Levels of computer use and access, at home, by years 9 and 10 pupils: an initial comparison of the types of computer used in the home and school environments

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Levels of computer use and access, at home, by years 9 and 10 pupils: an initial comparison of the types of computer used in the home and school environments

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Loughborough University

Abstract
Recent surveys have consistently reported that over fifty percent of secondary school pupils either own, or have access to, computers at home and that more boys than girls are home computer users. It has also been suggested that there is a link between the use of computers at home and school because there is a similarity between the types of computer found in the two environments. From Government statistics and data from a survey of over two thousand Year 9 and 10 pupils, attending seven schools, this paper questions the validity and reliability of these findings. The confusion between the concepts of ownership and access is discussed, through a consideration of the different cases, arising from the possible owner/user combinations.

The use of sequences of questions to obtain accurate responses, for determining ownership and access to different categories of computers, used by pupils at home, is explored. A model is proposed for categorising home computers in relation to their fitness for purpose, ie educational, entertainment, edutainment. The model is then used as the basis for comparing the levels of access to the categories of computer used by pupils in the home and school environments.

This paper, as one of a series, reports on some of the initial findings obtained from an enquiry into factors influencing pupils’ Information Technology Capability in Secondary Education. Three matters of concern are discussed using findings from published research, Government statistics, and data obtained from a survey of Years 9 and 10 pupils attending seven Secondary schools, conducted in November 1995. These matters are:

- the differentiation between those pupils who ‘own’, ‘have’ and ‘have access to’ a computer at home and the implications in defining, accurately, the term ‘user’;
- the proposal of a model for categorising computers used at home, based on their intended use for entertainment and educational based purposes;
- the possible correlations between gender and the category of computer used at home.

Access to computers at home, and associated gender differences, have been reported frequently. For example, the Non-Statutory Guidance for Information Technology (1990) reminds teachers that:

Statistics show that:
- more boys than girls use computers;
- parents are more likely to buy a home computer for boys than girls

and that

Boys often see computing as an interesting hobby and so become familiar with the technology...

Brown and Howlett (1994), report that:

Many children have a computer at home. Studies show that boys are more likely to have a computer than girls. Girls are thirteen times more likely to have access to a home computer.

When making reference to pupils’ use of computers at home it is important that the distinction between ‘use’ and ‘have’ is clear. Only by considering pupils’ responses to carefully crafted questions, about their computer at home (or not), is it possible to clarify the difference between those who have
and those who use a computer at home. Furthermore, those who ‘have’, is different from those who ‘have access to’ a computer at home, in terms of both ownership and use. The combination of the responses to questions such as, ‘Do you use?’, ‘Whose computer is it?’, and ‘What do you use a computer for?’ starts to address the need to separate the two cases of non-owner/non-user, owner/non-user combinations from the two cases of non-owner/user, owner/user combinations. The truth-table, table 1, summarises how the responses to such questions may be interpreted to distinguish the four cases.

The three questions, to establish the user/owner combinations, do not entirely identify the case of owner/non-user. There is, actually, no fail-safe method which would accurately identify this case. The direct question ‘Do you own computer’, which might seem suitable, is, in fact, not. The respondent, ie a teenager, may confuse the concepts of ‘access’ and ‘ownership’. An alternative question sequence might be ‘Is there a computer in your home?’, ‘Do you use it?’, (or ‘What do you use it for?’), ‘Whose computer is it?’. The problem with this alternative sequence is that the first two questions are leading questions. The respondent may believe that having given the answer ‘yes’ to the first question, then the ‘correct’ answer to the second question is also ‘yes’.

Studies by Moore (1985)\(^5\), Fife Schaw \textit{et al} (1985)\(^4\), Martin (1991)\(^1\), and Kirkman (1993)\(^6\) consistently report that over fifty percent of school children have, or have access to a computer at home. A news report\(^7\), summarising the ‘2005 AD’ survey of 500 teenagers, commissioned by Apple Computer UK (1995), reports:

\[\ldots\text{that} 69\% \text{of teenagers have a home computer} \ldots\]
\[\ldots\text{most teachers also felt that children with access to a home computer have a learning advantage over those without} \ldots\]
\[\ldots\text{over half the teenagers surveyed claimed that their school encouraged them to do their homework on a computer} \ldots\]

Martin (\textit{op cit}) proposes that it is reasonable to make the assumption that there is a link between the use of computers at home and school because there is a similarity between the types of computers found in the two environments. For this assumption to be valid it is necessary to find out the percentages of the different types of computers used at home and school. It is also necessary to produce a classification system for the different makes and models of computers available (of which there are many - past and present), for ease of subsequent data analysis and presentation. It should be, then, a straightforward matter of comparing the percentage of those pupils who have access to the types of computer at home, which may be usable for school work, with the types of computer used at school. None of the surveys cited in this paper has proposed a taxonomy for categorising computers at home; pupils either have, or do not have a computer at home. Heppell [8] suggests that there is some confusion about what a computer actually is. He proposes a definition of a home computer as one which can print at home. There are at least two main problems with this definition:

- Games consoles, at present, are incapable of supporting a printer. However, some

\begin{table}[ht]
\centering
\begin{tabular}{|c|c|c|}
\hline
\textbf{Question} & \textbf{Response} & \textbf{Interpretation} \\
\hline
Q1 Do you use a computer at home? & No & non-user (skip Q2, Q3) \\
& Yes & user (go to Q2) \\
\hline
Q2 Whose computer is it? & Own or shared & owner/user (go to Q3) \\
& Someone else & non-owner/user (go to Q3) \\
\hline
Q3 What do you use it for? & Gives uses & owner/user, non-owner/user \\
& Does not give uses (*) & owner/non-user, non-owner/non user (*) \\
\hline
\end{tabular}
\caption{Truth-table of responses to questions to identify owner and user combinations}
\end{table}
are capable of supporting interactive learning programs and encyclopaedic information on CDROM. (i.e Bill Gates' concept of, 'Edutainment' programs)

- Pupils could do their homework on a computer at home and then, by transferring to disc (file transfer via electronic mail), obtain printout of their work at school; but only if the computers in the two environments are software compatible.

It is important to acknowledge that dedicated games computers (games-consoles) may have a role in contributing towards a pupil’s IT capability (though this is not Heppell’s intention (ibid)). This is an area where further research is required. From the limited data available, there is an indication that for some socio-economic groups, the dominant computers in the home are games-consoles (a matter to be discussed in a subsequent paper). The recent survey reported in this paper has found that when responding to questions about computers at home, pupils give examples of games consoles (Sega, Nintendo) as computers, and state uses beyond that of playing games (e.g. designing new games, quizzes, information retrieval from CDROM). The post-Dearing National Curriculum definition of IT Capability9 continues to acknowledge, from an earlier definition10, the use of a wide range of IT tools ‘to support learning in a variety of contexts’.

The DFE has published, as statistical bulletins, the findings of surveys of Information Technology in schools. In the most recent of these bulletins (February 1995)11, the findings for the March 1994 survey include the percentage of microcomputers available in secondary schools. Comparisons of the 1994 survey findings are also presented, as bar charts, with similar sets of data for the previous surveys of 1988, 1990 and 1992 (ibid, Chart 5, ‘Secondary Schools’). For the 1994 survey, the types of computer are divided into fourteen categories, but for the comparison charts these have been condensed into seven categories; two relating to Acorn Computers, three relating to IBM PCs and clones (including AppleMacs), portable computers and other. These seven categories can be condensed further into three categories; Acorn, PC/Mac and ‘Other’. Since portable computers fall into the PC/MAC category then it is reasonable to place them therein (the percentage for portables in school has risen from 0% to 4% for the period 1988 to 1994). The most significant trends for the period covered by the graphs (1988 to 1994) are the decline of Acorn Computers from 65% to 40%, and the rise of PCs and clones from 10% to 50%.

The DFE statistics from the 1988 and 1994 surveys, showing the three proposed categories of computer found in secondary schools, have been represented as pie-charts in figure 1.

![Figure 1: Percentages of microcomputers in secondary schools, based on three proposed categories of computer](image-url)
These three categories of computers found in schools provide a possible basis for categorising computers used at home. However, two further categories need to be added: dedicated games consoles and none (ie no computer used at home). From the literature review undertaken, no research has been found which has reported data about the frequency of occurrence of different types of computer used at home. As discussed earlier, previous surveys have elicited responses, from pupils attending secondary school, which enquire about 'having' a computer at home, but not the type.

The survey for this enquiry, into factors influencing pupils' Information Technology Capability in Secondary Education, has attempted to address the issues of ownership, access and type of computer at home by using the sequence of questions in figure 2. Only the relevant questions, to this discussion, with their original numbering in the questionnaire, are included.

Referring to Figure 2, questions 7 and 8 determine which one of the five categories of computer was used at home (None, Games, Acorn, PC/MAC, Other). Question 9 acts as a method of validating the category. For

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>What sex are you? Female □ Male □</td>
</tr>
<tr>
<td>6</td>
<td>Do you use a computer at home? Yes □ No □</td>
</tr>
<tr>
<td>7</td>
<td>What make is it?</td>
</tr>
<tr>
<td>8</td>
<td>What model is it?</td>
</tr>
<tr>
<td>9</td>
<td>Which of the following does it have?</td>
</tr>
<tr>
<td>Colour display</td>
<td>Yes □ No □ Don’t know □</td>
</tr>
<tr>
<td>Hard disc</td>
<td>Yes □ No □ Don’t know □</td>
</tr>
<tr>
<td>CD drive</td>
<td>Yes □ No □ Don’t know □</td>
</tr>
<tr>
<td>Sound card</td>
<td>Yes □ No □ Don’t know □</td>
</tr>
<tr>
<td>Printer</td>
<td>Yes □ No □ Don’t know □</td>
</tr>
<tr>
<td>10</td>
<td>Whose computer is it?</td>
</tr>
<tr>
<td>11</td>
<td>Who else uses it? Brother/sister □ Parent □ No one else □</td>
</tr>
<tr>
<td>13</td>
<td>What do you use it for? (Please write up to 4 uses)</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2: Sequence of questions used to determine gender, computer access at home, and type of computer used
example, Amstrad computers can fall into the categories of games console, PC compatible or word processor (ie Other). Only by cross-referencing with responses to question 9 is it possible to determine which of these categories. Where the respondent indicates the use of more than one computer at home, an order of preference is used to allocate one of Acorn, PC or Other categories. For example, if the respondent uses a 486PC and a Nintendo games console then the allocated category is PC. If s/he also uses an Archimedes at home then the category used is Acorn.

Questions 10 and 11 (figure 2) determine the extent of access and ownership. This question also serves to determine to what extent the computer is a shared family resource. Heppell (op cit) refers to the importance of the computer in family life, and for a central location in the home, rather than the child's bedroom (the location where he reports 75% of teenage owners have their computer).

Question 13 determines the nature of computer use at home, relating to educational, entertainment and edutainment purposes. Question 13 also allows identification of a sample of pupils to be selected for semi-structured interviews. At the time of writing this paper a sample of 120 pupils has been selected, to discuss their use of computers at home for design related activity, from those responses which indicate use at home for creative purposes.

The sequence of questions in Figure 2 was used as part of a questionnaire, ‘A Survey about Computers’, which was administered in November 1995. Data were collected from 2144 pupils in Years 9 and 10 from seven schools. The sample included LEA funded, GM funded and Independent school. The geographical distribution of the schools ensured that the sample included pupils from a wide range of socio-economic backgrounds.

The numbers of male and female, and the total number, of pupils in Years 9 and 10 who produced responses to the questionnaire are shown in table 2. Also shown is the number of pupils expressed as a percentage of the number on role (NOR) at the time the questionnaire was completed. The total figure of 83% NOR represents an exceptionally high return rate; indicative of the support received from both staff and pupils in the schools used. There were a small number of returns, six for Year 9 and nine for Year 10, which were unusable because of being illegible, unfinished, or spoilt. These returns have been discounted from all subsequent analysis. Incidentally, the inclusion of these gives a return rate of 84%.

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>%NOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 9</td>
<td>465</td>
<td>519</td>
<td>984</td>
<td>84%</td>
</tr>
<tr>
<td>Year 10</td>
<td>544</td>
<td>616</td>
<td>1160</td>
<td>82%</td>
</tr>
<tr>
<td>Total</td>
<td>1009</td>
<td>1135</td>
<td>2144</td>
<td>83%</td>
</tr>
</tbody>
</table>

Table 2: Sample size and percentage number on role for all survey schools

Using the data obtained from questions 3, 6, 10 and 13 (figure 2) the percentages of pupils has been calculated, for male and female pupils in Years 9 and 10, who fall into the cases of owner/user, non-owner/user and non-owner/non-user (table 3). Because of the difficulties in accurately identifying the case of owner/non-user, discussed earlier, this case has been subsumed into the case of non-owner/non-user.

<table>
<thead>
<tr>
<th></th>
<th>Year 9</th>
<th>Year 10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Owner/user</td>
<td>13%</td>
<td>34%</td>
<td>9%</td>
</tr>
<tr>
<td>Non-owner/user</td>
<td>44%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Non-owner/non-user (Owner/non-user)</td>
<td>43%</td>
<td>26%</td>
<td>51%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 3: Percentages of pupils, by year and gender, falling into owner and user combinations

Table 3: Percentages of pupils, by year and gender, falling into owner and user combinations
The findings in table 3 show little difference between the percentages for male and female pupils in Years 9 and 10, for the case of non-owner/user of a computer at home. For female pupils in Year 9 the percentage, for this case, is slightly higher than for male pupils. These findings refute the gender difference, ‘girls are thirteen times more likely to have access..’, discussed earlier in this paper (op cit). The findings for the cases of owner/user and non-owner/non-user (and owner/non-user) confirm ‘that boys are more likely to have a computer than girls’ (ibid) and ‘more boys than girls use computers’ (op cit).

From the data obtained from questions 6, 7 and 8 (figure 2), pie-charts have been produced for Years 9 and 10, male and female pupils in each of the schools surveyed. Only the charts for all, male and female pupils, for the whole sample, are discussed in this paper (figure 3).

Figures 3a and 3b show that, for male and female pupils, there are significant gender differences:

- the percentage of female pupils who have no access to a computer system at home was found to be higher than for male pupils; by a ratio of approximately 2:1;

- the percentage of female pupils whose only use, at home, is dedicated games machines was found to be lower than for male pupils; by a ratio approximately 1:2;

- the percentage of female pupils (43%) with access to computer systems at home, which can be used for purposes other than playing games and can be connected to a printer, is lower than for male pupils (57%); by a ratio of 1:1.3

Similar gender differences, to greater or lesser extents, were found in each of the schools surveyed.

A comparison of the percentages for the micros in secondary schools from DFE statistics for 1994 (figure 1b), and the computer access at home for all pupils in the sample (figure 3c), shows significant

![Figure 3: Computer access at home for Year 9 and 10 pupils attending seven schools, based on five proposed categories of computer](image-url)
differences in the ratios of the three categories of PC/MAC:Acorn:Other:

- 5:4:1 for micros in all schools (March 94) - (the quotient of 49%:41%:10%)

- 8.5:1:5 for computers used at home by Year 9 and 10 pupils in the sample (Nov 95) - (the quotient of 26%:4%:21%)

Even though these ratios are obtained from different populations, at different times, it is difficult to confirm the assumption, as being reasonable, that there is a link between the use of computers at home and school because of a similarity between the types of computers (op cit). The main difference arises from the differences in the smaller percentage of pupils with access to Acorn computers and the larger percentage of ‘other’ computers at home. For the 49% of pupils who have access to either a games console, per se, or no computer at home there is no similarity. The implication is that if the computer used at home is the same as that used at school, then the level of similarity may be low. In the schools used in the survey, the IT policy did not include use of computers at home for schoolwork, or similarity between the types of computer in the two environments.

In conclusion, previous research into pupils’ use of computers in the home environment may have reported inaccuracies in gender differences and computer access. Similarity with computers found in school and home environments has not been sufficiently investigated. These inaccuracies may have arisen as a result of responses to badly drafted questions about pupils’ computer ownership and access. The findings reported in this paper suggest that computer access at home is lower; gender differences in computer access are insignificant; and there are significant differences in the similarity between the types of computers, and their frequency of occurrence, in the home and school environments.

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