted in order to answer the three aims of the project. The comparison of the pupils' progress does give an accurate measure of the pupils' progress relative to their end of year target level. This provided data that could be used to assess in which year the pupils made better progress relative to their target level. An alternative to this method would be to analyse the six end of topic assessments that are completed throughout the year to see the incremental progress the pupils make and track this. This would be much harder to analyse and will be affected by the pupils' ability in the individual topics. This variation is balanced out in the end of year exam, and comparing this level with the expected target level provided a measure of pupil progress that I could use in my analysis.

The lesson observations provided lots of talking points amongst the three Year 7 Science teachers and provided qualitative data for aims two and three. What was observed was mostly positive, and no major issues as a result of horizontal setting were observed which is good in terms of the project. The pupil questionnaire was quite broad in terms of the questions it asked, but the responses from the pupils were quite similar in terms of the themes that they conveyed. The responses of the pupil questionnaire did provide evidence for aim three in terms of issues arising from

adopting parallel setting, but also the pupils' thoughts, experiences and feeling which were very insightful and very useful. The pupil questionnaire was an excellent research tool for collecting the pupils' perspective on the change to horizontal setting.

Impact on own practice

The main impact this project has had on me is that it has made me have a greater consideration for the consequences of my actions and decisions. I now think about the impact on the pupils and my practice, in much greater detail, any decisions that I make. On a professional level it was very encouraging and it gave me confidence that once I had made the decision to adopt horizontal setting, I was able to explain my justification to the other Year 7 teachers and they supported me and embraced the idea, which has helped this project to be such a success. I have got great satisfaction in seeing the Year 7 pupils enjoy their Science lessons so much and seeing them make excellent progress. I enjoyed observing the other Year 7 Science lessons as I felt I learnt some useful tips and techniques and I found the sharing of good practice extremely valuable.

What I could have done differently

I feel the project went extremely well. The research methods were successful in collecting evidence to answer the three aims and I stuck to the timescale that I set out at the beginning of the project. On part of the project I should have done differently, is that I should have observed the trial Year 7 group in lessons in which they are set vertically. This would have allowed me to make comparisons with what I observed when I observed the trial group in horizontally set Science lessons. This is because although the lesson observations were very insightful, I had no reference point to compare them against. Observing the same pupils set in a different manner

would have given me a better insight into the effect of horizontal setting has on the pupils.

Further research

The main way that this project could be continued is by doing the same analysis on next year's Year 7 Science cohort to see if the same findings occur, adding weight to the argument that horizontal setting on average allows the pupils to make more progress. If the results are repeatable than it adds validity to the conclusions of this project. This is something that I intend to do, to ensure this year's trial group were not just an exception.

This project intentionally just focussed on Year 7 Science in the research school. Further research could include checking back with the trial group in a year's time to get their experience and their thoughts now that they have being set vertically for a year. It would be interesting to see if their opinion as to which method of setting they prefer has changed or not. It would also be interesting to investigate the experiences of the control group when they were in Year 7 (set vertically) to see how it compares with the trial groups (set horizontally) year. The project could get a lot larger by looking at how other subjects in the research school set their Year 7 classes, and to see how it compares with the findings of this project. Another way of expanding the project would be to see how other schools in the Trust set their Year 7 Science classes and how their experiences compare to that of the research school.

Lasting impact

The most obvious legacy of this project is that next year's Year 7 Science will be set horizontally as through doing this research I have the evidence to show that it was a success. As I have said above, I really enjoyed observing the other Year 7 Science lessons and sharing good practice, so as part of my Year 7 Science Co-ordinator

role, this is something I wish to make a regular occurrence. I also was amazed by the wealth of information I gained from doing the pupil questionnaires; this is a tool I definitely intend to use again in the future.

Dissemination

Members of the Science department were aware that this project was taking place during the course of last year, and several of them have enquired as to how it was going, and have asked to be informed of the findings. The three teachers involved in the observation triangle fed back to the relevant teachers what they had observed and we had informal discussion amongst the three of us in order to share good practice. The pupil responses to the pupil questionnaire were shared with the Year 7 Science teachers and the Head of Science, and again we had informal discussions about the initial findings. By communicating what I was doing and sharing initial findings as they occurred, it allowed points to be discussed with colleagues and ideas to be developed. The project would not have been as successful without the flow of ideas between the three teachers of Year 7 Science. The major analysis and the writing up of this project took place during the summer holiday, but I intend to share the research with the other two Year 7 Science teachers and the rest of the Science department initially, then I will wish to present the research and the findings to the rest of the teaching staff at the research school.

Accessing peer support, coaching and mentoring

The table below shows the sources of peer support, mentoring and coaching that has taken place during the project:

Name of person	Role	Impact on project
Dr Albin Wallace	Head of Teacher Leader program at UCST Group Director of ICT and e-Learning	Led the two Teacher Leader courses and the Research Conference. Helped with choosing a focus for the project and developing my initial ideas. Proof read my drafts and offered guidance throughout the whole project.
Reg Tooth	Sheffield Hallam University Tutor	Helped introduce the course and its requirements and also helped narrow the focus of the project.
James Kirwan	Course Administrator Sheffield Hallam University	Help with enrolment and log-in problems.
Phil Badham	E-Learning Training and Development Manager	Help with It's Learning.
Ralph Cowan	Head of Science at the research school	Help with the initial idea for the project. Also helped with the setting of Year 7 Science and generally supporting me in the Science department.
Carolyn Ludlow and Sara Towill	Year 7 Science teachers at the research school	Teaching Year 7 Science and supporting the change to horizontal setting. Taking part in the research, especially the observation triangle. Feeding back and sharing ideas relating to the research project.
Lucinda Allen	Director of Studies at the research school	Recommending me for the Teacher Leader program.

Bibliography

Argys, L., Rees, D. I. and Brewer, D. J. (1996) Detracking America's schools: equity at zero cost? *Journal of Policy Analysis and Management*, 15 (4), pp623–645

Baker Lunn, J. C. (1970) *Streaming in primary school*. Slough: NFER

Barber, M. (2000) *The Very Big Picture*. School Improvement Unit, Department for Education and Enjoyment, London. *Improving Schools*, 3 (2), pp5-17

Boaler, J. (1997b) When even the winners are losers: evaluating the experiences of 'top set' students. *Journal of Curriculum Studies*, 29 (2), pp165–82

Boaler, J., Dylan, W. and Brown, M. (1998) Students' experiences of ability grouping-disaffection, polarization and the construction of failure. *Journal of Research in Special Educational Needs*, 6, pp69–75

Brown, A. and Dowling, P. (1998) *Doing research/Reacting Research* London; the Falmer Press (Chapter 5: Gathering Information and asking questions: Interviews, Questionnaires and accounts)

Bryman, A. and Cramer, D. (1997) *Quantitative Data Analysis with SPSS for Windows – A Guide for School Social Scientists* London: Routledge

Burton, D. and Bartlett, S. (2005) *Key Issues for Education Researchers* California: Sage

Cohen, L., Manion, L. and Morrison, H. (2007) (6th ed) *Research Methods in Education* London: Routledge

Denscombe, M. (2007) (2nd ed) *The Good Research Guide* Buckingham: Open University Press

DfEE (1997) *Excellence in Schools*. London: DfEE.

DfEE (2001) *Schools: Building on Success*. London: DfEE.

Gamoran, A. and Mare, R. D. (1989) Secondary school tracking and educational inequality: compensation, reinforcement or neutrality? *American Journal of Sociology*, 54 (1), pp89–105

Hitchcock, G. and Hughs. D. (1995) (2nd ed) *Research and the Teacher* New York: Routledge

Hoffer, T. B. (1992) Middle school ability grouping and student achievement in science and mathematics. *Educational Evaluation and Policy Analysis*, 14 (3), pp205–227

- Ireson, J. and Hallam, S. (2001) *Ability Grouping in Education*. London: Paul Chapman Publishing
- Ireson, J., Hallam, S. and Hurley, C. (2005) What are the effects of ability grouping on GCSE attainment? *British Educational Research Journal*, 31 (4), pp443-458
- McNiff, J., Lomax, P. and Whitehead, J. (2003) *You and Your Action Research Project*. London: Routledge Falmer
- Mertens, D.M., (1998) *Research Methods in Education and Psychology*. California: Sage
- OFSTED (1999) *Primary Education 1994-98: A review of primary schools in England*. London: The Stationery Office
- OFSTED (2001) *Annual report of Her Majesty's Chief Inspector of Schools, Standards and Quality in Education*. London: The Stationery Office
- Reason, P. and Bradbury, H., (2001) *The SAGE Handbook of Action Research. Participative Inquiry and Practice*. London: Sage
- Reid, M., Clunies-Ross, L., Goacher, B. and Vile, C. (1981) *Mixed Ability Teaching: Problems and Possibilities*. Windsor: National Foundation for Educational Research (NFER)
- Robson, C. (2002) (2nd ed) *Real World Research*. Oxford: Blackwell
- Rudduck, J. and Flutter, J. (2003) *Consulting Young People in Schools*. Cambridge: Economic and Social Research Council (ESRC).
- Scottish Office Education and Industry Department (1996) *Achievement for All*. Edinburgh: Her Majesty's Stationery Office (HMSO).
- Slavin, R. E. (1990) Achievement effects of ability grouping in secondary schools: a best evidence synthesis. *Review of Educational Research*, 60, pp471–490
- Smith, C. M. M. and Sutherland, M. J. (2006) Setting or mixed ability?: pupils' views of the organisational arrangement in their school. *Journal of Research in Special Educational Needs*, 6 (2), pp69–75
- Stoll, L., MacBeath, J. and Mortimore, P. (2001) *Beyond 2000: Where Next for Effectiveness and Improvement?* In: *Improving School Effectiveness*. Open University Press: Maidenhead, pp191-207
- Suknandan, L. and Lee, B. (1999) *Streaming, Setting and Grouping by Ability*. Slough: National Foundation for Educational Research (NFER).
- Wellington, J. (2000) *Educational Research: Contemporary Issues and Practical Approaches*. London: Continuum

Wylle, T. (1999) School and beyond, in B. O'Hagan *Modern Education Myths*.
London: Kogan Page

Willig, C. J (1963) Social implications of streaming in junior schools. *Education Research*, 5, pp151-154

Appendices

- 1 National Curriculum → MidYIS conversion table
- 2 Lesson observation pro-forma
- 3 Pupil questionnaire questions
- 4 Pupils raw data for pupil progress comparison
- 5 Year 6 pupil data for the trial group
- 6 Lesson observations from the observation triangle
- 7 Pupil questionnaire responses