Thinking Maps® and School Effectiveness
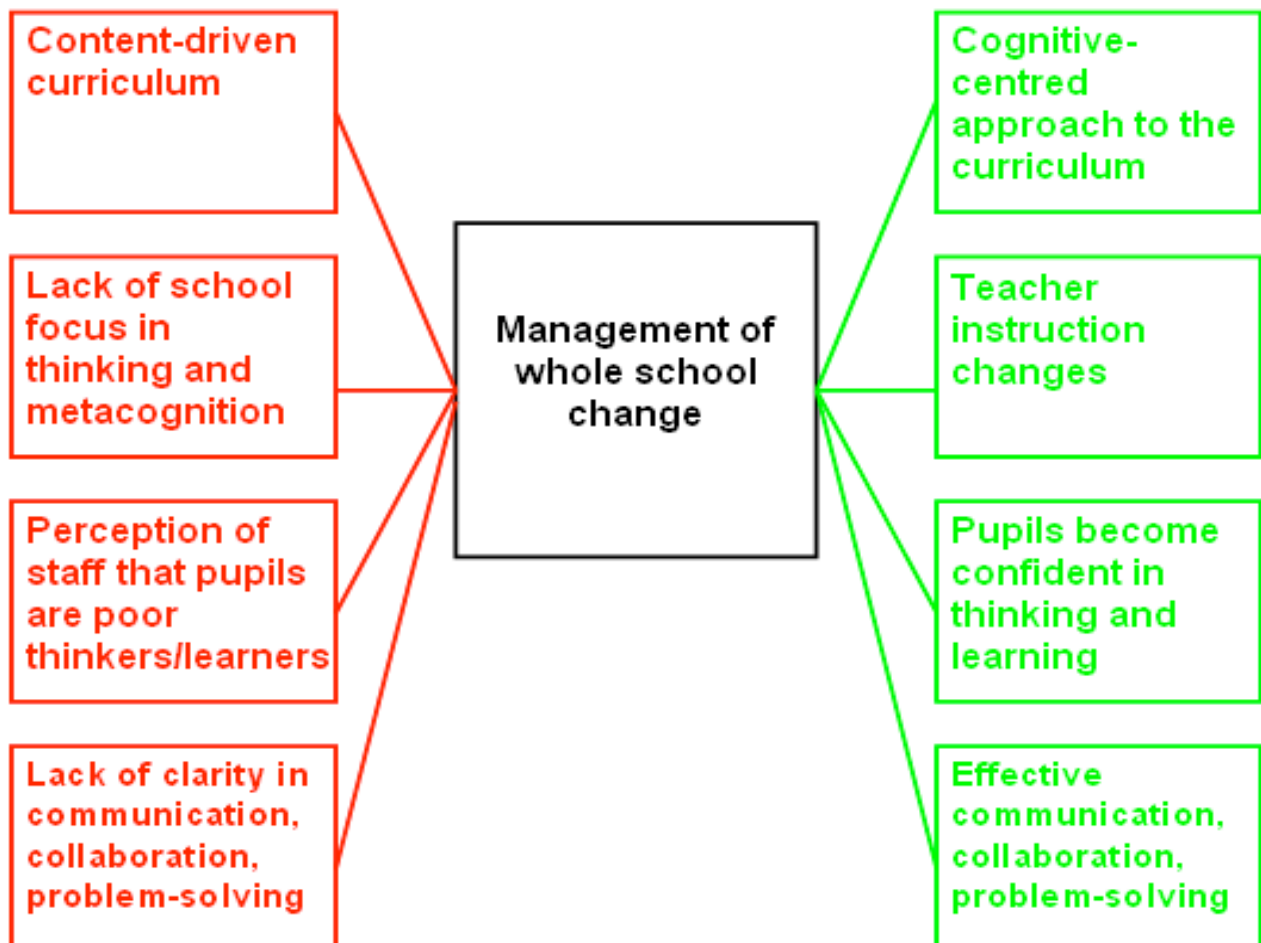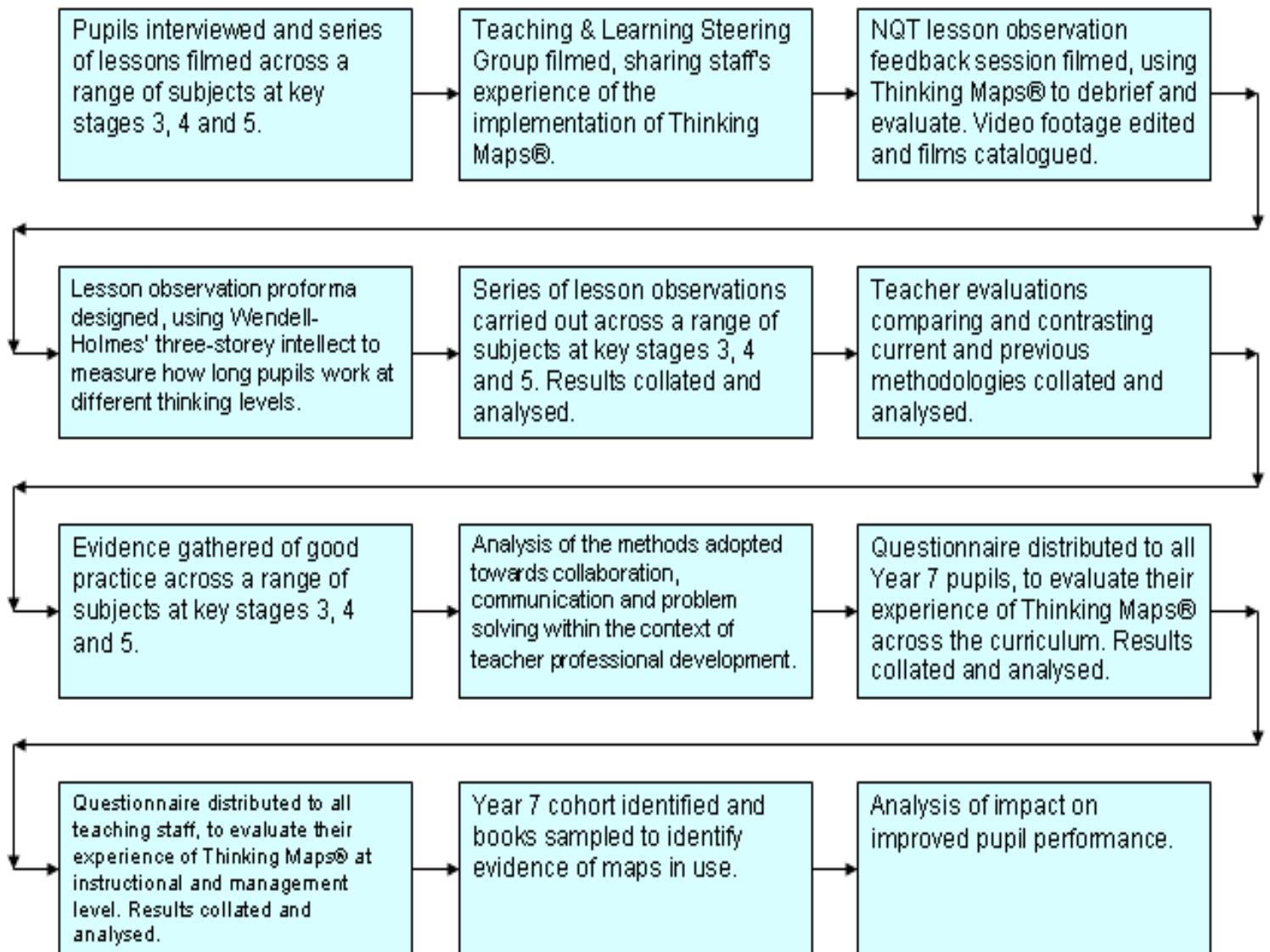
A Study of a UK Comprehensive School

Report

1.   Summary, methods of research, anticipated results

Thinking Maps® were introduced in September 2007 to all staff as a key strategy which will underpin the development of thinking at St Robert of Newminster Catholic School and Sixth Form College. The purpose of this strategy was to decrease the quantity of teacher instruction and transmission of knowledge in a content driven curriculum whilst increasing the amount of time dedicated to developing learning dispositions and thinking skills through student deployment of Thinking Maps® in their learning.

1.1. Methods of research

Pupils interviewed and series of lessons filmed across a range of subjects at key stages 3, 4 and 5.	Teaching & Learning Steering Group filmed, sharing staff's experience of the implementation of Thinking Maps®.	NQT lesson observation feedback session filmed, using Thinking Maps® to debrief and evaluate. Video footage edited and films catalogued.
Lesson observation proforma designed, using Wendell-Holmes' three-storey intellect to measure how long pupils work at different thinking levels.	Series of lesson observations carried out across a range of subjects at key stages 3, 4 and 5. Results collated and analysed.	Teacher evaluations comparing and contrasting current and previous methodologies collated and analysed.
Evidence gathered of good practice across a range of subjects at key stages 3, 4 and 5.	Analysis of the methods adopted towards collaboration, communication and problem solving within the context of teacher professional development.	Questionnaire distributed to all Year 7 pupils, to evaluate their experience of Thinking Maps® across the curriculum. Results collated and analysed.
Questionnaire distributed to all teaching staff, to evaluate their experience of Thinking Maps® at instructional and management level. Results collated and analysed.	Year 7 cohort identified and books sampled to identify evidence of maps in use.	Analysis of impact on improved pupil performance.

1.2.   Anticipated results

We anticipate that our research will show that teacher collaboration and conversation will be more focussed and that these new dispositions and skills will lead to the development of common understandings, beliefs and practices about teaching for learning. As a consequence enhancement of teacher instructional effectiveness will significantly influence the learning that occurs for all members of the school community.

2.   Intentions

It is the intent of this report to examine the role of Thinking Maps® in the transformation of teacher and pupil effectiveness. The report will detail the following specific areas of interest, before and after the implementation of Thinking Maps®:

∞   teacher instructional levels

∞   the amount of time pupils spend on higher order thinking

∞   teacher methodologies

∞   consistency and frequency of use

∞   examples of good practice

∞   analysis of pupils' perceptions of themselves as learners

∞   analysis of the methods adopted towards collaboration, communication and problem solving within the context of teacher professional development

∞   to determine whether there is a link between the use of Thinking Maps® and improved pupil performance

3.   Specific areas of interest

Until recently there has been no formal analysis of the time pupils spend on higher order thinking. We speculate that the implementation of Thinking Maps® has facilitated the change in teacher instructional levels, resulting in less time spent gathering and more time processing and applying.

In order to test this, we designed a lesson observation proforma utilising Oliver Wendell Holmes' three-storey intellect, which focused on recording the amount of time pupils spent at each thinking level. Staff from a range of departments volunteered to participate in the lesson observation cycle.

Following the lesson observation, staff were asked to compare and contrast previous and current methodologies, highlighting where thinking and learning was supported by the use of Thinking Maps®.

In a large school with 120 teaching staff analysing the frequency and consistency of the use of Thinking Maps® could prove to be challenging. It was therefore decided to sample Y7 books, assessing where Thinking Maps® were being used.

To compliment the book sampling we have gathered examples of Thinking Maps® in use from a range of departments across the school. This will enable us to evaluate further the frequency, consistency and quality of maps in use. In addition to this, a questionnaire was completed by every pupil in Y7 in order for us to assess the impact the maps are having on our students' learning.

Teachers and school leaders in 2006-7 concluded that there is a lack of school focus on thinking and metacognition at all levels within the School. There is also agreement that some learners perceive themselves as novice thinkers and do not progress in their thinking and learning strategies. Thus they remain poor thinkers and dependent learners and, as a consequence, progress for these students is less than their potential indicates. In an attempt to quantify this, we have used MALS (Myself As A Learner Scale) data with all Y7 pupils. At the end of the research phase, this self-assessment will be revisited, highlighting whether the introduction of Thinking Maps® has altered their perception of themselves as learners.

We hope to prove that as a consequence of a deliberate immersion strategy of adopting a cognitive approach to Teacher Professional Development - i.e. the use of Thinking Maps® in training, teacher observation and feedback, mentoring and coaching - teacher confidence and effectiveness will increase. Staff questionnaires were designed to evaluate the impact of Thinking Maps® at instructional and management levels. We will also test whether as a direct consequence of introducing Thinking Maps® as a whole school strategy, teachers change their instructional methodology leading to a rise in pupil achievement.

3.1 Teacher instructional and higher order thinking levels

16 lessons were observed, across a range of subjects at key stages 3, 4 and 5. Utilising the lesson observation proforma (see Appendix 1), we were able to assess the percentage of time our pupils spend gathering, processing and applying information as a result of teacher instruction. Results are recorded below:

Percentage of time pupils spend at each thinking level
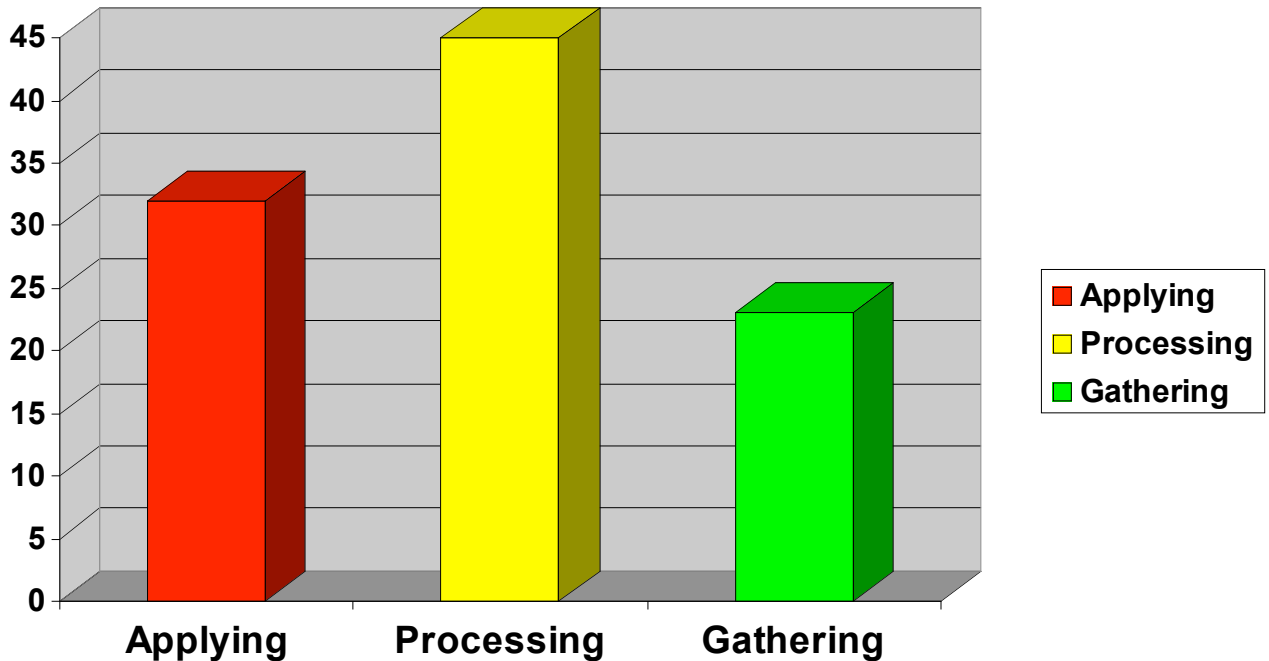
From the data gathered, we have proved that pupils spend less time gathering and more time processing and applying information. As the graph demonstrated, pupils spent 77% of time engaging in higher order thinking skills. It could be surmised that the implementation of Thinking Maps® has facilitated this. In order to substantiate this claim, we also analysed staff responses to a questionnaire, which compared time spent at each thinking level before the implementation of Thinking Maps®.

3.2 Teacher methodologies

Following every lesson observation, staff were asked to compare and contrast their previous and current teaching methodologies since the implementation of Thinking Maps®. As demonstrated by the double-bubble map below, the analysis of these evaluations highlighted some generic similarities and differences.
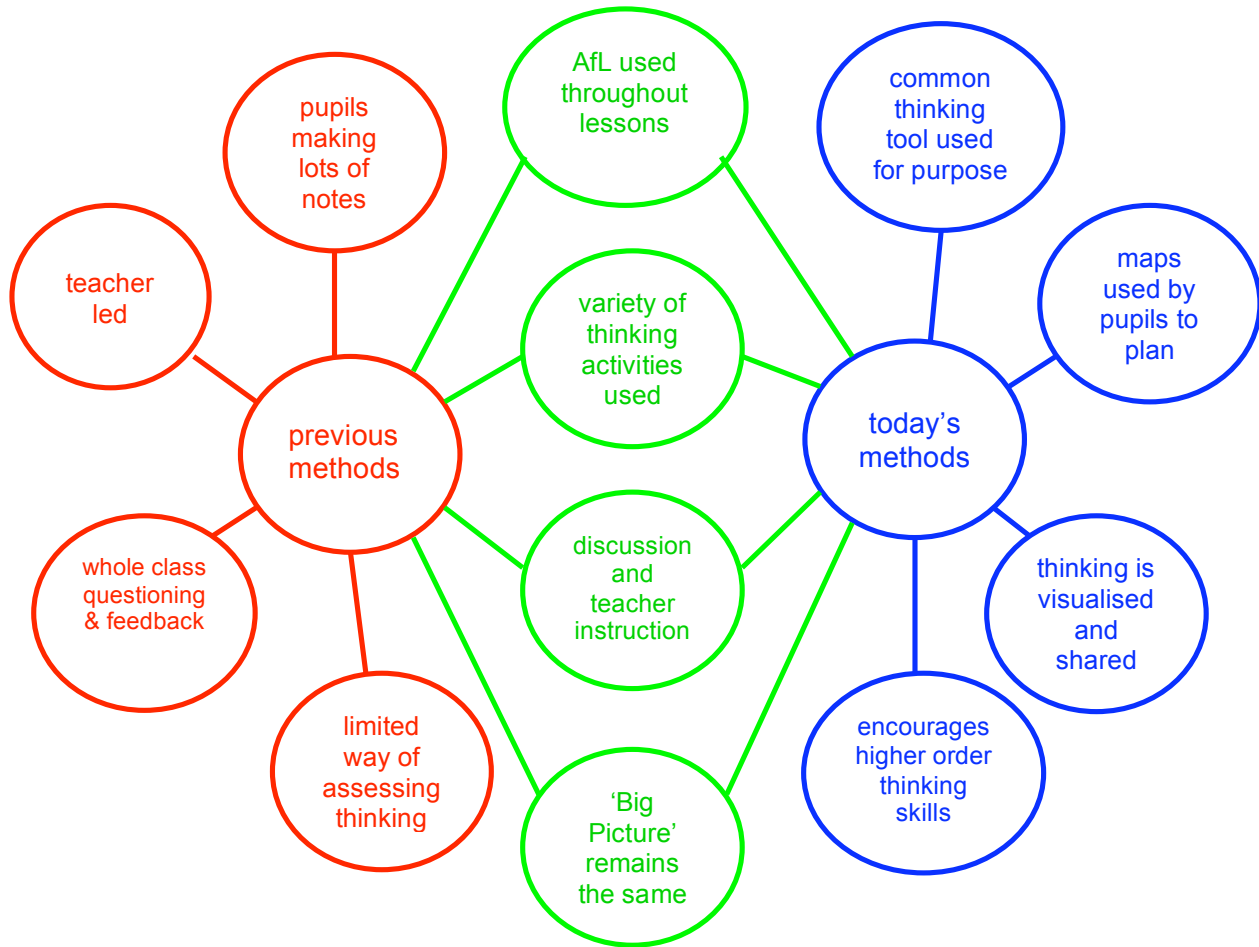
Previous methods suggested an emphasis upon teacher-led activities, with much time devoted to note-taking in linear prose. Reassuringly, discussion, assessment for learning and a variety of thinking activities remained integral to the lesson. Since the implementation of Thinking Maps® teachers have planned opportunities for pupils to visualise and share their thinking at the higher levels and they are beginning to develop a common thinking language.
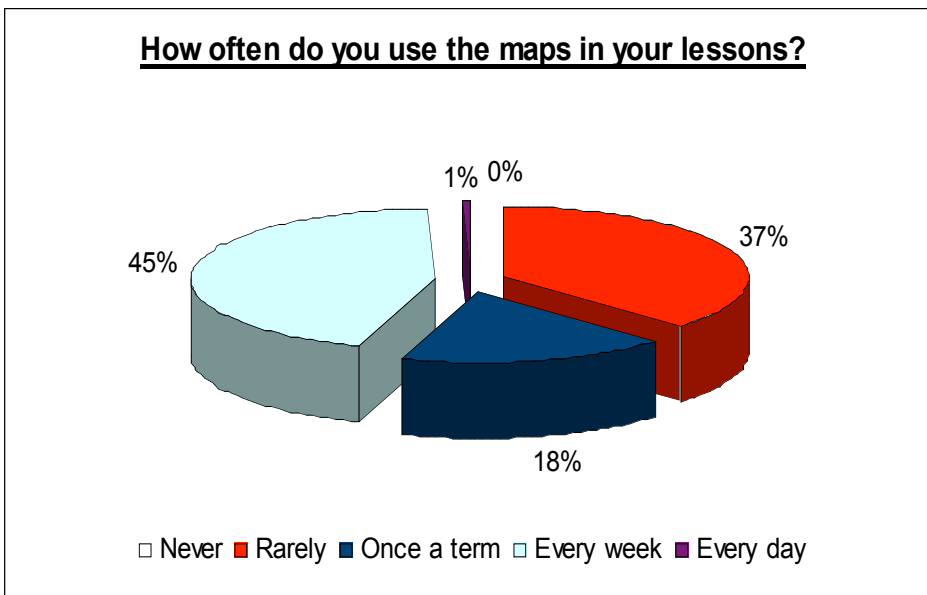
3.3 Consistency and frequency of use

Y7 has been targeted for book sampling, in order to assess the frequency and consistency of the use of Thinking Maps®. Initial findings showed sporadic use across all departments in the School; for example English, Science, History, RE, ICT and MFL demonstrated frequent use, whereas other subjects within the Y7 curriculum showed little if any use. This may have been due to the nature of the initial book sampling and in order to assess more accurately, we made the process more robust in our subsequent research.
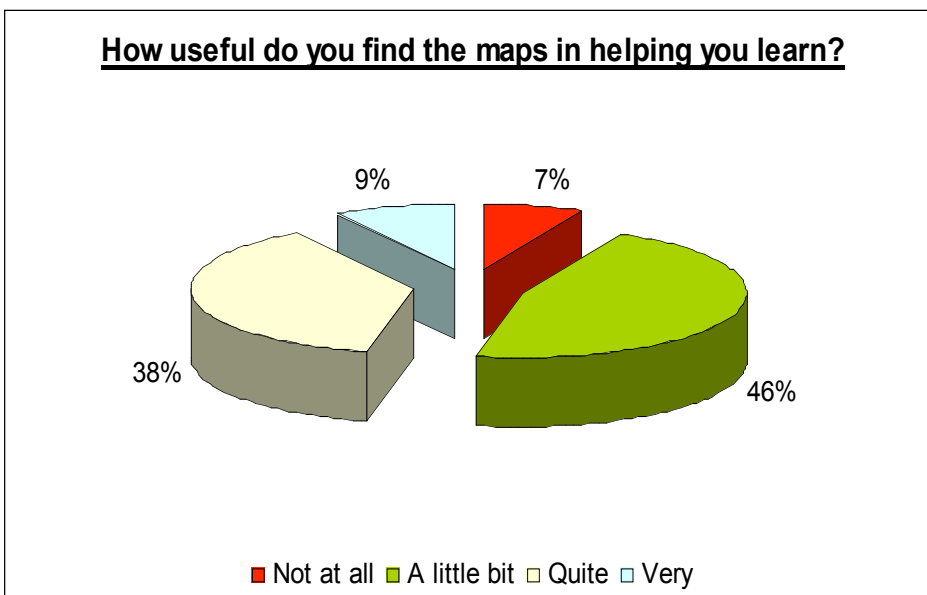
Consequently, a random sample of 20 students from the cohort was then taken, covering every Y7 teaching group. Every subject in the Y7 curriculum was sampled: French, Geography, Science, Religious Education, English, Maths, History and Art. Results indicated that the subjects where the maps were being used more frequently were French, Science, English and History. The circle and bubble maps were most frequently used maps, whilst the multi-flow and bridge map were least used. Following consultation with staff, it was highlighted that maps are only being used when there is a genuine opportunity in the lesson, where they support and scaffold the learning (see Appendix 2 – DVD: Teaching & Learning Steering Group). Furthermore, staff added that certain Thinking Maps® appear to be subject-specific and fit for purpose. The brace map, for example, seemed to be of more use to pupils in Science and PE, where there are tangible 'wholes' which need to be broken down.

We know that the circle map has proved successful in assessing what students know and how they know it. Yet a further outcome has been that the use of the frame of reference has enabled students to identify gaps in their knowledge. This was particularly useful in a Y13 tutorial lesson, when students were recalling their existing knowledge about asylum seekers. The debriefing of the circle map activity revealed that much of the students' knowledge was inaccurate, because their primary source was the media (see Appendix 3). A fruitful discussion regarding bias and spin followed and the students then explored other sources of information, resulting in a more accurate and rounded knowledge base.
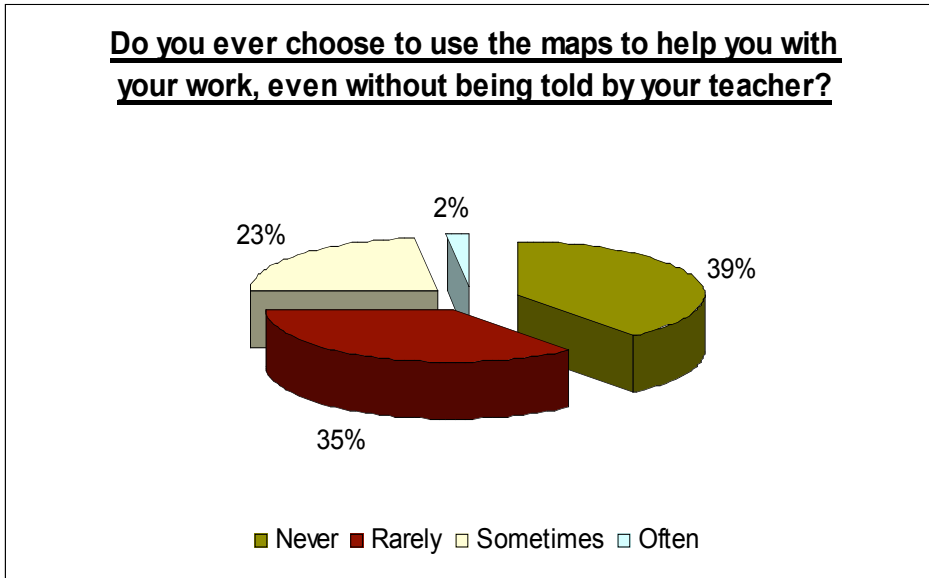
Every student in Y7 completed the questionnaire, which was designed to assess the impact the maps are having on our students' learning and results were collated (see Appendix 4 & 5).

How often do you use the maps in your lessons?

1% 0%
45%
37%
18%

□ Never ■ Rarely ■ Once a term □ Every week ■ Every day

As illustrated, 64% of the cohort use the maps to a degree with 46% using them every week.

How useful do you find the maps in helping you learn?

9% 7%
38%
46%

■ Not at all ■ A little bit □ Quite □ Very

An encouraging statistic is that 93% of students find the maps useful to a degree in helping them learn.

Do you ever choose to use the maps to help you with your work, even without being told by your teacher?

2%

23%

39%

35%
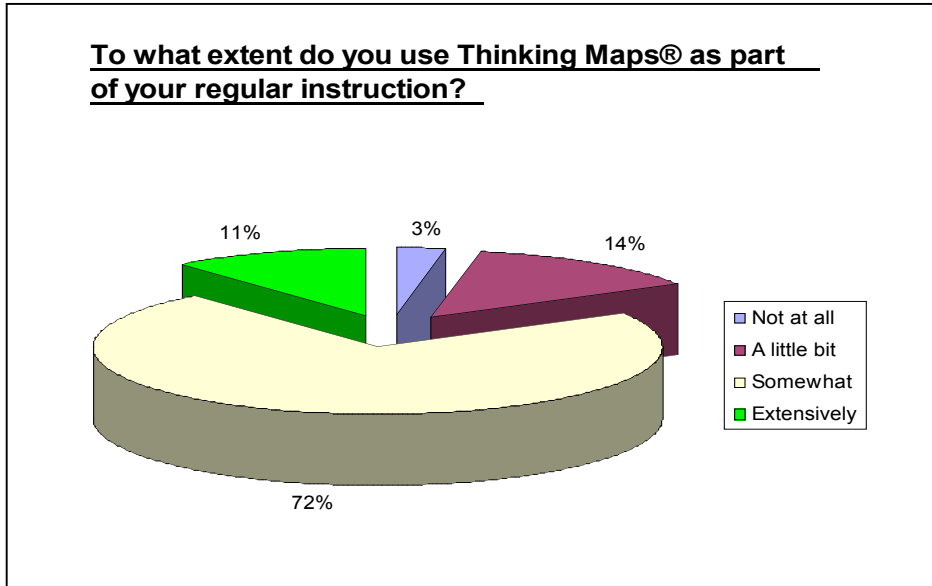
■ Never ■ Rarely □ Sometimes □ Often

25% of students use the maps spontaneously. This was exemplified during the SLT review of Thinking Maps®, when the Assistant Head Teacher described the planning process of the Fair Trade project, led by Y8 students. Without being prompted, the students opted to use Thinking Maps® to plan and structure the project.
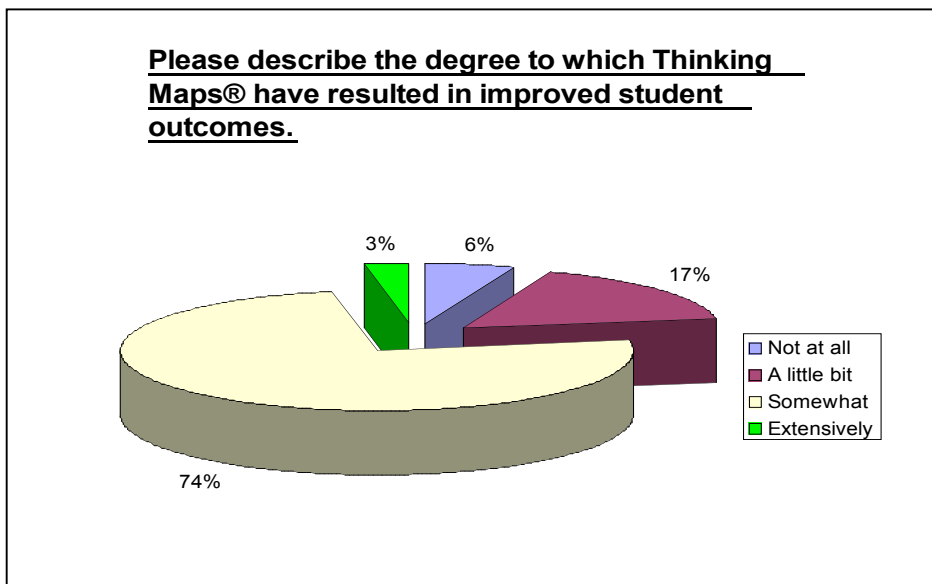
3.4 Examples of good practice

In order to share good practice amongst staff and provide evidence of the consistent and frequent use of Thinking Maps®, we have gathered examples of the maps in use (see Appendix 6). These are available to staff via the School intranet and further examples of good practice are discussed regularly at the Teaching & Learning Steering Group.

3.5   Teacher perceptions of Thinking Maps®

Six months after implementation, staff completed a questionnaire designed to evaluate the impact of Thinking Maps® at instructional and management levels and results were collated (see Appendix 7 and 8).

To what extent do you use Thinking Maps® as part of your regular instruction?

11%   3%   14%

72%

- Not at all
- A little bit
- Somewhat
- Extensively

As illustrated, the maps are proving to be effective at instructional level across the whole school, with 97% of staff stating that they use the maps to a degree in lessons.

Please describe the degree to which Thinking Maps® have resulted in improved student outcomes.

3%   6%   17%

74%

- Not at all
- A little bit
- Somewhat
- Extensively

An encouraging statistic is that 74% of staff believe that the maps have resulted somewhat in improved student outcomes with a further 3% stating that outcomes have extensively improved.

To what extent have Thinking Maps® helped develop a common thinking language in your classroom?

17%

8%

19%

- ☐ Not at all
- ☐ A little bit
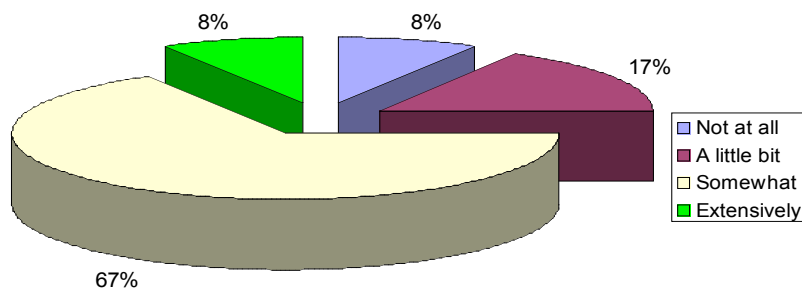- ☐ Somewhat
- ☐ Extensively

56%
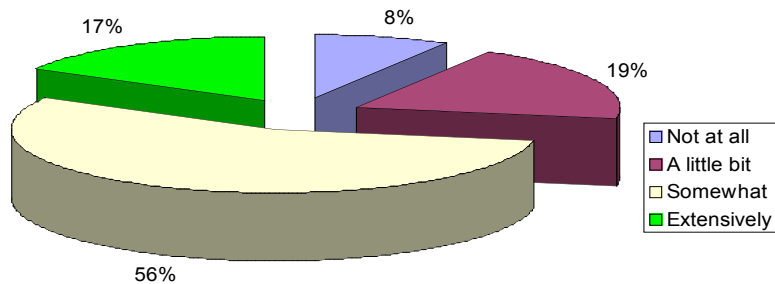
Furthermore, 92% of staff state that the implementation of the maps has helped to a degree to develop a common thinking language in their classroom.

Please rate the extent to which you have applied Thinking Maps® as part of your decision making/leadership practice.

31%

11%

17%

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often

41%
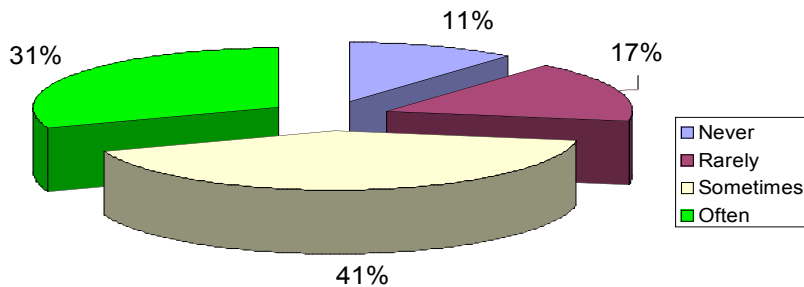
In terms of improving teacher effectiveness, results demonstrate that 72% of staff use the maps as part of their decision making/leadership practice either sometimes or often (see Appendix 9).

Please choose the degree to which Thinking Maps® have resulted in improved teacher performance.

67% of staff believe that the maps have resulted somewhat in improved teacher performance with a further 8% stating that this improvement is extensive additionally; staff were given the opportunity to comment on examples of map use within their own classrooms. Responses were mostly positive and are recorded below:

Teacher perceptions of Thinking Maps®

positive

∞ provides a framework for higher order thinking
∞ supports development of analytical responses
∞ particularly helpful for essay planning
∞ human thinking maps® good for kinaesthetic learners
∞ saves time
∞ students think at the level you want them to without it always being necessary to produce extended written responses
∞ allows students to recognise and label the level of thinking they are engaging in
∞ effective in forcing students to structure evidence
∞ it's useful to diagrammatically present the stages of an argument
∞ helpful for putting a philosophical idea in a 'nutshell'
∞ useful for home learning so I'm able to intervene if necessary before students write their essay – effective AfL tool
∞ vital teaching tool for AS and A2
∞ effective as display
∞ excellent revision tools
∞ effective carousel activities when students need to gather and process information
∞ work well as visual aids to support students when they identify ideas and plan presentations
∞ another effective thinking tool to add to students' toolbox

negative

∞ I don't think students write enough when they are producing the map – especially boys
∞ students are fed up of them

3.6 Analysis of pupils' perceptions of themselves as learners

As with most schools, St Robert of Newminster School collects a range of assessment information on their learners and on their learner entry to school. This takes the form of reading age and SATs. This data assists the prediction of future academic success and the distribution of learners within the curriculum sets or groupings. However we were interested in whether the use of Thinking Maps® can impact on their academic self-concept.

Young people's perceptions of themselves as learners and active problem - solvers have been shown in numerous research studies to be a key element in their learning progress.

We decided to test the impact of the implementation of Thinking Maps® on learners' academic self perceptions to determine whether or not the maps changed the way in which a group of Y7 (11 – 12 year olds) conceive of themselves as learners within educational settings.

There is a general lack of available techniques for assessing general academic self perceptions so we used the Myself As a Learner Scale developed by Robert Burden Professor of applied Educational Psychology at Exeter University (publishers: nferNelson) (see Appendix 10).

Using the MALS data on 156 learners on entry (September) produced a mean score of 60 .5 and after retesting 6 months later the mean score had risen to 67.2. This demonstrates a 10% rise in students' positive self perceptions as learners and active problem solvers. The key elements, as identified by MALS, are:

- ∞ confidence in one's own ability to do well in a variety of academic learning situations

- ∞ enjoyment in problem solving

- ∞ lack of anxiety

- ∞ access to and use of a wide vocabulary

    (MALS p.7 R Burden nferNelson)

When coupled with the questionnaire on Thinking Maps® to the same cohort, our preliminary findings indicate that the introduction of Thinking Maps® as a tool for teaching and learning has contributed to the increased learner confidence in their own ability and motivation as learners.

3.7 Teacher collaboration, communication and problem solving

A change in teacher attitudes towards the use of Thinking Maps® in aiding collaboration, communication and problem solving at St Robert's is a long term goal. The modelling of maps not only in lessons, but in our planning, communication and coaching should become embedded in our practice. This process is in its infancy, but where it has been implemented has been effective (see Appendix 9):

∞   NQT lesson observation debriefs (see Appendix 11)

∞   AST coaching and target setting

∞   Departmental CPD

∞   Middle leaders CPD and Review

∞   Whole-school INSET planning

∞   Process of change in whole-school policies

∞   Behaviour management

∞   T&L Steering Group and SLT Review meetings

At all levels, the school is endeavouring to adopt a more uniform approach to teacher collaboration, communication and problem solving through the use of Thinking Maps®.


Thinking Maps® as a coaching tool for enhancing teacher effectiveness.

Prior to the introduction of Thinking Maps® the de-brief of a Newly Qualified Teacher's (NQT) classroom practice followed the traditional methodology for feeding back and setting targets for improvement.

This usually involved the observer reading form his/ her linear notes, attempting to focus in on aspects of the lesson that went well in order to encourage the NQT to continue adopting specific strategies that worked, and identifying elements of planning and delivery that did not work so well in order to generate possible strategies for improving teacher performance.

A significant barrier within this process appeared to be that the NQT does not have access to those notes and as a consequence any teacher de-brief relied on the accuracy of recall being agreed by both observer and the NQT and often a selective account of what had been captured by the observer. Furthermore, it was often difficult for the NQT to remain objective about the lesson during the feedback, often regarding comments intended to improve classroom performance in a negative manner which reduced NQT self esteem.

The bubble map below describes the traditional feedback methods used before our trial.
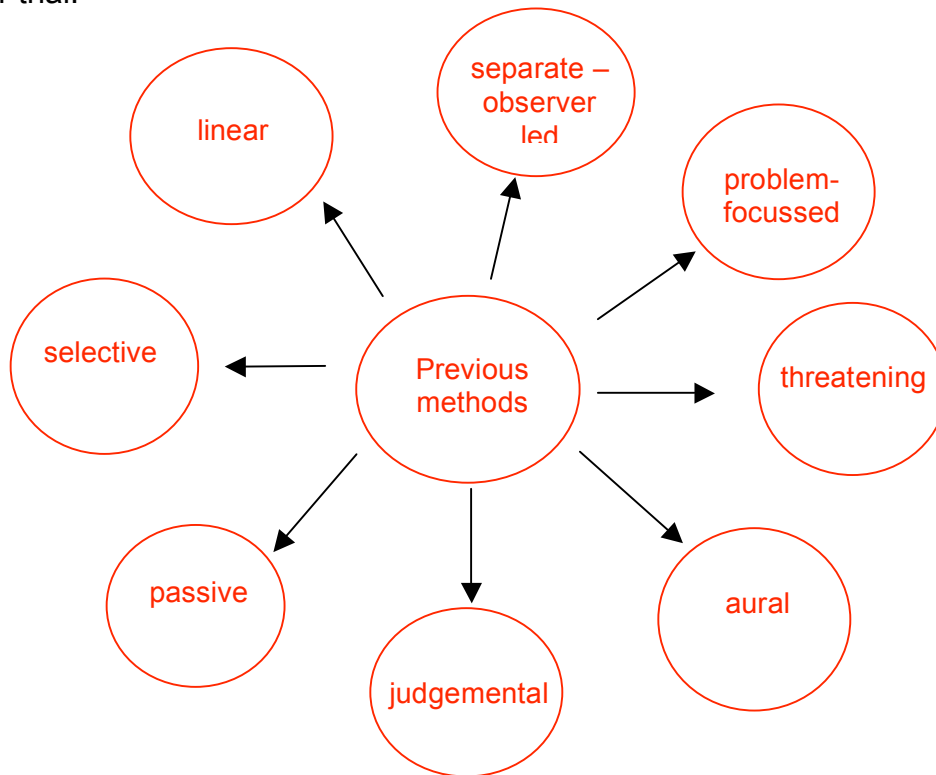
As part of our research into the use of Thinking Maps® for leadership purposes we decided to see what difference their use could make to the objective of increasing NQT effectiveness in the classroom.

Anticipated outcomes

If it was possible to provide a visual map of the lesson, we hoped that the NQT would more easily understand those micro elements of teaching and learning which were required to be tweaked in order to transform teaching and learning in the classroom.

Methodology

A number of Thinking Maps® were deployed, since their introduction in 2008, in an attempt to allow:

1. the NQT visual access to the observer's thinking (and inevitably judgements) about the lesson being observed;

2. the observer visual access to NQT feelings and perceptions about the lesson;

3. the NQT and the observer to agree the areas for development and strategies to be deployed in order to make teaching and learning more effective.

The lesson de-brief began by inviting the NQT to create a bubble map to describe the lesson she had just delivered (see Appendix 11). This allowed the NQT thinking time for reflection, so she could set the agenda for discussion, and the observer time to focus on how the NQT felt about the lesson and the reasons behind those feelings.

After initial exploration the new map was then "double bubbled". The NQT compared and contrasted her impressions of the lesson with her bubble map of a previous observation. In this sequence the NQT was given a chance to discuss the planned changes made by her prior to delivering the lesson in order to seek improvement.

The observer's flow map was produced which clearly made visible to the NQT the structure of the lesson, key events, planned tasks and transitions between teacher – learner activity.

By allowing the NQT visual access in this way a discussion occurred about whether or not it represented an accurate record of the sequences which occurred in the lesson. Data captured in each sequence could be seen and thus the focus moved more easily into an effective discussion about aspects of planning, teacher behaviour, learner behaviour and outcomes.

The discussion allowed:

- ∞ for clarification and negotiation about the validity of statements being made by each party;
- ∞ the NQT an opportunity to generate her own ideas about how the lesson could have been improved;
- ∞ a valuable discussion about the potential strategies offered to her by the observer which could be deployed in the future;
- ∞ a discussion about shifts in planning which may need to occur to enhance the effectiveness of similar lessons in the future.

Offering the NQT access to a visual map of the lesson meant the map itself became the object of the discussion about performance. It allowed the fostering of a relationship based upon mutual respect for each other's roles. The NQT moved from being merely a recipient of negative feedback (for that is all they seem to hear) towards being an active partner in a co-constructive relationship.
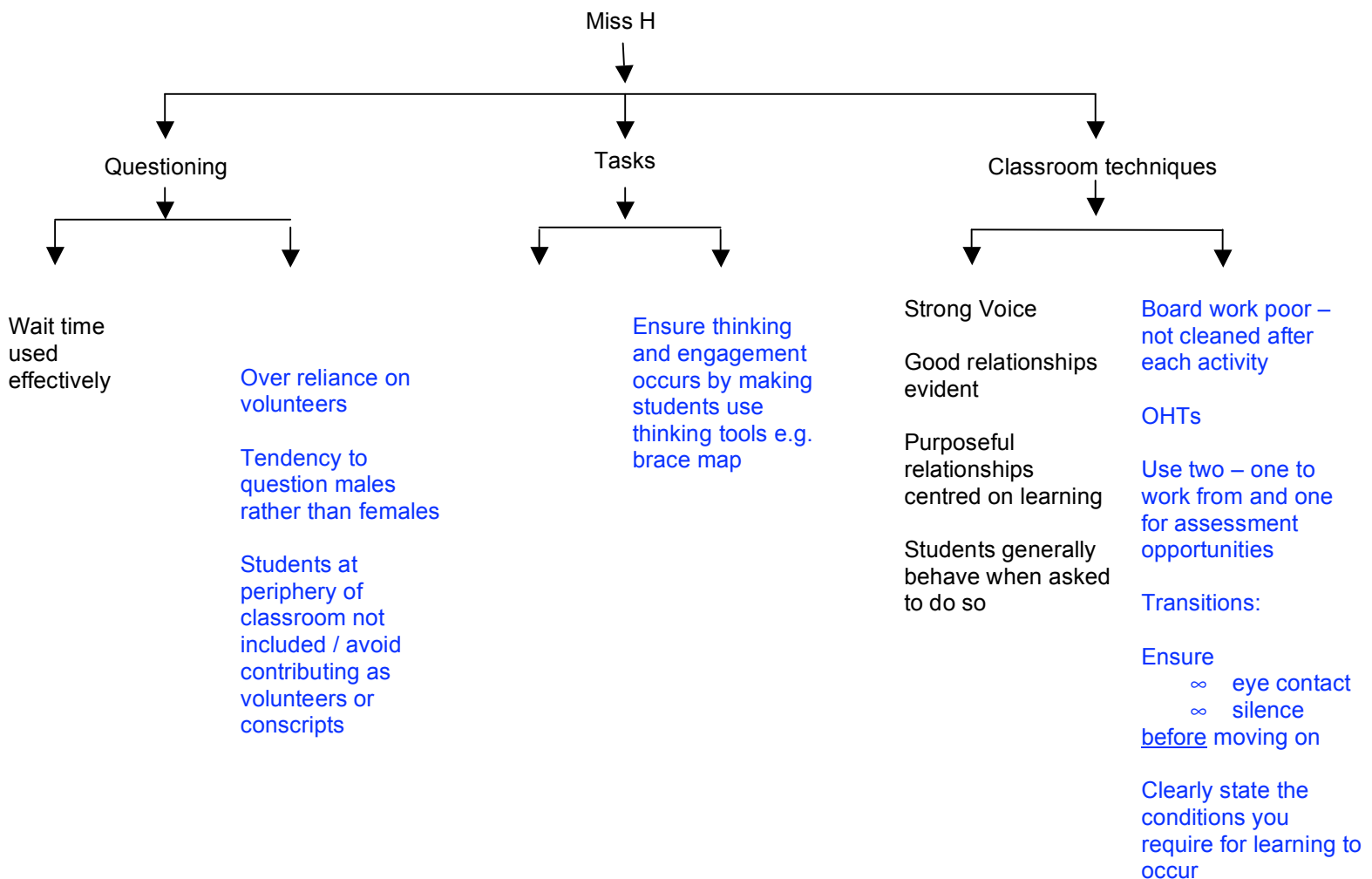
The discussion about teacher performance was summarised by the use of a tree map. Traditionally a lesson debrief would have in it some brief targets (bulleted) for improvement and a number of points that went well. The use of the tree map clearly allowed for the target setting to become more focussed visually on the

micro aspects of teaching and learning. This allowed the observer an opportunity to:
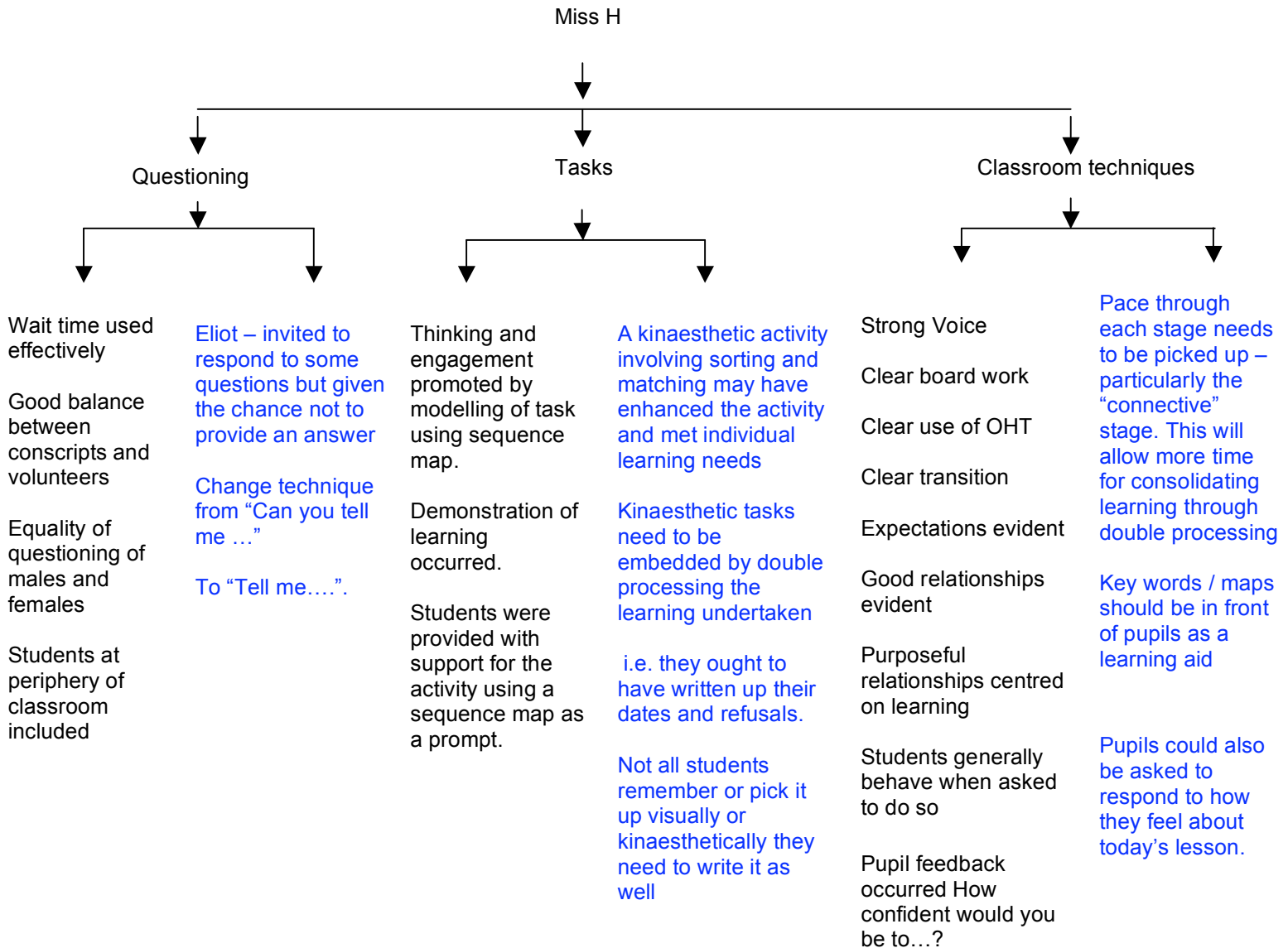
- ∞ highlight those pedagogical processes which were effectively employed (affirmation and recognition);
- ∞ highlight those aspects which needed to be changed for increased effectiveness (informing Continuing Professional Development Needs).

Illustrated below are examples of how tree maps were used with one NQT:

Lesson One

```
                                Miss H
                                  │
        ┌─────────────────────────┼─────────────────────────┐
        │                         │                          │
   Questioning                  Tasks              Classroom techniques
        │                         │                          │
   ┌────┴────┐              ┌─────┴─────┐            ┌────────┴────────┐
   │         │              │           │            │                 │
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Questioning:

Wait time used effectively

Over reliance on volunteers

Tendency to question males rather than females

Students at periphery of classroom not included / avoid contributing as volunteers or conscripts

Tasks:

Ensure thinking and engagement occurs by making students use thinking tools e.g. brace map

Classroom techniques:

Strong Voice

Good relationships evident

Purposeful relationships centred on learning

Students generally behave when asked to do so

Board work poor – not cleaned after each activity

OHTs

Use two – one to work from and one for assessment opportunities

Transitions:

Ensure
- ∞ eye contact
- ∞ silence
before moving on

Clearly state the conditions you require for learning to occur

Lesson Two

Miss H

Questioning

Wait time used effectively

Good balance between conscripts and volunteers

Equality of questioning of males and females

Students at periphery of classroom included

Eliot – invited to respond to some questions but given the chance not to provide an answer

Change technique from "Can you tell me …"

To "Tell me….".

Tasks

Thinking and engagement promoted by modelling of task using sequence map.

Demonstration of learning occurred.

Students were provided with support for the activity using a sequence map as a prompt.

A kinaesthetic activity involving sorting and matching may have enhanced the activity and met individual learning needs

Kinaesthetic tasks need to be embedded by double processing the learning undertaken

 i.e. they ought to have written up their dates and refusals.

Not all students remember or pick it up visually or kinaesthetically they need to write it as well

Classroom techniques

Strong Voice

Clear board work

Clear use of OHT

Clear transition

Expectations evident

Good relationships evident

Purposeful relationships centred on learning

Students generally behave when asked to do so

Pupil feedback occurred How confident would you be to…?

Pace through each stage needs to be picked up – particularly the "connective" stage. This will allow more time for consolidating learning through double processing

Key words / maps should be in front of pupils as a learning aid

Pupils could also be asked to respond to how they feel about today's lesson.

## NQT's Observations (see Appendix 11 - DVD sequence)

The following is a summary of the NQT's response to the use of Thinking Maps® as a coaching tool.

In the past I would write an evaluation of my lesson which I found hard to do. The feedback was more of an essay. It is a lot easier to view the lesson [use of flow map] if it is presented sequentially. I was surprised how logical it is and it is easier for both of you to see it and discuss it. A bubble map is easier to do as it allows me to focus on five key descriptions and discuss each of these in turn. The [tree] map allowed for clear feedback and it was easier to compare visually how I have improved.

In response to whether there is anything threatening about the use of the maps:

No I was quite comfortable. I didn't have to think about my writing style. There was a lot less pressure. We could focus on things that make an effective lesson and for me to concentrate on. The maps can also be kept as a form of reference in my file for me to refer back to.

The bubble map below describes the feedback methods following the implementation of Thinking Maps®

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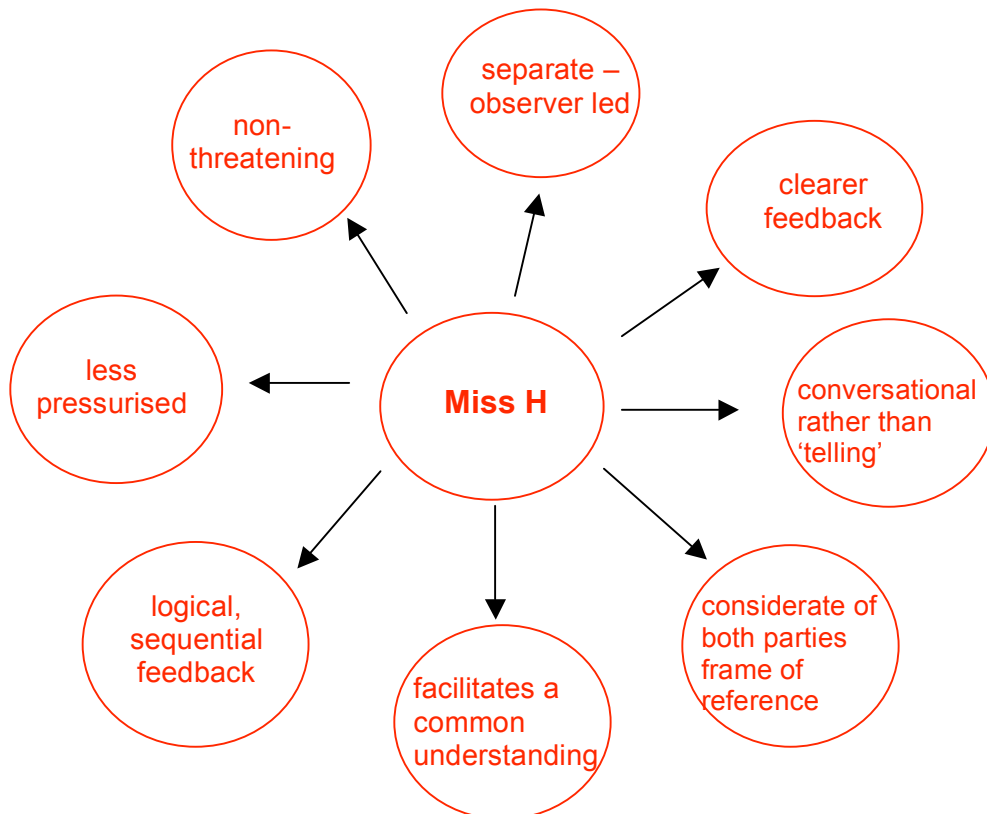
3.8 Impact of Thinking Maps® on improved pupil performance

Evidence gathered thus far is mainly anecdotal. According to teachers, the quality of essay writing appears to have improved as a result of maps being used as a planning tool. Furthermore, lesson observations have suggested that pupils participating in Thinking Map® activities have an improved on task behaviour.

As illustrated below, in one subject area, pupils who used maps to demonstrate their learning achieved higher coursework grades compared with those who didn't. In a task where students were asked to compare and contrast then categorise their own ability against an ideal model, students in Group 1 opted to use a series of double-bubble and tree maps. Students in Group 2 opted to present their thinking in linear text. Extended written responses demonstrated that students in Group 1 outperformed those in Group 2. Coursework was externally moderated, providing measurable evidence that the use of Thinking Maps® supported improved student outcomes in this area.

Comparison of 2 A level PE Coursework Scores
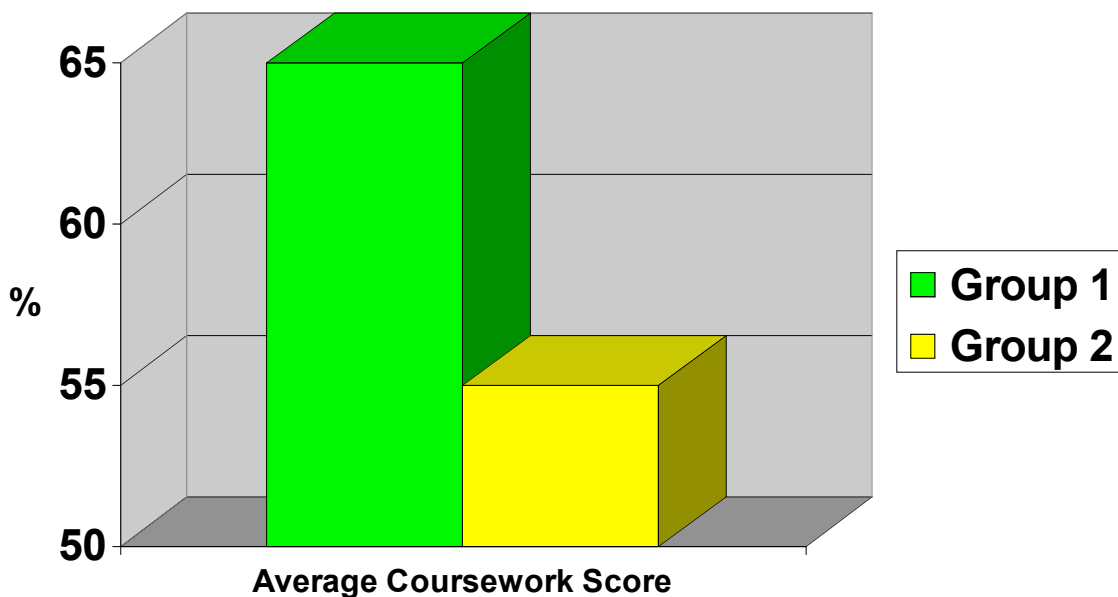
In the same subject area, Groups 1 and 2 were immersed in the use of Thinking Maps® whereas Groups 3 and 4's experience was more sporadic. Particular emphasis of usage was given to the revision process where the visual representation of thinking appears to have facilitated greater understanding of the theoretical aspects of GCSE PE. As illustrated below, Groups 1 and 2, who went through this process, outperformed Groups 3 and 4. Furthermore, this cohort outperformed the previous year, who were examined before the implementation of Thinking Maps®.

**Mean Value Added Score Groups 1-4 at GCSE**
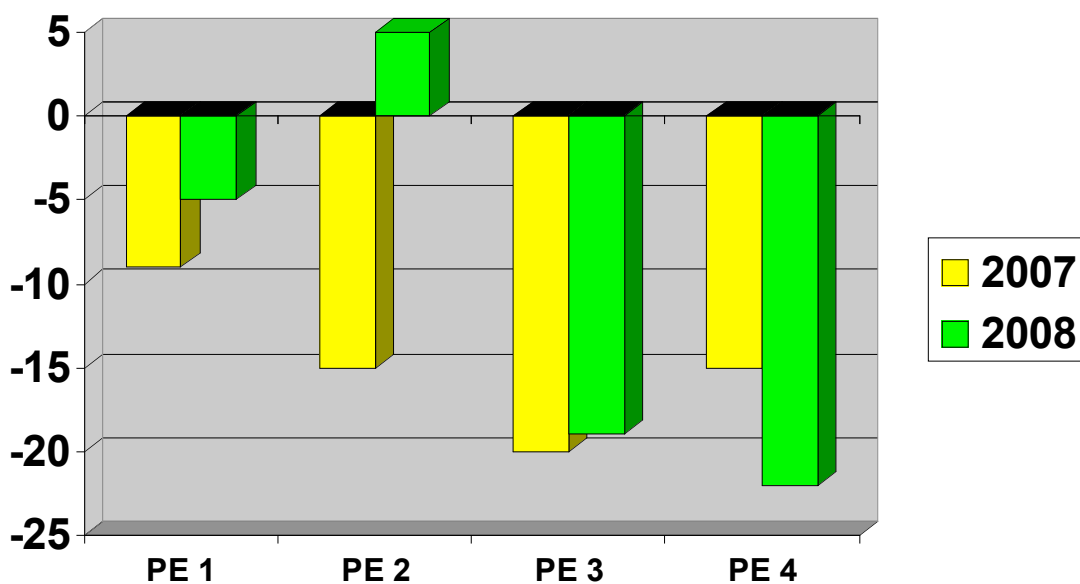
In a different subject area, Value Added Scores have improved since the implementation of Thinking Maps®. Illustrated below are the results of two parallel classes of average-ability students, taught by the same teacher before and after the implementation of Thinking Maps®. The 2006 class performed well, achieving a mean Value Added Score of 2 in English and 6 in English Literature. The 2008 class achieved a higher mean Value Added Score of 11 in English and 13 in English Literature. Results demonstrate that thinking skills activity approaches embedded in the teaching and learning of the 2006 class were complimented by the immersion of Thinking Maps® in 2008.

<u>Mean Value Added Score at GCSE</u>
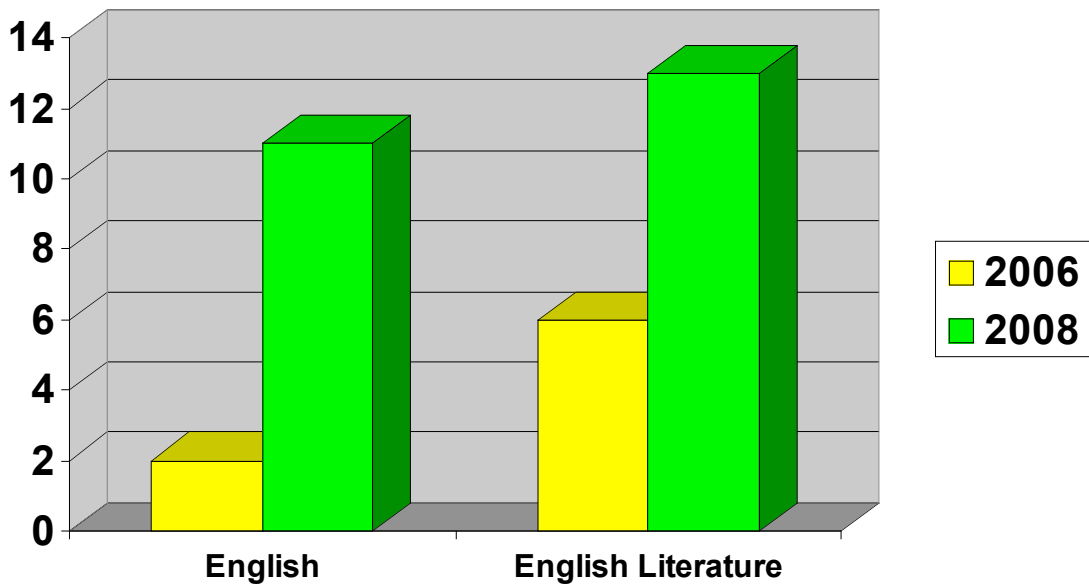
In a third subject area the introduction of Thinking Maps® as a teaching and learning strategy significantly contributed to improved learner performance. Illustrated below are the Value Added Scores for 23 learners over two externally marked Advanced Level examinations in Law. In January learners performed poorly with significant underachievement; however significant over achievement occurred in the July examinations. The immersion of learners in the use of Thinking Maps® as a visual tool resulted in more effective access by the teacher to learner thinking about the subject matter. This enabled a more effective use of scaffolding and signposting of learning which, when coupled with the technique of double processing of knowledge and understanding, played a significant role in enhancing learner performance.

Value added scores in A2 Law Special Study
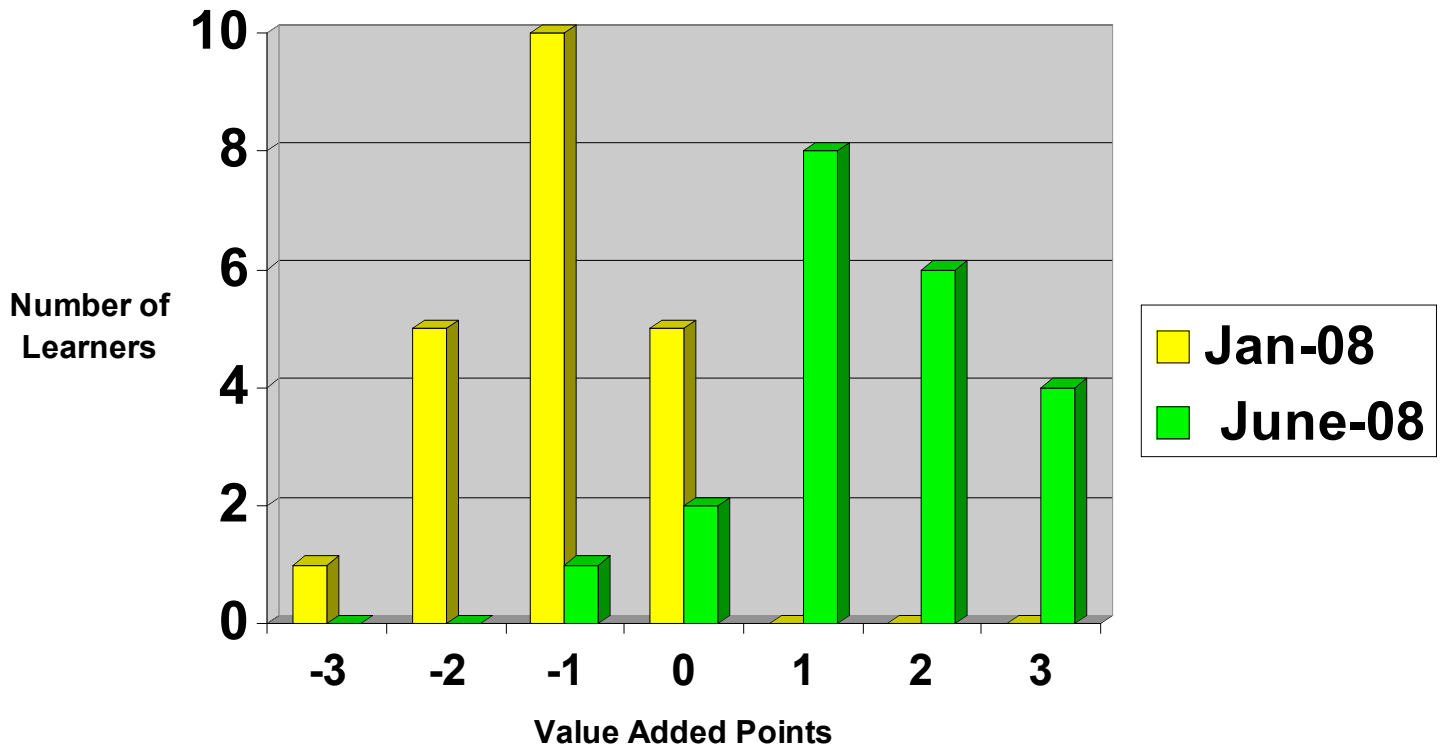
4.   Conclusion

It was the intention of this study to examine the role of Thinking Maps® in the transformation of teacher and pupil effectiveness at St Robert of Newminster Catholic School and Sixth Form College.

We hoped that our research would show that due to the implementation of Thinking Maps®, teacher collaboration and conversation are more focussed and that these new dispositions and skills lead to the development of common understandings, beliefs and practices about teaching for learning.

The results of our lesson observations demonstrate that the use of Thinking Maps® facilitate a greater percentage of time spent on activities that promote higher order thinking. Although 16 lessons constitute a relatively small sample, these results are encouraging and suggest that where Thinking Maps® are being used, students have more consistent access to higher order thinking skills.

Staff evaluations of previous and current teaching methodologies demonstrated that existing effective pedagogical practices remain integral to the lesson. However, staff indicated that the implementation of Thinking Maps® has enhanced their effectiveness by developing: a common thinking tool used for purpose; students' access to a more effective planning tool; the sharing and visualisation of thinking. As previously concluded, staff indicate that the use of Thinking Maps® facilitate higher order thinking skills.

Book sampling revealed that maps are only being used when there is a genuine opportunity in the lesson. This supports the premise that certain Thinking Maps® appear to be subject-specific and fit for purpose.

Staff and student perceptions of Thinking Maps® were mainly positive. Results illustrate that the maps have been well received and are on the whole, considered as effective tools to develop and support higher order thinking.

Finally, we aimed to test whether as a direct consequence of introducing Thinking Maps® as a whole school strategy, the change in teacher instructional methodology led to a rise in pupil achievement. Evidence presented is mainly anecdotal. The quality of essay writing appears to have improved as a result of maps being used as a planning tool and students participating in Thinking Map® activities appear to have an improved on task behaviour. In two subject areas, some quantitative data has indicated that the use of Thinking Maps® have contributed to improved student outcomes.