

Using Peer Tutoring to Develop Primary Pupils' ICT Skills



**Research designed and undertaken
by Rob Porteous and Judy Duncan**

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1 Introduction

This paper outlines research undertaken by two primary school classroom teachers during the course of the session 1999-2000, in two Scottish schools. Rob Porteous is Senior Teacher for ICT & Maths in the Junior School of St George's School for Girls, an Independent girls school in Edinburgh. Judy Duncan is ICT co-ordinator at Kingswells Primary School, a mixed state primary school in Aberdeen. During the research period Rob Porteous was class teacher for a primary 5 class of 22 pupils and Judy Duncan had responsibility for a primary 6 class of 30 pupils.

2 Background

Peer tutoring refers to teaching-learning contexts where one pupil passes on skills in a structured way to another pupil of the same or similar age. It has been used successfully with pupils from nursery age through to university level in a wide variety of contexts. It can be particularly useful in situations where the teacher cannot demonstrate new skills easily to the whole class or where the time interval between demonstration and the practical session for some pupils would be too great for the skills to be retained. The teacher first tutors a small group while the rest of the class is occupied on another activity, and then allows these children to show the others what to do when it is their turn.

There are several advantages to recommend the peer tutoring approach.

- Differentiation – pupils with differing prior experience can be catered for easily. Children who are more able can move onto more challenging work relatively quickly, while those who are less secure receive extra support.
- Quality teaching input – the teacher can work with a small group to introduce new skills while the rest of the class is usefully employed consolidating previous learning. The pupils being tutored receive 1-1 attention from their peers and can learn at their own pace.
- The children acting as tutors develop in confidence and consolidate their own learning.

The study looks specifically at the use of peer tutoring to teach ICT skills to primary school pupils. In his previous post at the Dolphin School in Berkshire, Rob Porteous had experimented with a peer tutoring approach for developing the ICT skills of the pupils he was teaching and had developed materials to support this. He was keen to discover whether this method of learning could have a wider application and how it could be best utilised to improve pupil learning.

The study is unusual in that it began as a developmental project, with ongoing feedback used to enable further improvement. As the project progressed it became apparent that it would be worth undertaking a more systematic and controlled study. Four separate pieces of research have now been completed. This report is an account of the findings.

3 Aims of the Study

The research addressed the following questions;

- How effective is the use of peer tutoring in teaching ICT skills?
- What are the key factors required for peer tutoring to be successful?
- What are pupils' attitudes towards using peer tutoring?
- What are teachers' attitudes towards using peer tutoring?
- What are the most effective models for using peer tutoring in schools with different hardware provision and different classroom organisation?
- How can differentiation be achieved?
- Is there any evidence to suggest that peer tutoring is more or less effective than other methods of teaching ICT skills?

4 The Resource

The *Dolphin System* is a peer tutoring scheme for developing the ICT skills of primary school pupils. It was developed by Rob Porteous, at Dolphin School in Berkshire, from 1997-1999.

The *Dolphin System* consists of a graded series of modules arranged in a hierarchy to form the *Ladder of Success*. Instructions are provided as a set of interlinked instruction pages, similar to Web pages on the internet, but located on the school network or classroom computer.

Pupils learn new skills from their tutor (another child or adult) and at the end of each tutoring session the give feedback to their tutors on the quality of their teaching. The children record their progress in their personal record booklet.

At various points in the program, pupils carry out simple assessment tasks to demonstrate that they have acquired new skills. Certificates are given at the end of each step on the ladder to reward achievement.

5 Research Methods

5.1 Peer Tutoring in the Classroom

We used the peer tutoring materials developed at Dolphin School with the pupils in our own classes at St George's and at Kingswells.

- Pupil progress was monitored throughout using pupil record booklets.
- The children's attitude was observed and their interaction with each other was monitored at various points in the programme as they undertook the tasks.
- Teachers from the other classes involved offered their observations.
- A number of pupils took the materials to work with at home and parents offered feedback.

5.2 Peer Tutoring in an ICT Suite

We used a variety of models of peer tutoring to teach classes in an IT suite and evaluated their effectiveness.

- Pupil progress was monitored throughout by direct observation.
- The children's attitude and interaction with each other was observed as they undertook the tasks.
- Teachers from the other classes involved offered their observations.

5.3 Controlled Study

We undertook a controlled study of three classes in St George's School using different peer tutoring models.

- A representative sample of pupils with differing levels of ability from each class was given a test involving a series of practical tasks using the computer. Pupils were scored individually on their ability to complete each task unaided.
- The same test was given to the same children 8 weeks later at the end of the study period.
- Teachers were asked to keep a brief log of the project.

5.4 Survey of Pupils' Attitudes

We carried out a survey at Kingswells Primary School to identify pupil interest and attitude.

- Pupils in one class were asked to give written answers to a series of questions about the peer tutoring scheme.

6 Findings

6.1 Peer Tutoring in the Classroom

Peer tutoring was used within the classroom with a primary 5 class at St George's School and a primary 6 class at Kingswells Primary. Both classes were resourced with a single computer and children were allocated time on this computer using a rota system.

A small group of pupils was introduced to each new module. These children then taught the skills they had learned to other pupils in their class, who then taught other pupils and so on.

Half hour slots were timetabled when pupils were not specifically required for class lessons. Pupils were allowed to select their own tutor by reference to a 'ladder' on the wall which indicated who was further advanced than they were. Those at the top of the ladder continued to be tutored by the class teacher on each new module.

A full description of the organisational model used (referred to as the Duncan model) is given in Appendix 3.

Pupils in these classes were subsequently used as tutors to teach children from other classes in their school.

- Children in both classes demonstrated considerable enthusiasm for the programme. They were eager to have their turn on the computer and most enjoyed the responsibility of teaching their peers.

The Dolphin System provided a natural opportunity for differentiation according to ability. Pupils' progress through the modules was monitored on a 'ladder' attached to the wall.

- The more able children, or those with prior experience, made rapid progress through the early modules.
- Those with less confidence or experience advanced more slowly.
- Pupils lower down the ladder seemed quite happy in the knowledge that many of their classmates were further ahead and appreciated the support that they were given by their 'computer tutors'.

Many of the pupils in these two classes had the opportunity of tutoring children from other classes in the school. Some of their tutees were the same age. Others were younger children.

- Most of the tutors responded very positively to tutoring others over the short term.
- A number requested to continue working with a particular partner over a whole term.
- Others enjoyed the initial experience but chose not to be involved thereafter.

Ten children from the primary 5 class requested the materials to use at home. Parents comments were all favourable. One pupil was so enthusiastic that she created her own modules to teach her younger sister!

- Several pupils used the materials to tutor younger siblings and one parent remarked on a considerable improvement in the younger sibling's computer competence.
- A number of pupils took on the role of tutoring their parents.

Classroom organisation was a challenge in one of the classes. The prevailing teaching model in this school was 'block' teaching, where the classroom time was predominantly divided into set lessons.

- Concern was raised about pupils missing curricular time from other subjects while they were occupied at the computer.

This problem was alleviated by timetabling the computers for use before and after school and during lunch breaks.

- The use of computers outwith class time was moderately successful, with some pupils taking their commitment very seriously and others finding it difficult to keep their appointments.

It was noted that younger pupils were particularly enthusiastic about using the scheme if it had first been introduced with older pupils.

6.2 Peer Tutoring in an ICT Suite

One of the schools in the study had an IT suite. 10 Acorn 7000 computers were arranged in a circular arrangement around the walls of a small classroom. Pupils from three primary 4 and three primary 5 classes were timetabled for a 40 minute lesson each week.

Following the success of the peer tutoring in the classroom, it was decided to experiment with a peer tutoring approach in the IT suite. Several models were used with different classes and evaluated and modified on an ongoing basis. All classes were taught by the ICT co-ordinator. With the primary 4 classes the ICT co-ordinator worked in conjunction with the class teacher. With the primary 5 classes the ICT co-ordinator worked alone.

Model 1: Flexible Pairing (used with primary 5 - 22 pupils - one teacher)

Pupils were introduced as a class to a new task each lesson. They then worked in pairs on the task at their own pace. At the start of each subsequent lesson, pupils were paired up. Those who had progressed further tutored those who were behind.

This method worked well initially. However, problems soon became apparent.

- As pupils progressed through the tasks at different rates it was difficult to set realistic targets and ensure that all pupils remained on task.
- It was difficult to ensure that all pupils got a fair mix of tutoring and being tutored.

Model 2: Three Group Rotation (used with primary 4 - 21 pupils - second teacher available)

The class was divided into three groups and peer tutoring was organised on a two week cycle:

Week 1: One teacher introduced group 1 to a new task. Groups 2 and 3 remained in class with the other teacher.

Week 2: Group 1 tutored group 2. Group three remained in class.

Week 3: Group 2 tutored group 3. Teacher introduced group 1 to the next task.

Week 4: Group 1 tutored group 2. Group three consolidating.

Working with the small group proved very beneficial. The children were gathered around a small number of screens and direct teaching was given. They were then divided into pairs and given time to practise the task.

- The learning experience was much more focussed than had been achieved with the whole class sitting around the room at a large number of computers.

Pupils in group 1 proved very able at tutoring those in group 2.

- The group 2 pupils clearly benefited from the one-to-one tuition and the group 1 pupils benefited from the consolidation.

- Demands on the teacher were minimal. The teacher was able to circulate and deal with occasional technical glitches confident that the rest of the pupils were on task.

The model was less successful when it came to group 2 tutoring group 3.

- Pupils in group 2, who had not benefited from the small group time with the teacher, did not have the same sense of responsibility in their role as tutors.
- It was difficult to monitor their progress, because the teacher was involved for the first part of the lesson in teaching group 1. This again resulted in some pupils making much more rapid progress through the tasks than others and bottlenecks developing when several pupils were waiting to be taught on the same module.

This latter problem was solved by working for a while on a three week rotation with the class teacher retaining one group in the classroom. However, three weeks proved to be too long for retention of skills and progress for some pupils was very slow.

There were also problems of grouping when children had been extracted from previous lessons to attend musical instrument tuition.

Model 3: Triads (used with primary 5 - 22 pupils - one teacher)

The class was divided into three groups and then triads (clusters of three pupils) were formed with one pupil from each group. A rotation similar to Model 2 was then used. This model was quickly abandoned as too complex.

Model 4: Two Group Rotation: (used with primary 4 - 21 pupils - second teacher available)

The class was divided into two groups and a two week cycle was used:

Week 1: The ICT co-ordinator taught group 1 while the class teacher retained the rest of the class.

Week 2: Group 1 tutored group 2.

Week 3: The ICT co-ordinator taught group 1 while group 2 worked in pairs to consolidate previous learning.

Week 4: Group 1 tutored group 2.

This worked very well.

- Working with half the class (11 pupils) was just as effective as working with a group of 7.
- The teacher was free to monitor all the peer tutoring.
- The group 1 pupils became thoroughly competent through tutoring the others.
- The group 2 pupils benefited from targeted one-to-one tuition.
- All pupils were using the computer every week.

However,

- Concern was expressed that only the group 1 pupils were getting direct teaching input from the teacher.

An alternative model was proposed with pupils in group 2 tutoring pupils in group 1 on alternate weeks. However, there was insufficient time to evaluate this. Further research is to be carried out.

Model 5: Accelerated Pair Work (used with primary 5 - 22 pupils - one teacher)

The pupils were paired up and decided who would be tutor and who would be tutee. At the start of the lesson, the tutors gathered together around one computer while the teacher explained the task and demonstrated any new skills. Meanwhile the tutees logged on at other computers and spent time consolidating the skills learned the previous week. The tutors then joined their tutees and the two pupils worked together to practise the skills that the teacher had demonstrated.

This model was extremely successful.

- The less able pupils had time to consolidate previous learning at the start of the lesson.
- The lesson time was utilised to the full. The teacher was able to cover a lot of new material with the initial group, who were mostly able to pick up ideas and concepts quickly, while the other pupils were logging on and getting programs opened up.
- The tutors had a clear goal: to cover with their tutees all the skills that they had just been taught.
- Demands on the teacher were minimal. The teacher was able to circulate and observe the peer tutoring, ensure that all pupils remained on task and assist the small number who had not fully understood the initial teaching.

This model is proposed as the preferred model for future work.

6.3 Controlled Study

Having gathered a considerable amount of anecdotal evidence as to the effectiveness of the peer tutoring approach, particularly in the 'single computer in the classroom' model, we set up a short, formal study to compare different methods of teaching ICT skills using the same materials. Three primary 3 classes were chosen since they had no prior experience of the Dolphin System.

We decided to have no control group, since some of the teachers involved argued that the pupils in a control group might be disadvantaged. In addition, there was almost certain to be an improvement in the skills of the pupils receiving the extra input. Having a control group would therefore simply confirm the obvious.

Before the start of the study, eight pupils from each class were given a practical assessment. The sample was carefully selected to be as representative as possible to get a range of:

- reading ability
- previous computer experience
- computer confidence
- patience (a skill needed for tutoring)
- ability to follow instructions
- aptitude for learning new things

The eight children were told that they were going to do something on the computer which would involve things that they had not done before. They would be asked to see if they could do some things on their own first, but were allowed to ask for help if they did not know what to do.

This assessment task required careful timetabling. The class teacher carried out the test with the small group while another member of staff covered the remainder of the class. The ICT co-ordinator was also on hand to assist the teacher in the IT suite and to deal with any technical problems.

For each task the teacher read the instructions to the pupils and then indicated on a record sheet whether the pupil was able to carry out the task unaided. The children were then helped to complete the task if necessary.

This was repeated for each of the tasks.

The tasks were as follows:

- Log on.
- Open up your painting program.
- Draw a rectangle on your page.
- Save the picture in your personal folder.
- Close the painting program.
- Log off.

Open up your painting program.	N	N	N	N	N	N	N	N
Draw a rectangle on your page.	Y	Y	Y	Y	Y	Y	Y	Y
Save the picture in your personal folder.	N	N	N	N	N	N	N	N
Close the painting program.	Y	Y	Y	N	Y	Y	Y	Y
Log off.	N	N	N	N	N	N	N	N
Log on at another computer.								
Open your picture again.	Y	Y	N	Y	Y	N	N	Y
Fill the rectangle with a colour.	Y	Y	Y	Y	Y	Y	Y	N
Print your picture.	N	N	N	N	N	N	N	N

3B Pre-test Pupil Number 1 2 3 4 5 6 7 8

Tasks

Log on.	N	N	N	N	N	N	N	N
Open up your painting program.	N	N	N	N	N	N	N	N
Draw a rectangle on your page.	Y	Y	Y	Y	Y	Y	Y	Y
Save the picture in your personal folder.	N	N	N	N	N	N	N	N
Close the painting program.	Y	Y	Y	Y	Y	Y	Y	Y
Log off.	N	N	N	N	N	N	N	N
Log on at another computer.								
Open your picture again.	Y	Y	Y	Y	N	N	Y	Y
Fill the rectangle with a colour.	Y	Y	Y	Y	Y	Y	Y	Y
Print your picture.	N	Y	Y	N	N	N	N	N

3C Pre-test Pupil Number 1 2 3 4 5 6 7 8

Tasks

Log on.	N	N	N	N	N	N	N	N
Open up your painting program.	N	N	N	N	N	N	N	N
Draw a rectangle on your page.	Y	Y	Y	Y	Y	Y	N	Y
Save the picture in your personal folder.	N	N	N	N	N	N	N	N
Close the painting program.	Y	Y	Y	Y	Y	N	Y	Y
Log off.	N	N	Y	N	N	N	N	N
Log on at another computer.								
Open your picture again.	Y	Y	Y	N	Y	N	Y	N
Fill the rectangle with a colour.	Y	Y	Y	Y	Y	Y	Y	Y
Print your picture.	N	N	Y	N	N	N	N	N

3A Post-test Pupil Number 1 2 3 4 5 6 7 8

Tasks

Log on.	Y	Y	Y	Y	Y	Y	Y	Y
Open up your painting program.	Y	Y	Y	Y	Y	Y	Y	Y
Draw a rectangle on your page.	Y	Y	Y	Y	Y	Y	Y	Y
Save the picture in your personal folder.	Y	Y	Y	Y	N	Y	Y	Y
Close the painting program.	Y	Y	Y	Y	N	Y	Y	Y
Log off.	Y	Y	Y	Y	N	Y	N	Y
Log on at another computer.								
Open your picture again.	Y	Y	Y	Y	Y	Y	Y	Y
Fill the rectangle with a colour.	Y	Y	Y	Y	Y	Y	Y	Y
Print your picture.	Y	Y	Y	Y	N	Y	N	Y

Several items were interpreted liberally. Two of the questions were intended to test the pupils' ability to use the shape and fill tools in the painting program. However, nearly all the pupils interpreted the question according to their own experience, drawing a closed shape with the

paintbrush and then painting its interior. They were credited as having achieved the task successfully! The item 'Log on at another computer' was not assessed since it was considered on reflection to involve the same skills as the first task.

6.4 Survey of Pupils' Attitudes

Pupils using the peer tutoring model seemed on the whole to be very enthusiastic. However, it was suspected that if asked to give honest feedback, some pupils would be more positive in their comments than others.

A simple questionnaire was designed and given to a class of primary 6 pupils who had been using the Dolphin System on a single computer in their classroom for 6 months. It was hoped to gain objective information about the pupils' attitudes to peer tutoring and to gain useful suggestions to help improve the teaching materials. The pupils were asked to be as honest as possible in their feedback.

The results were generally very positive indeed for both boys and girls. Even when specifically asked to be critical, 50% of the pupils failed to think of anything negative to say! The large majority of pupils enjoyed tutoring and were keen to continue, though a small number were hesitant about the prospect of tutoring pupils from other classes whom they did not know.

The pupils' responses are recorded in Appendix 2 and a full analysis is given in section 7.4.

7 Analysis

7.1 Peer Tutoring in the Classroom

While it is clearly difficult to base extensive conclusions on the current evidence, certain trends are emerging. The following statements can be made:

- The pupils responded to the peer tutoring programme in their own class with considerable enthusiasm.
- Differentiation according to ability was easy to achieve.
- Some pupils very much enjoyed tutoring pupils from other classes, others less so.
- A number of pupils were able to use at home the tutoring skills learned in the classroom environment.
- Classroom organisation for peer tutoring (as with any kind of pair work with a limited resource) needs to be carefully thought out to avoid an adverse effect on work in other areas of the curriculum.

7.2 Peer Tutoring in an ICT Suite

- Peer tutoring using the 'accelerated pair work' model worked well with primary 5 pupils. It has yet to be tried with other age groups.
- The two group rotation model may also be effective in a modified form (pupils taking turns to tutor on alternate weeks). However, further evidence is required to substantiate this.

7.3 Controlled Study

It was disappointing that technical problems were encountered with the computer network during the study period, although this is recognised as expected classroom experience. Comparative data between different teaching approaches was therefore not obtained as intended.

However, the results available demonstrate conclusively that **significant learning gains can be achieved** and sustained over a comparatively short period (8 weeks) using peer tutoring with a

single computer in the classroom. A number of pupils required considerably less than the 45 minutes originally suggested.

The results for the pre-test and post test for class 3A are shown here side by side. Learning gains are highlighted in bold in the second table and the losses are shown in italics and underlined.

3A Pre-test	Pupil Number	1	2	3	4	5	6	7	8
Tasks									
Log on.		N	N	N	N	N	N	N	N
Open up your painting program.		N	N	N	N	N	N	N	N
Draw a rectangle on your page.		Y	Y	Y	Y	Y	Y	Y	Y
Save the picture in your personal folder.		N	N	N	N	N	N	N	N
Close the painting program.		Y	Y	Y	N	Y	Y	Y	Y
Log off.		N	N	N	N	N	N	N	N
Log on at another computer.									
Open your picture again.		Y	Y	N	Y	Y	N	N	Y
Fill the rectangle with a colour.		Y	Y	Y	Y	Y	Y	Y	N
Print your picture.		N	N	N	N	N	N	N	N
3A Post-test									
Pupil Number	1	2	3	4	5	6	7	8	
Tasks									
Log on.		Y	Y	Y	Y	Y	Y	Y	Y
Open up your painting program.		Y	Y	Y	Y	Y	Y	Y	Y
Draw a rectangle on your page.		Y	Y	Y	Y	Y	Y	Y	Y
Save the picture in your personal folder.		Y	Y	Y	Y	N	Y	Y	Y
Close the painting program.		Y	Y	Y	Y	<u>N</u>	Y	Y	Y
Log off.		Y	Y	Y	Y	N	Y	N	Y
Log on at another computer.									
Open your picture again.		Y	Y	Y	Y	Y	Y	Y	Y
Fill the rectangle with a colour.		Y	Y	Y	Y	Y	Y	Y	Y
Print your picture.		Y	Y	Y	Y	N	Y	N	Y

All but two of the pupils in the study group were able to carry out every task in the final assessment without support. Notably, the skill of saving a file, often not remembered by pupils because it is used comparatively less frequently, has been learned and retained by 7 of the 8 children tested.

7.4 Survey of Pupils' Attitudes

The questionnaire included a number of questions which, though not directly relevant to the current research, would nevertheless provide useful data. Attention is here focussed on results relevant to the research questions.

Although the responses have been divided according to sex, no formal analysis of gender differences is made here. The data can however, be used at a later date as part of a study on gender and co-operative learning.

Question 1: What do you like about the Dolphin System?

Although this was a general question about the scheme as a whole it is worth noting that a number of the children's responses referred either directly or indirectly to benefits which could be attributed to the use of peer tutoring. The number of occurrences is given in brackets.

Pupils:

- valued differentiated learning - 'You can work at your own pace' - (6)
- enjoyed tutoring others - 'I like the way you teach other people' - (3)
- liked the independence - 'You do not always have to have a teacher around' - (1)
- appreciated having support on hand - 'if you are not sure what to do you can ask a tutor' - (1)
- recognised that they made less demands on the teacher - 'the teacher doesn't help all the time when she's busy
- were able to use what they had learned to support other members of their family - 'if you have a computer at home you can get to help on it' - (1)

Question 2: What do you not like?

It is a mark of success for the programme that 50% of pupils could think of nothing that they did not like about the system! Of the 14 pupils who did have criticisms,

- 3 were related to the presentation of the materials (use of graphics, clarity of instructions, length of modules),
- one was to do with a personal challenge with co-ordination ('it goes all wonky')
- one expressed frustration with the equipment ('the system sometimes writes slower than other times')
- a few pupils expressed dislike of tests or hard work or tasks involving writing.

Only three were directly or indirectly to issues of peer tutoring.

- Two were to do with repetition. ('you have to go over things you have already learnt')
- One referred to insensitive teaching. ('people are slow and people are fast when they teach you')

It is worth noting that in the former case the two pupils concerned may have not have been referring to peer tutoring at all but to the fact that all the pupils were asked to start at the beginning of the programme irrespective of previous experience. As a consequence pupils were inevitably covering some skills which they had acquired previously.

Question 3: Which level are you on?

The pupils answers to this question show clearly that a considerable amount of differentiation has taken place since the start of the programme.

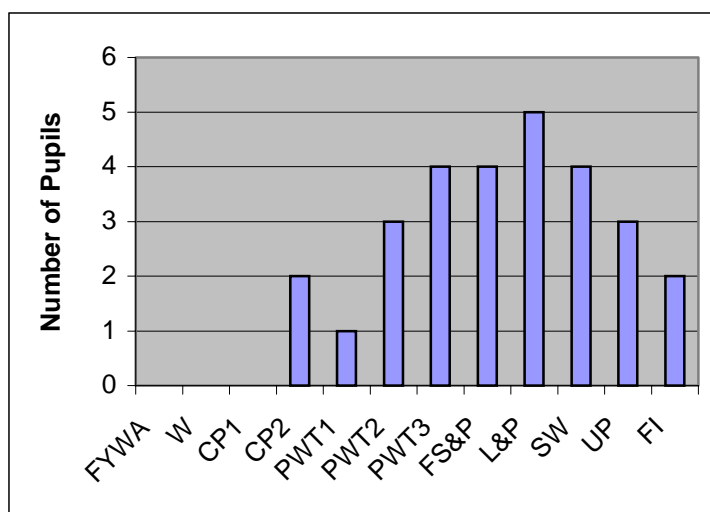
Modules are listed below in sequential order. Approximate number of pupils working on each are given in brackets. (It is not possible to give precise figures since several pupils give incomplete information.)

Step 1

- Finding Your Way Around (0)
- Windows (0)
- Creating Pictures 1 (0)
- Creating Pictures 2 (2)
- Playing with Text 1 (1)
- Playing with Text 2 (3)
- Playing with Text 3 (4)
- File Saving and Printing (4)

Step 2

- Lists and Poems (5)



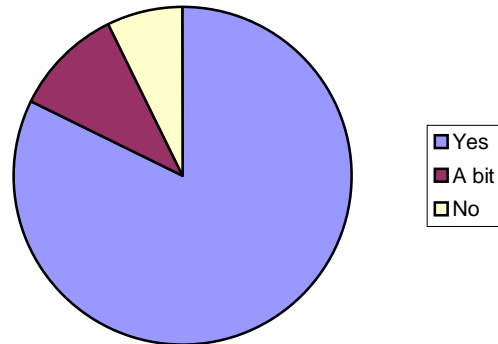
Story Writing (4)
 Using Programs
 Finding Information (2)

Question 4: Are you better at computer skills now?

Improvement in Pupils' Computer Skills (Pupils' Own Perceptions)

An overwhelming number of pupils answered this question in the affirmative.

- Yes 23/28 (82%)
- A bit 3/28 (11%)
- No 2/28 (7%)



While this result cannot be attributed to peer tutoring as such (one would hope that any teaching would have the same result!) it at least shows that the tutoring was effective.

The improvement in pupils' performance was measured more objectively in the controlled study mentioned elsewhere in this report.

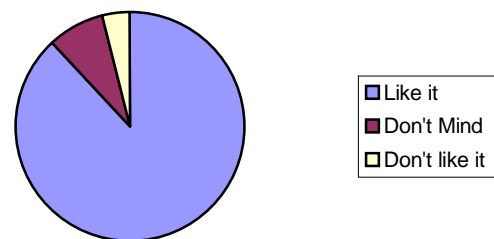
Question 5: Do you like being taught by other children?

Again the overwhelming response to this question was 'Yes'.

- Yes 22/25 (88%)
- Don't Mind 2/25 (8%)
- No 1/25 (4%)

Pupils' attitude towards being taught by other pupils

(Three pupils were unable to answer this question since, as members of the initial group, they had received all their input directly from the teacher.)



Pupils gave an astonishing variety of reasons for their responses. Some of these referred to the benefits to the tutor rather than the tutee. All are included for the sake of completeness.

Again these are grouped according to theme and listed with the number of occurrences of each in brackets.

- Pupils found it easy to relate to other children as tutors - 'Being taught by other children is really fun as I find I can relate to them better' - (2)
- The tutor's memory was refreshed in the process of tutoring others - 'when they teach you it would refresh their memory' - (2)
- Tutors enjoyed getting feedback about the quality of their teaching - 'at the end they will find out how well they've taught' - (1)
- Tutors understood their pupils' difficulties - 'they have been taught themselves and they know what bits are hard' - (1)

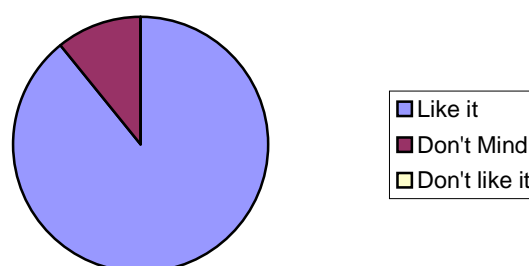
- Lesson pace could be adjusted to suit the individual - 'they know which parts you find easy so they let you do it quickly' - (1)
- Pupils felt increased confidence - 'it gives you more confidence and makes you feel that, if they can do it, so can you' - (1)
- Pupils appreciated the sharing of skills and ideas - 'they will have different views from you and you will learn from them' - (2)
- Being taught by another child was a welcome change - 'it's just fun to be taught by other people' - (3)
- Some tutors knew things the teacher didn't - 'sometimes they can tell you some stuff teachers don't know' - (1)
- One pupil just liked the whole concept! - 'I think it is a very clever idea to ask children to help other children' - (1)

Question 6: Do you like tutoring?

Yet again the overwhelming response to this question was 'Yes'.

- Yes 25/28 (89%)
- Don't Mind 3/28 (11%)
- No 0/28 (0%)

Pupils' attitude towards tutoring others



This result was very encouraging. One of our concerns before undertaking the study was that pupils would eventually tire of tutoring others once the novelty had worn off. However, this result seems to suggest otherwise and shows the clear majority of pupils still very enthusiastic about tutoring six months into the experience.

As before the pupils reasons are grouped and number of occurrences given in brackets. The children:

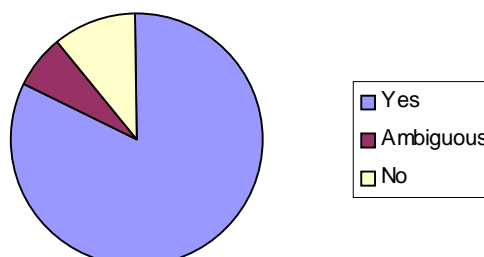
- found it fun - 'its fun' - (7)
- felt pride in being a teacher - 'it makes you feel like a real teacher' - (5)
- enjoyed passing on their knowledge and skills - 'I like to pass on experience and skills' - (3)
- felt good about helping others - 'I am helping them on the computer and that feels nice' - (1)
- found their memory was refreshed through teaching others - 'it's teaching yourself by going over it again with other people' - (2)
- enjoyed getting feedback about their teaching - 'you get people to colour in whether you are a good teacher' - (2)
- enjoyed teaching and explaining - 'it's fun to teach different people and explain everything' - (1)
- recognised that it saved the teacher time - 'it will save the teacher a lot of fuss' - (1)
- saw time spent tutoring as coveted extra time on the computer - 'you get more time on the computer' - (1)

Question 7: Do you have a PC at home?

The majority of pupils answered this in the affirmative.

- Yes 23 (82%)
- Ambiguous 2 (7%)
- No 3 (11%)

Pupils' access to computers at home



Though not directly relevant to the research questions, it is interesting to note that despite the high number of pupils with access to

computers at home, many had clearly not been using them effectively before the start of the skills training programme in school. (cf pupils answers to question 4).

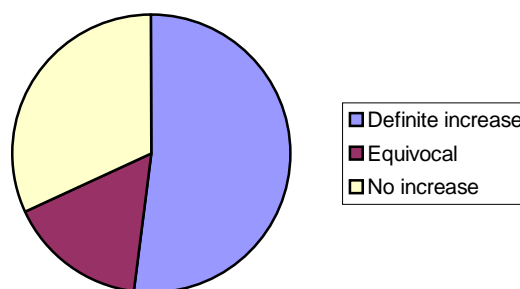
Question 8: Do you use it more now?

Again a majority yes, though less dramatic this time.

- Definite yes 13/25 (52%)
- Equivocal 4/25 (16%)
- No 8/25 (32%)

Again this result cannot be attributed directly to the use of peer tutoring. It does, however, show the effectiveness of the programme in increasing pupils' competence and confidence in using computers independently - the fundamental aim of the Dolphin System.

Pupils' use of computers at home



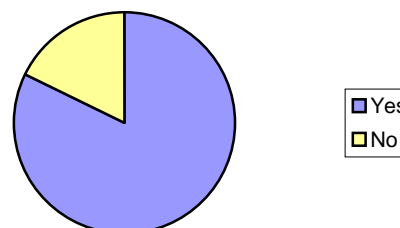
Question 9: Would you like to tutor other classes?

Yes, again!

- Yes 23 (82%)
- No 5 (18%)

Another encouraging result, though care must be taken to note that this represents pupils' willingness *before* engaging in the experience. It would be interesting to question the pupils again once they had tutored other pupils from other classes and compare the results.

Pupils' willingness to tutor other classes



Again some pupils gave reasons for their answer. These are grouped as before. Reasons for:

- Enjoyment of tutoring others - 'I like teaching' - (2)

- Excited about the idea - 'it would be really exciting' - (1)
- Opportunity to revise prior learning - 'I'd be reminded about what I had already learned' - (1)
- Likes idea of doing things again - 'it would be fun to go back to the start again' - (1)
- Opportunity to share skills - 'you are sharing your skills with another class - (1)
- Pride in passing on what has been learned - 'show that I try and learn of the computer' - (1)
- Enjoyment - 'I think it would be fun' - (1)
- Experience - 'it would be a good experience' - (1)
- Potential source of income! - 'but I would have to get paid' - (1)

Reasons against:

- Lack of confidence in relating - 'I don't think I could...unless I knew people' - (1)
- Lack of confidence in ability - 'I wouldn't be a good teacher' - (1)

It is interesting to note that both of the reasons given for not wanting to participate refer to lack of confidence, not to lack of interest.

Question 10: Any other comments?

Once again the comments are overwhelmingly positive. Of the 23 children who had further comments to make,

- 3 were suggestions for improving the teaching materials (use of graphics, clarity of instructions, enjoyment of use)
- 2 were statements about the hierarchy of skills - ('I can see them getting harder and I will have a bit of a challenge ahead')
- were general expressions of enthusiasm - 'schools all over the world should use it' or positive comments about aspects of the teaching materials, e.g. the glossary ('it explains words that you might not know')

Peer tutoring was hardly referred to, presumably because the children had been given the opportunity to say all they wished in answer to earlier questions. The only reference was a perceptive comment on the untrustworthiness of peer feedback due to pupils' concern not to hurt each others feelings!

- 'when you colour in the pictures to see how good a tutor you are....people just colour them all in to be nice.'

8 Conclusions

How effective is the use of peer tutoring in teaching ICT skills?

In both schools involved in this study, peer tutoring has been demonstrated to be an effective means of teaching ICT skills. Pupils from primary 3 to primary 6 have worked independently of the teacher and have learned the majority of their skills through tutoring by their peers. Significant learning gains have been established, both by pupils evaluating their own progress and through objective assessment.

Care should be taken to avoid generalising the results without further research, particularly with reference to other year groups, since the use of the particular scheme (the Dolphin System) used in this study is dependent on the tutors' reading skills.

What are the key factors required for peer tutoring to be successful?

Evidence gathered throughout the study points to the following factors as having a significant effect:

- The teacher must model the peer tutoring process carefully with the initial group of children.
- Pupils who are to tutor others must understand that it is a special responsibility which is being entrusted to them. They must be given clear guidelines at the outset as to what is expected of them.
- Organisational systems must be clearly thought out but be as simple as possible.
- The tutoring must be supported by a resource which gives clear instructions for the children to follow.
- Computer equipment must be reliable.
- The teacher and tutors must be committed and enthusiastic.

What are pupils' attitudes towards using peer tutoring?

The vast majority of pupils in the study group were enthusiastic about being taught by other children and about tutoring others. This enthusiasm was sustained over a period of several months and many were eager to extend their experience by working with children in other classes.

The pupils in the questionnaire group noted a wide variety of benefits of peer tutoring, both for themselves as tutors and as pupils.

Many of the pupils questioned were aware of, and able to articulate, the teaching and learning process. In particular, the pupils

- were able to reflect on their own learning in terms of mastering a set of skills.
- had appreciated the value of the tutoring process for highlighting areas of poor understanding *in the tutor*.

What are teachers' attitudes towards using peer tutoring?

Teachers have been very enthusiastic about the peer tutoring process when they have taken full responsibility for running it in their own classrooms. Those involved in a support role with the ICT co-ordinator in the IT suite in one school were less enthusiastic. This may have been due to:

- the experimental nature of the teaching models
- difficulties dealing with technical problems. If a machine malfunctions when a whole class is using computers simultaneously, the teacher's attention is inevitably drawn to the group whose computer is down and the rest of the class become restless.

What are the most effective models for using peer tutoring in schools with different hardware provision and different classroom organisation?

Peer tutoring has been demonstrated to work very effectively where one computer is installed in the pupils' own classroom. The teacher trains the initial group in each module and these pupils then tutor the others. Care must be taken with timetabling the activity so that other curricular work is not affected.

A successful model has been established for using peer tutoring with a whole class in an IT suite. The pupils are paired up and it is decided who will be tutor and who will be tutee. At the start of the lesson, the tutors gather together around one computer while the teacher explains the task and demonstrates any new skills. Meanwhile the tutees log on at other computers and spend time consolidating the skills learned the previous week. The tutors then join their tutees and the two pupils work together to practise the skills that the teacher has demonstrated.

How can differentiation be achieved?

The structure of the Dolphin System makes it easy for differentiation to be achieved in the classroom. Pupils move through a hierarchy of skill modules at their own rate. The pupils in the questionnaire group made particular reference to this as a favourable feature of the scheme.

Differentiation is much more of a challenge with a whole class in the IT suite. Monitoring progress can be difficult with pupils working on a variety of tasks at different levels. In the preferred model arising from the research, all pupils work on the same task simultaneously, to ensure that all pupils are thoroughly competent with what they have been taught.

A further study is planned using the Dolphin System as a key component of a 'topic' based approach to ICT skills teaching, with differentiation being provided within the skill strand addressed by the topic. It is likely that the preferred teaching model in the IT suite will use a mixture of whole class teaching and peer tutoring.

Is there any evidence to suggest that peer tutoring is more or less effective than other methods of teaching ICT skills

Objective data which might have pointed to an answer to this question was not obtained in this study, although further research is being undertaken. It is thought likely that peer tutoring will prove to be neither more nor less effective than other methods of teaching, but that a variety of methods will be seen to have their place in the effective delivery of the ICT skills curriculum. Teaching methods have to take account of the needs and experiences of the particular teachers and pupils involved.

Whole class teaching is clearly very difficult, if not impossible, where the only resource is a single computer in the classroom. Peer tutoring is an effective teaching model in these circumstances.

Peer tutoring would seem less necessary when an IT suite is available, particularly if it is equipped with projection facilities which all pupils can see simultaneously. However, we suspect that peer tutoring may prove to have a role here too, particularly with regard to pupils' retention of skills learned.

It would seem valuable that every teacher become aware of the possibilities of peer-group tutoring as one of the strategies they might employ to teach ICT skills effectively.

References

Wheldall, K & Beaman, R. (1999) 'Using peer-tutors to increase individual instruction', *Education Today: Journal of the College of Teachers*, September, pp 9-14.

Dolphin System Web site: www.dolphinsystem.net

A **Peer Assisted Learning email list**, hosted by the Centre for Paired Learning, Department of Psychology, University of Dundee provides links to a number of additional internet references to peer tutoring.

Appendix 1 Date Flow Chart

April 1997 – Jun 1999	Experimental work at Dolphin School to develop a peer tutoring approach
Sep 1999 – Jun 2000	Classroom based peer tutoring introduced with primary 5 class at St George's School (4.1)
Jan 2000 – Jun 2000	Classroom based peer tutoring introduced with primary 6 class at Kingswells Primary School (4.1)
Jan 2000 – Jun 2000	Development and evaluation of various models for peer tutoring using an ICT suite at St George's School (4.2)
May 2000 – Jun 2000	Controlled Study at St George's School (4.3)
Jun 2000	Survey of Pupils' Attitudes, Kingswells Primary School (4.4)

Appendix 2 Responses to Pupil Attitude Survey

Each question is taken in turn. The responses have been divided into those from boys and those from girls. Pupils have been given a number so that their responses to other questions can be referred to.

The pupils comments have been reproduced as they were written, though spelling and grammar have been corrected and capital letters have been added in certain places where it was felt that this would facilitate understanding.

Question 1: What do you like about the Dolphin System?

Girls:

- I like the Dolphin System because you can learn lots of things about computers.
- I like the idea of the Dolphin System the way it has steps for you to follow.
- I like the Dolphin System because it gives you a chance to work individually. Also I liked it because you can work at your own pace. Another reason I like it for is that you can be a tutor and teach other children.
- I like creating pictures one and two because you get to create and name any pictures you want to.
- I really like the layout of the dolphin system because you are never stuck and it always makes it clear what you've got to do.
- I like the dolphin system because you can just follow the instructions and if your not sure what to do you can ask a tutor. Also it is good because you go step by step at your own pace and the dolphin system makes it fun on computers.
- I like the Dolphin system because it teaches everything you need to know in an interesting way. It also lets you go at exactly the right speed for you.
- I like all the fun modules in the Dolphin System.
- The best thing about the Dolphin System is when you get to draw pictures.
- I like the Dolphin System because its very interesting and helps you to learn.
- I like learning about skills on the computer because before I didn't know anything about the computer but now I know quite a lot.
- What I like about the Dolphin system is that it is a good and fun way to learn.
- I like that you can go onto the computer and if you have a computer at home you can get to help on it.
- I like how you can go at your own speed and skill. Also its good because it has little tests to make sure you can do it.
- I like it when you can finish a module and you feel a sense of accomplishment.
- I think the Dolphin System is a good System because you can learn how to use the computer the right way and know you're not breaking it also you will have fun on the computer.

Boys:

- The things I like about the Dolphin system is that you can learn new things like how to preview your page and it is fun when you paint things.
- I like how you do not always have to have a teacher around you telling you what to do.
- I like the dolphin system because it gives me full instructions and I can do it at my own speed.
- I liked everything about the Dolphin System so far.
- The Dolphin System is exciting when you don't know much about computers. If you know about computers its not fun.
- I like the dolphin system how it's got a help option after every instruction and I also like it how you can teach other people on the dolphin system and they can teach other people and so on.

- I like the Dolphin System because it gives children a head start to computing it could help if they have a job leading to computers.
- I like it how you can learn fun things.
- I like that you don't have to work at the same speed.
- I like the way you teach other people.
- I like the dolphin system because it helps us find out about computer.
- I think the dolphin system is good for learning and the teacher doesn't help all the time when she's busy.

Question 2: What do you not like?

Girls:

- I like everything about the Dolphin System there's nothing I don't like.
- I like everything.
- I don't really like it when you are working on the Dolphin System on things you already know. Although some people don't know it and they have to make sure everyone understands it.
- I think I like everything about the Dolphin System.
- The dolphin system could maybe be a bit more interesting by showing you other pictures that other people have done.
- Some of the things I don't like about the dolphin system are that you have to go over the things that you have already learnt instead of learning things that you haven't.
- There is nothing I don't like about the Dolphin System.
- I like everything.
- I don't like the writing ones because they're kind of boring.
- I don't like the File saving & Printing because it was very confusing.
- I like everything about it because its really fun.
- I like it all there is nothing bad about it.
- -
- Nothing, I think it's a good system and I like it.
- I like everything.
- I don't like the paint because it goes all wonky but sometimes its fun but not on my computer tests.

Boys:

- I don't like some steps because sometimes they're hard to do like playing with text 3.
- The bit I do not like is sometimes it can be a little bit boring.
- I can't really think about anything I don't like because it's great.
- So far it has been excellent and I don't have a dislike.
- I don't like the tests.
- I don't like it how the system sometimes writes slower than other times when it writes a lot faster.
- I don't think there's anything wrong. It's great!
- I don't like it when it's hard.
- I don't like the hard bits.
- I don't like it when people are slow and people are fast when they teach you.
- I like it so I don't really dislike it at all.
- I don't like how some modules are big and some are really small.

Question 3: Which level are you on?

Girls:

- I am on step 2 module 1.
- I am in the middle of playing with text, step1.
- I have just finished step 1 although I need to do File Saving and Printing by myself.
- I am on step one File Saving and Printing.
- I am on step 2 on the Dolphin System.
- I am on the 1st step and on the module playing with text 2 but I forgot about my creating pictures 1 test so I had to go back and do my test.
- I have done Playing with Text 1 and am ready to go onto Playing with Text 2. I have only taught people on Creating Pictures 1 and 2.
- I am on step 2 Lists and Poems.
- I am on step 2 module 1 on the Dolphin System.
- I am on step 2 Test but I am going onto Story Writing.
- I am on step 1 Creating Pictures 2 on the test.
- The level I am on is Step 1 module Playing with Text 3. That is what I will be going on to.
- I am on step one module Playing with Text 3 test.
- I am on step two but have not started any work on it.
- I'm on Creating Pictures 2 Test.
- I am on Step one playing with text 3, because I like to go at my own speed.

Boys:

- The level I am on is step 2 on module 2, Story Writing.
- I am on the level File Saving and Printing.
- I am on step 2 and the module Finding Information.
- I'm on Step 2 Finding Information.
- I'm on level 2.
- I am on step two file Story Writing.
- I'm on level 2 but I haven't got a certificate.
- I am on Playing with Text 3.
- Playing with Text 2.
- I am on step 2 Story Writing.
- I am on step 2 Lists and Poems.
- I am on poems and lists step 2.

Question 4: Are you better at computer skills now?

- Yes, I do think I am better at computer skills now.
- I think I am better at computer skills now because I have had a lot more practice!
- Definitely. I know lots more about computers and I understand them better. Now because I understand them better they are more fun.
- I think I am better at computer skills because when my Dad goes on the computer at home he asks me for help.
- Yes, I do think I am better at computer skills now, especially with saving a file.
- Yes, I do think I know more about computer skills now that I have been working on the dolphin system because before I started working on the dolphin system I had to guess what buttons mean but now I know what they mean.
- I feel I have a lot more skills on the computer and could do a lot more.
- Yes, I do think I know more about computers now.
- Yes I do, because when I first came on to the computer I didn't know much.
- Yes I do because there are a lot of things to learn on it.
- Yes, I am much better at computer skills now because before I couldn't do anything.
- I have learned one thing and that is how to put my picture on the desk top.
- Yes, I do think I am better on a computer.
- Yes, before I started the system I had used the computer at home but I've never really known about it or how to use some things.
- Yes, my skills have improved a lot.
- Yes, I think I am better at computer skills now. I didn't know how to change the colour in play with text but now I do.

Boys:

- Yes, I am a lot better at computer skills now because I learned quite a lot on the dolphin system but most of them I knew already.
- I don't really think so.
- I am by far better. Before I didn't even know about centering writing.
- Yes! I have improved a lot since the start.
- Yes I do.
- Yes I do think I am better at computer skills now for instance I didn't know about the tab key or the option that allows you to centre the piece of writing you just wrote out.
- Yeah, I think I'm a little bit better at computing.
- I do think I am better at computer skills now.
- A bit better.
- Yes I think I am much better now.
- No not really because I was good before this.
- Yes, I have learned to type a lot faster.

Question 5: Do you like being taught by other children?

Girls:

- Yes, I do like being taught by other children on the dolphin system.
- I like being taught by other children because it gives them a chance to teach instead of having Mrs D. all to yourself for everything.
- Being taught by other children is really fun as I find I can relate to them better. Also I think its good for the children teaching you, because when they teach you it would refresh their memory on the section you were working at.
- Yes, it is nice for children to give up their time to teach me.
- Yes, I do like being taught by other pupils in the class because at the end they will find out how well they've taught and if they need to improve on anything.
- I do like being taught by other children on the Dolphin System because they have been taught themselves and they know what bits are hard and they know which parts you find easy to do so they let you do it quickly.
- It's good to be taught by other children because it gives you more confidence and makes you feel that if they can do it so can you.
- Yes, I do like being taught by other children.
- I don't know what it feels like to be taught by a child because I never had the experience.
- Yes I do because they will have different views from you and you will learn from them.
- Yes, because you are always taught by a teacher and hardly ever taught by another child in your class.
- I do like being taught by other children.
- Yes, I like to be taught by other children.
- Yes, because normally its your friend that teaches you but even still you know them and they can help you.
- Yes, I like being taught by other pupils in the class.
- Yes, I like being taught by other children because we always get taught by our teacher. It's just fun to be taught by other people.

Boys:

- Yes, I like being taught by other children because sometimes they can tell you some stuff teachers don't know.
- Yes, I like it for a change.
- I do not get taught by other children.
- I only get taught by Mrs D only so I don't know.
- Yes because we can share different skills.
- I think it is a very clever idea to ask children to help other children.
- I don't mind getting taught by other children.
- I do like being taught by other children.
- Yes, I like being taught by other children.
- No, I would rather do it myself.
- I don't really mind at all.
- Yes, it is a clever way that helps the tutor work better too.

Question 6: Do you like tutoring?

Girls:

- Yes, I do like teaching others on the Dolphin System.
- I do like teaching others on the computer because it makes you feel like a real teacher.
- I find I really enjoy teaching others on the computer, because as I said it helps to refresh your memory on whatever section you are working at. Also its good because you're learning and sharing your knowledge, and its fun at the same time.
- I would like to teach others on the computer.
- Yes, I do like teaching other people because it gives you an idea of how well you've taught them at the end.
- Yes, I do like teaching others on the computer because I feel that I am helping them on the computer and that feels nice.
- I like teaching other children because I like to pass on experience and skills.
- Yes, I do like teaching other children.
- Yes, I do because you get more time on the computer and it is fun.
- Yes I do because it's fun to teach different people and explain everything.
- Yes, because you get the chance to be a teacher and get to share your skills with another child in a class.
- I do like teaching other people on the computer.
- Yes, I do like to teach others on the computer.
- Yes, I find fun getting to teach other people and it's teaching yourself by going over it again with other people.
- Yes I like teaching other pupils in the class.
- Yes, I like teaching others on the computer because it's like you get to be the teacher and you get people to colour in whether you are a good teacher.

Boys:

- It's really cool to teach other people on the computer so you see how it feels to be a teacher.
- It is OK sometimes.
- Yes, I enjoy teaching others. It is fun to know that you have taught them something.
- Yes, it is good being able to teach others.
- Yes, because it's fun.
- Yes I do like teaching other children. I think it's a good idea for children to tutor other children and it will save the teacher a lot of fuss.
- Mmm, I don't really mind teaching other children.
- I do like teaching others on the computer.
- Yes, I like teaching others on the computer.
- Yes, because you feel important.
- It's OK. I do not mind at all.
- Yes, I enjoy teaching and I find it fun.

Question 7: Do you have a PC at home?

Girls:

- No, I don't have a computer at home but I am getting one for Christmas.
- Yes, I have a computer at home.
- Yes, I have a computer at home and my dad's recently got a new laptop.
- Yes, I do have a computer at home.
- Yes, I do have a computer at home.
- Yes, I do have a computer at home but I don't have the internet.
- I do have a computer at home and I sometimes try out skills on it.
- Yes, I do have a computer at home.
- Yes, I do have a computer at home.
- Yes, I do.
- No, I don't have a computer at home.
- I have a computer but it broke down.
- Yes, I have a computer at home.
- Yes.
- Yes, I do have a computer at home.
- Yes I have got a computer at home a packerbell computer.

Boys:

- Yes, I have a computer at home which I use to surf the net.
- Yes, I do have a computer at home.
- Yes, I have a computer at home in my dining room.
- Yes, I do.
- Yes, I have a computer at home.
- Yes, I do have a computer at home.
- Yes, I do have a computer at home.
- I don't have a computer at home.
- No, I don't have a computer.
- Yes, I have got a PC.
- Yes, I do have a computer at home.
- Yes, I have 2 and 1 in my room.

Question 8: Do you use it more now?

Girls:

- Yes, I use Yasmin's computer quite a lot now.
- I don't use it more now.
- I certainly use paint more as I now know how to use everything better now. Although I am not sure about Word, as I don't use it very often.
- Yes, I do use my computer more at home. I know how to use it.
- Yes, I do use it more now, especially for email.
- I don't think I use the computer now. I have been working on the dolphin system because I think since I have been on the computer at school I don't have to go on the computer at home.
- I don't really use it very much more, but I do a bit.
- Yes, I do use it more now.
- No, I don't, because my mum is always on it.
- Yes, I do. I always use the paint program and make different backgrounds.
- -
- No, I do not go on the computer any more often.
- No, because my brother is on before I can playing games. If I try to get him off he will go into a temper.
- Yes, I've always used it a little but now I use it a lot more.
- I use it a little more because I never really use it.
- Yes, I use a computer to draw pictures for cards and write letters to my friends and family.

Boys:

- Yes, I use it more now than I used to.
- No, not really.
- I suppose I do. Lately I have been sending emails to my cousins.
- A bit more than I did.
- Yes, I use it a lot more.
- Yes, I do in my spare time I test out my skills on the computer and use some buttons I haven't used that much before.
- No, I haven't really used my computer lately because I've got better things to so.
- I don't have a computer.
- No, because I don't have a computer.
- Yes, because it is easier to use.
- No, I do not think so because I always use it.
- Yes, I have got my own password and my own screen saver.

Question 9: Would you like to tutor other classes?

Girls:

- Yes, I would love to tutor other classes.
- Yes, I would like to tutor other classes because I like teaching.
- Yes, I am quite happy teaching other classes, and I don't mind going on a lot.
- Yes, I would love to tutor other classes.
- Yes, it would be really exciting to teach other classes.
- No, I don't think I could teach other classes unless I knew the people.
- I would very much like to tutor other classes, because I would be reminded about what I had already learned.
- Yes, I would like to tutor other classes.
- Yes, I would like to teach another class if I had the chance.
- Yes, I do because it be fun to go back to the start again.
- Yes, because you don't always get to teach another class and if you do you are sharing your skills with another class and teaching them the dolphin system.
- Yes, I would like to teach other classes.
- Yes, I would like to teach other children in other classes.
- Yes, I would really like to tutor other people and classes.
- Yes, I would like to tutor other classes.
- Yes, I would like to tutor other classes and show that I try and learn of the computer.

Boys:

- Yes, I would like to tutor other classes.
- No.
- I would really enjoy it because I like teaching other children things.
- Yes, I would like to.
- No, I wouldn't like to teach other classes.
- Yes, I would like to tutor other classrooms. I think it would be fun and they could tutor the next classroom and so on.
- No, I don't want to teach other classes because I wouldn't be a good teacher.
- I would like to tutor other classes.
- No, I wouldn't like to teach other classes.
- Yes, because it would be a good experience.
- I would not mind at all "but I would have to get paid".
- Yes, I have already taught R_____ from the other class.

Question 10: Any other comments?

Girls:

- -
- I have no more comments.
- I have one more comment to make on the Dolphin System. That is how I find sometimes the instructions are hard to take in. How sometimes there's a bit of an information overload - if you know what I mean. Although if you work through it slowly it's OK. Also I don't think it's very good when you colour in the pictures to see how good a tutor you are. People just colour them all in to be nice.
- I think a lot of children would love the Dolphin System.
- No, there are no other comments.
- I think the instructions could be displayed more clear and visible and set out in a fun way and some pictures as well.
- It really helps me understand the computer better.
- I like the time we get so we can do as much as we can.
- I think that the Dolphin System could be more fun.
- I think the Dolphin System is a very good learning system and schools all over the world should use it.
- I also think it is good because it explains words that you might not know about already.
- I have enjoyed the Dolphin System.
- I do think the computer helps you and I like it very much.
- I think it is a really good and helpful for children learning computer skills because it gives good instructions and help which is easy to follow and learn.
- I think the Dolphin System could help us in later life because we might apply for a job requiring computer skills.
- The Dolphin system encourages young children to use the computer and learn from and not just to play games, to explore the internet and email their friend and in the future see the friend while writing to them.

Boys:

- I would like to have the Dolphin system at home because it's ace.
- My favourite part on the Dolphin System is going on the paint program.
- The modules at the beginning were very easy but now I can see them getting harder and I will have a bit of a challenge ahead.
- The modules are getting harder bit by bit.
- No, I don't have any comments.
- I don't think I have any other comments.
- I think Dolphin System is great.
- I like the Dolphin System because there are so many steps to learn.
- I think it helps children to learn more about computers.
- I think the Dolphin System is very educational.
- I think the Dolphin System helps are educational.
- The Dolphin System is easy, fun and simple so I think it is good.

Appendix 3 Successful Peer Tutoring Models

The first two models below were both used successfully by teachers who had one computer in the classroom. The third was used in an IT suite.

Model A:

This model was devised and used successfully by a primary 3 teacher with a class of 20 pupils with one computer. It could easily be adapted for use with any size of class.

It is suitable if the teacher wishes all children to progress through a skills programme at the same rate and is therefore recommended for teachers using peer tutoring for the first time.

Five able readers were selected and trained as tutors. Each of them was made responsible for a team of three other pupils. (A larger class could likewise be divided into teams of four, each with one tutor and three pupils.)

Each week a set of skills was taught to the small group of tutors. Each tutor was then responsible for teaching the same skills to each of the other pupils in the group. The tutors were given opportunities at various points in the week, when they were not required in teaching groups, to tutor whichever of their pupils was available, and, being more able pupils, found it easy to catch up with other class work.

One afternoon in the week (Wednesday) was designated as 'Dolphin afternoon'. During this time the teacher

- gave any necessary conceptual teaching input to the whole class at the whiteboard.
- tutored the small group of tutors on the next unit of teaching

The children

- used the time to complete any item of work which had not been finished earlier in the week as a result of tutoring or being tutored.
- updated computer notebooks
- continued with other class work or further tutoring (once the computer was available)

The teacher reported that:

- apart from this once weekly teaching input, the pupils ran the entire programme themselves thus freeing her from their requests for attention.
- the pupils much preferred keeping the same tutor throughout.
- pupils were very responsible about informing their tutor or the teacher that they were not free for computer work if they had other pressing assignments to complete.
- pupils who were not tutors requested that they also be allowed to tutor.

The teacher considered that this last could be achieved by altering the model slightly once the pupils became more confident, vis:

Week 1: Tutor teaches pupil A, pupil A teaches pupil B, pupil B teaches pupil C

Week 2: Tutor teaches pupil B, pupil B teaches pupil C, pupil C teaches pupil A

Week 3: Tutor teaches pupil C, pupil C teaches pupil A, pupil A teaches pupil B

This would ensure that all children had the opportunity to tutor. Any of pupils A, B, or C who had difficulty with any aspect of the task would be able to call on their original tutor for assistance.

Further research is to be carried out on this adapted model.

Model B:

This model was used successfully by a primary 6 teacher with a class of 30 pupils and a primary 5 teacher with a class of 22 pupils. Both classrooms had one computer. It could easily be adapted for use with any size of class.

It is suitable if the teacher wishes to allow children to progress through a skills programme at different rates to take account of differences of experience and ability.

Five able readers were selected and trained as tutors. The teacher taught the tutors the first set of skills and established a rota so that each of the other pupils in the class could learn the skills from one of the tutors.

When all children had been tutored, the teacher then taught the next set of skills to the initial group and the process was repeated.

Once the system was well established, the pupils were allowed to select their own tutor by reference to a 'ladder' on the wall which indicated who was further advanced than they were. Those at the top of the ladder continued to be tutored by the class teacher on each new module.

Initially all pupils were required to complete the same task. Subsequently, to allow for differentiation, pupils were timetabled for half hour slots and were allowed to progress through the material at their own rate.

As in the Forbes model, pupils took their turn on the computer when they were not specifically required for other class lessons. Again the teacher reported that the pupils were very responsible about this and frequently passed up the opportunity to have their turn (or to tutor someone else) if they were at a critical point in other work.

Model 5: Accelerated Pair Work

This model was used successfully with a primary 5 class of 22 pupils in an IT suite. It could easily be adapted for use with any size of class.

It is suitable if the teacher wishes all children to progress through a skills programme at the same rate and is therefore recommended for teachers using peer tutoring for the first time.

Before the lesson the pupils were paired up and it was decided who would be tutor and who would be tutee.

At the start of the lesson, the tutors gathered together around one computer while the teacher explained the task and demonstrated any new skills. Meanwhile the tutees logged on at other computers and spent time consolidating the skills learned the previous week.

The tutors then joined their tutees and the two pupils worked together to practise the skills that the teacher had demonstrated. The teacher circulated and assisted where necessary.

Research is still being carried out into the most effective model for use in an IT suite if the teacher wishes to allow children to progress through a skills programme at different rates to take account of differences of experience and ability.

Appendix 4

Summary of Findings

The Research

Research was carried out during the course of the session 1999/2000 in two Scottish schools, St George's School for Girls, an Independent school in Edinburgh, and Kingswells Primary School, a state primary in Aberdeen.

The aim was to evaluate the effectiveness of peer tutoring as a model for teaching ICT skills to primary school pupils.

We looked at the use of peer tutoring with a single computer in the classroom and at its use in an IT suite. We used a controlled study to compare three different teaching models and surveyed pupils' attitudes.

Findings

- Peer tutoring was demonstrated to be an effective means of teaching ICT skills to pupils from primary 3 to primary 6. Significant learning gains were established, both by pupils evaluating their own progress and through objective assessment.
- A variety of factors is required for peer tutoring to be successful. The teacher must model the peer tutoring process carefully at the outset and pupils must be given clear guidelines as to what is expected of them. Organisational systems must be carefully thought out and be as simple as possible.
- The vast majority of pupils were enthusiastic about being taught by other children and about tutoring others. This enthusiasm was sustained. Pupils and teachers noted a wide variety of benefits of peer tutoring, for children in both the tutoring and learning roles.
- Teachers were very enthusiastic about the peer tutoring process when they took full responsibility for running it in their own classrooms.
- Effective models have been established for using peer tutoring both where one computer is installed in the pupils' own classroom and for working with a whole class in an IT suite.
- One of the models allowed for differentiation between pupils of different abilities.

It would seem valuable that every teacher become aware of the possibilities of peer-group tutoring as one of the strategies they might employ to teach ICT skills effectively.

Dissemination of Findings

The draft report was made available, and the findings were referred to, at a presentation about the Dolphin System at Kingswells Primary School, Aberdeen on 30th August 2000. The event was attended by 50 delegates from Kingswells and other local primary schools.

Mention will be made of the report in a presentation about the Dolphin System to participants at the CertICT training course in Cambridge on 5th September 2000 and an oral presentation of the research methods and findings is to be given at a Practitioner Researcher Seminar at St George's School for Girls, Edinburgh on 26th October 2000.

We have been invited to submit articles for publication in *Education Today*, the Journal of the College of Teachers; the *SATIPS* (Support and Training in Preparatory Schools) newsletter; and *Enhance*, the online educational ICT journal published by Pearson Information. It is anticipated that further opportunities for dissemination will arise in forthcoming months.

Rob Porteous

1st September 2000