Initial Teacher Training Students’
Attitudes to Use of Information Technology and
Individual Locus of Control

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ABSTRACT Being in control of a computer has been found to be a significant factor in becoming involved in computer use yet, like all individuals, initial teacher training (ITT) students differ in how much they feel that they are in control. It is proposed that those who have a more internal locus of control (who are more likely to believe that they are in control of events) are more likely to enjoy being put in control of a computer. Thus they are more likely to have a positive attitude to using computers and become more involved in their use. This hypothesis was tested using a questionnaire survey of 153 postgraduate students in teacher training. It is concluded that there is a low but significant correlation between being internally controlled and being more prepared to use a computer. This correlation appears more strongly in those who have had little previous involvement with information technology such as the women in this study. This finding is important for those introducing ITT students to the use of IT so that appropriate software and teaching strategies may be selected.

Introduction

For some years now students in teacher training have been required to learn to make effective use of information technology (IT) (DES, 1989) in their teaching subjects. However, on entry to their course, the ITT students have a wide range of previous involvement in and experience of IT. It has been found that computer users are more likely to become involved in some types of programs or applications than others
For example, educational adventure games were the most involving of the software then used in primary schools. On looking more closely at possible cognitive factors related to such user involvement, feelings of being in control of the computer were found to play the largest part in becoming involved with it. This suggests that how prepared someone is to become involved with a computer is related to how they feel about being in control of it.

The concept of locus of control was first introduced by Rotter (1966) in explanation of the differences between individuals in how they make attributions about their success or failure and how this affects learning. People range from being highly internally controlled, i.e. are sure that they influence what happens to them, to highly externally controlled, i.e. those who are sure that anything that happens to them is the result of fate or work by others.

Lefcourt (1982) has summarised much of the research on the concept of locus of control which was also found to vary widely amongst individuals. Individuals with an internal locus of control are more likely to be resistant to outside influence, attain higher academic achievement and to be more active cognitively. Locus of control has also been found to influence the likelihood of an individual’s participation in various activities.

Runyon (1973), in an investigation of management style and job involvement, unexpectedly found that, whatever the management style, locus of control was related to job involvement with those with a more internal locus of control being more involved. Andrisani & Nestel (1976) found that locus of control could be used to predict workers’ motivation and job satisfaction. Generally, an internally controlled individual believes that the results of a job are up to him or her and so becomes involved in the work, whereas an externally controlled individual believes that the results of a job are nothing to do with them and so does not learn from mistakes nor gain any satisfaction from a job well done.

An individual’s locus of control has also been found to be related to their involvement in academic work. Tobin & Capie (1982) measured academic engagement in an experiment to test whether students with a more internal locus of control would become more deeply involved in achieving their objectives when learning scientific skills. They found a low but significant correlation ($p = 0.2, P < 0.05$) between locus of
control and engagement, but locus of control was not related to achievement at or retention of the task.
Similar reasoning may be applied to involvement with computers and indeed Coovert & Goldstein (1980) found that internally controlled individuals had a significantly more positive attitude towards computers than externally controlled individuals. They asked 68 American university undergraduates to complete two scales. They first measured positive attitudes to computers, how much the subject regards the computer as a tool to be utilised, and second, negative attitudes to computers, how much the subject regards the computer as an autonomous or mind controlling entity. They also asked the subjects to complete Rotter’s (1966) Internal External (IE) Locus of Control scale. Their results showed that those who were more internally controlled had a significantly more positive attitude toward computers than those who were more externally controlled.
Arndt et al (1983) also measured locus of control in a study investigating the anxiety, eagerness and curiosity of secretaries about word processing equipment. They carried out a questionnaire study of subjects randomly selected from the secretarial staff at an American university. They received 241 replies from subjects whose experience ranged from those who used a word processor continuously in their work to those who had never used one. The questionnaire assessed the subjects’ experience of word processing, their feelings toward word processors and included a locus of control scale developed by Nowicki & Duke (1974). The results showed that locus of control was related to how reluctant a secretary felt towards using a word processor. Externally controlled individuals were significantly more reluctant to use the equipment and less curious about it. Also, for secretaries with experience of word processing, locus of control was related to curiosity and anxiety, internally controlled individuals being significantly more curious and less anxious about word processing.
Thus it may be anticipated that locus of control is related to involvement in computing, though an investigation by Crable et al (1994) into predictors of computer anxiety found only a weak relationship between locus of control measured using Rotter’s (1966) scale and computer anxiety. Their strongest correlation was 0.29 ($P < 0.05$) between perceiving computers as a threat and being less internally controlled.
However, other research has shown that the original concept of locus of control put forward by Rotter (1966) is not a simple continuum. Levenson (1972) proposed that Rotter’s scale was multidimensional and in studies, both with normal subjects and psychiatric patients (1972, 1973), she found two definite dimensions: control by powerful others and control by fate or gods. She also found evidence for a possible third dimension: control by oneself. This was confirmed by Reid & Ware (1974) who measured the locus of control of 167 university students and used factor analysis to reveal the same three dimensions. In the light of this research, Coovert & Goldstein (1980) carried out a second experiment with 65 subjects. They again measured American university students’ positive and negative attitudes toward computers but used Levenson’s scale to measure their locus of control for the three dimensions. The results confirmed their hypothesis that those with positive attitudes who regard the computer as a tool to be used would score highly on internal control of oneself and low on the other two dimensions. However, they had also proposed that those with negative attitudes would regard the computer as a powerful other and so score highly on the control by others dimension. This second hypothesis was not confirmed. The only dimension for which they found a statistically significant difference between people with positive and negative attitudes towards computers was internal control.

From this research it appears that this dimension, control of oneself or internal control, of the original locus of control scale is the one most related to involvement with computers. It may be described in terms of reinforcement, from Rotter’s (1966) original theory, as a continuum which ranges from highly internal individuals (who attribute reinforcement for their actions to their abilities) to highly external individuals (who attribute reinforcements to external causes). Thus Rotter’s theories are based on behaviourist theories of learning such as those proposed by Skinner (1938). However, it was shown by Wishart (1988) that the cognitive concept of control was more likely to be held responsible for creating involvement with computers than reinforcement. Therefore, a better description of the dimension of internal control is that of Duttweiler (1984) who considered it to be the extent to which an individual believes that they are in control of their lives.
This leads to the hypothesis that control by oneself or internal control will affect attitude to and use of computers. If a person believes they are in control and, as reported by Wishart (1990), being in control of a computer is rewarding, then they will be happy with using a computer. However, if a person believes that they are not in control, being placed in charge of a computer will be unsettling and lead to conflicting emotions.

Should the above hypothesis be proven then differentiated training strategies need to be provided for ITT students as it is important that all students on teacher training courses become familiar with the use of computers. Possible strategies to aid those who are more externally controlled and less willing to take on the use of IT in their teaching will be discussed later.

Method

This theory was tested with a questionnaire survey of attitudes towards computers and internal locus of control of postgraduate teacher training students at Loughborough University carried out before they embarked on their first ‘Learning to Use IT’ assignment (Simmons & Wild, 1994). The questionnaire format was chosen as the simplest way of getting information from the sample population and it was also the format used by Duttweiler (1984) for her internal locus of control scale. Duttweiler’s scale was chosen rather than Rotter’s (1966) original scale because it was designed to measure specifically control by oneself and not control by others or fate. The latter two were not hypothesised to be related to computer use. Also Duttweiler (1984) found her scale to be highly reliable unlike Levenson’s scale for internal control used by Coovert & Goldstein (1980) which Levenson, herself, (1973) found to be unreliable. The questionnaire asked the students to describe their attitudes towards computers and how much experience they had of using computers as well as asking them to complete the Internal Locus of Control Index (Duttweiler, 1984). The design of the questions had been piloted as part of an earlier survey (Wishart, 1988). The questionnaire was issued by hand to all 234 postgraduates training to be secondary school teachers at Loughborough University in the first semester of the 1996/97 academic year. The participants were
volunteers, unrewarded for taking part and naive as to the purpose of the study. A copy of the questionnaire is shown in Appendix 1. SPSS for Windows was used to analyse the data. $X^2$ was used to calculate associations between independent groups and Spearman’s $p$ to calculate correlations as the data were non-parametric. $N$ or $n$, the number of participants, varies according to how much data was missing.

**Results**

153 questionnaires were returned, 81 from females and 67 from males, giving a response rate of 65%.

No significant association was found between internal locus of control (LOC) and gender though females had a wider range of internal LOC scores. Other results linked to gender are shown in Table I.

Table I. Associations between gender and use of, or attitudes to, computers.

Age of participants ranged from 21 to 42 years with an average of 23.47. Statistically significant correlations between age in years, internal LOC and use of and attitudes to computers are shown in Table II. Interestingly, age correlates with being scared of using computers but in opposite directions for males and females, older women being less scared of computers and older men being more scared.

Internal LOC scores ranged from 77 to 129 with a median of 103. Internal LOC also correlated significantly but weakly with attitudes to computers as shown in Table III.
Table II. Correlations between age, internal LOC and use of, and attitudes to, computers.

Table III. Significant correlations between attitudes to computers and internal LOC.

The relationship between internal LOC and attitude towards, and use of, computers becomes clearer if males and females are studied separately as shown in Tables IV and V.

Table IV. Correlations in males between attitudes to computers and internal LOC.

Use made of a computer at home and at work and number of different applications used are the factors most strongly related to positive attitudes to computers as shown in Tables VI, VII and VIII.
Table V. Correlations in females between attitudes to computers and internal LOC.

Table VI. Correlations between use of a computer at home and attitudes to computers.

Table VII. Correlations between use of a computer at work and attitudes to computers.
People who like using computers more are more likely to believe the user is in control of the computer \( (p = 0.43, n = 148, P < 0.001) \) but those who are more scared of using computers are less likely to believe the user is in control \( (p = -0.34, n = 149, P < 0.001) \).

Table VIII. Correlations between number of computer applications used and attitudes to computers.

**Discussion**

One of the most interesting results of this study is the low but definite correlation between the internal dimension of locus of control in females and attitude towards computers as shown in Table V. Those who are more likely to locate control of their actions internally also hold more positive attitudes to using computers.

It is of some concern that this relationship has only been established in females. This may be due to differing levels of involvement with computers for males and females. In this study it can be seen that the females are less involved with computers than the males as Table I shows that men are more likely to use a computer at work and at home and have used more computer applications than women. Earlier, Hawk (1989) found that there was no relationship between locus of control and attitude toward a computer system used at work for individuals highly involved in its use but, for less involved individuals, attitudes to the computer system were substantially less positive in more externally controlled individuals.

It has been an established finding that females tend to be more externally controlled than males (Rotter, 1966; Lefcourt, 1982). This was confirmed more recently by Sherman et al (1997) in their synthesis of research exploring the relationship of gender to locus of control measures conducted in the last two decades. Their research suggests
that while both males and females are becoming more external, females tend to be more external than males on most locus of control measures.

If a person does not believe that they are in control then they will find it difficult to become involved in the control of a computer in such tasks as word-processing, programming or playing a computer game. However, in the case of rigid drill and practice software the computer appears to be in control and so externally controlled people would be more likely to become involved in using computers in this way. The idea of the user controlling the computer versus the computer controlling the user was noted by Papert (1980) when he advocated the use of LOGO, a programming language designed for education, in preference to the drill and practice software typically used. If, as Papert suggests, drill and practice software causes the computer to ‘program’ or control the user then, according to the above discussion of internal locus of control, students with external control will be happy using drill and practice whereas internally controlled students will not. This is indeed what Wesley et al (1985) discovered. When comparing internals and externals on computer aided instruction (CAI) and instruction from text, they found that externals favoured the CAI mode and there was no difference between modes for internals.

Chandler (1984) also notes the change in locus of control from within the program being used to within the user according to the type of software being operated. However, he does not consider it to be a dichotomy like Papert, but rather a continuous variation from tutorials where the program is in control through games, simulation games, experimental simulations and content free tools, to programming languages where the user is controlling the computer.

The relationship between locus of control and involvement with computers is particularly relevant to initial teacher education. It is extremely important that student teachers achieve positive experiences of IT if they are to continue with its use in their teaching. Tutors could use a student’s feelings about being in control elicited through discussion or questionnaire to predict how their students would react to the different types of computer applications. The tutor needs to initially provide the student with appropriate software, applications with lots of opportunity for user control for internals and more structured tasks for externals. Thus IT assignments need to be differentiated by task
according to a student’s experience of and attitudes to IT to ensure they are successful at controlling the computer.

In the particular case of the Learning to Learn IT assignment set at Loughborough University (Simmons & Wild, 1994) the PGCE student is required to acquire a novel IT skill and evaluate their learning process in doing so. Differentiation by task occurs as the IT skill to be learned is chosen according to the student’s previous experience with IT and their individual needs.

In this study, as shown in Table II, increasing age was seen to be linked to increasingly internal LOC, and as expected, older women were found to be less scared of using a computer; unexpectedly, older men were found to be more likely to be scared of using a computer. This is an important finding for those of us involved in training mature students of IT. It is quite possible that more mature female students than mature male students have used computers, for instance, for secretarial or administrative work in previous careers.

Lastly, Tables VI–VIII show that the most positive attitudes to the use of computers were related to amount of use made of computers, especially the use of a computer at home. It appears that to learn to successfully control and to enjoy using a computer one needs to be made available in the home environment. Indeed in the evaluation of a project carried out by the NCET introducing portable computers to schools, Stradling et al (1994) pointed to the successful introduction of IT into lessons resulting from teachers being encouraged to take the school computers home. Also students who took the school computers home were more confident in their use of IT and made more use of it at school.

Conclusion

It is concluded that being in control of a computer is a major factor in motivation to use it and that an individual’s belief as to the source of control of their actions affects the level of their involvement with a computer. In particular female ITT students with more internal sources of control held more positive attitudes towards using computers. This finding is important for those introducing students to the use of IT so that appropriate software and teaching strategies may be selected.
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References


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APPENDIX 1

This questionnaire is part of a study that I am carrying out in the Department of Education. It contains questions about people's opinions of themselves and their attitudes towards computers. I would be very grateful if you would complete it and return it to me via your FPS tutor.

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