

RESEARCH

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Economic Impact of Training and
Education in Basic Skills

Summary of Evidence

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Economic Impact of Training and Education in Basic Skills

Summary of Evidence

**National Research and Development Centre for adult literacy and numeracy
Institute of Education, University of London**

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Contents

Section 1. Introduction 1

Section 2. Overview 2

Section 3. Earnings..... 4

Section 4. Employment..... 10

Section 5. The workplace 14

Appendices

APPENDIX 1: COURSE DURATION AND SKILL DEVELOPMENT 16

APPENDIX 2: TABLES 20

APPENDIX 3: NOTES ON SELECTED SOURCES..... 35

APPENDIX 4: EVIDENCE ON EARNINGS FROM THE USA 38

APPENDIX 5: IMPACT OF THE EMPLOYER TRAINING PILOTS 40

APPENDIX 6: DISTINGUISHING EVIDENCE BY METHOD..... 41

APPENDIX 7: REFERENCES..... 42

Section 1 - Introduction

- 1.1 This paper summarises recent quantitative evidence on the economic returns to having or improving literacy and numeracy skills.
- 1.2 The summary includes evidence on earnings and employment, and distinguishes between returns to having basic skills whenever these are acquired, and returns to acquiring basic skills in adulthood. The review is confined to economic returns to individuals; macro effects - on productivity for example - are not considered.
- 1.3 **Section 2** provides an overview of the evidence. **Section 3** summarises the evidence on earnings, **section 4** summarises the evidence on employment and **section 5** includes US evidence on the workplace.
- 1.4 Where possible, evidence is distinguished according to the age at which education and training is undertaken, and whether undertaken in the context of a Further Education college or the workplace.
- 1.5 Under each heading, and unless otherwise specified, sources are presented in chronological order, most recent first. All sources are identified at first mention and fully referenced; sources are often quoted.
- 1.6 UK Evidence is largely taken from five data sets: the 1958 National Child Development Survey (NCDS), the British Cohort Study 1970 (BCS70), the 2003 *Skills for Life* survey, and a longitudinal study of a representative sample of adult literacy and numeracy learners. Evidence from the United States is also presented, largely in Appendices 1 and 4.
- 1.7 Appendices are included in a separate attachment. There is no authoritative analysis on the relation between course duration and economic outcomes for individuals. There is, however, evidence on the relationship between duration and skill development, with implications for economic outcomes, and this evidence is summarised in **Appendix 1**. **Appendix 2** presents a set of tables giving further statistical information about the data presented in the main text. **Appendix 3** provides further details on selected sources. **Appendix 4** presents further evidence on earnings from the USA. **Appendix 5** provides evidence on the impact of Employer Training Pilots. **Appendix 6** distinguishes some of the evidence on the impact of literacy and numeracy provision by method; and **Appendix 7** provides a full set of references.

Section 2 - Overview

- 2.1 This report summarises the evidence on the impact of an adult's possession of basic skills on their employment and earnings: on economic impact rather than wider benefits such as improvements in self-esteem or impact on children's education for example.
- 2.2 UK evidence is largely from 4 data sets: the 1958 National Child Development Survey (NCDS), the British Cohort Study 1970 (BCS70), the 2003 Skills for Life survey and the longitudinal study of a representative sample of adult literacy and numeracy learners.
- 2.3 There is conclusive evidence on the positive effects of having basic skills as an adult. The estimates do vary across different studies and it is important to distinguish between people who have good literacy and numeracy skills and may have attained them in childhood; with adults who lacked these skills and attained them in adulthood: this latter group are more likely to suffer multiple deprivation and therefore earnings returns are likely to take longer to realise.
- 2.4 Comparing those who have basic skills as an adult with those who do not, there is conclusive evidence of the positive effect, even after controlling for background, prior ability and other characteristics that influence earnings and employment. De Coulon et al found that as literacy and numeracy increased, so did earnings: an additional standard deviation in literacy results in approximately 14% higher earnings, whilst an additional standard deviation in numeracy results in 11% higher earnings. Grinyer compared people with and without literacy and numeracy skills. The earnings premium for level 1 literacy (the Skills for Life target threshold) was 12%, and the premium was larger for women than men. Their chances of being in employment were also higher: those with Level 1 literacy are 6% more likely to be in employment than those with Entry Level 3. For numeracy, there was a 13% earnings effect for Entry level 3 skills (the Skills for Life target threshold) over entry level 2 and below; and a further 6% effect for Level 1 skills (the equivalent of grade D-G at GCSE maths). Those with Entry were Level 3 are 6% more likely to be in employment than those with Entry level 2 or below. In turn, those with Level 1 are 4% more likely to be in employment than those with Entry Level 3.
- 2.5 Adults who attain basic skills later in life have a number of hurdles to overcome which impact on how quickly they are able to gain full time employment and higher earnings. Bynner & Parsons (2006) show that adults who improved their numeracy skills between ages 21 and 34 were more likely to have their own home, savings and less likely to be on benefits than those who did not improve their skills. McIntosh and Vignoles 2001 found the wage premium for having numeracy skills at level 1 or above was 8-10%; the wage premium for level 1 literacy skills was 2-6%.
- 2.6 There is insufficient evidence on whether the impact varies for those who learn through different routes - e.g. through further education courses or workplace provision. As in the US, participants' performance was seen to improve over the 2 years after the course: it was the learners who used their literacy skills actively who showed consistent gains.

Map of UK evidence - attaining skills in adulthood

	Impact of attaining literacy skills on earnings	Impact of attaining numeracy skills on earnings	Impact of attaining literacy skills on employment	Impact of attaining numeracy skills on employment	Comment
Metcalf and Meadows 2009	No	No	Inconclusive	Inconclusive	High levels of attrition
Bynner and Parsons 2006	Yes	Yes	Yes: men	Yes: women	
Machin 2001	Yes: men	Yes: men	n/a	Yes: men	
McIntosh and Vignoles 2001b	Yes	Yes	Yes	Yes	Consistent results from two data sets. Employment effects small/statistically insignificant

Map of UK evidence - having skills whenever acquired

	Impact of attaining literacy skills on earnings	Impact of attaining numeracy skills on earnings	Impact of attaining literacy skills on employment	Impact of attaining numeracy skills on employment	Comment
De Coulon 2007	Yes	Yes	Yes: men Yes: women	Yes: men No: women	
Grinyer 2006	Yes	Yes	Yes	Yes	
Bynner and Parsons 2005				Yes	Numeracy more significant than literacy as predictor of negative outcomes, especially for women
McIntosh and Vignoles 2001a	Yes	Yes	No: women	No: women	Earnings effects larger for numeracy than literacy; effects small/statistically insignificant with all controls added
Machin 2001	Yes	Yes	No: women	Yes: men	
Dearden 2000 Dearden 2002	Yes	Yes	Yes	Yes	Employment evidence on literacy mixed: ranged from no effect to significant effect

Section 3 - Earnings

- 3.1 There is extensive evidence on the earnings and employment returns of having basic skills, however and whenever these are acquired. There is less evidence on the returns to attaining basic skills in adulthood, although most of this evidence suggests a positive impact on labour market outcomes.

Attaining basic skills in adulthood

- 3.2 There is evidence of the impact on earnings of improving basic skills in adulthood. The limited evidence is inconclusive on whether adult literacy and numeracy courses have an economic impact. 'Adult' denotes any person aged 16 or over.

Metcalf and Meadows, 2009¹

- 3.3 Longitudinal study: followed literacy and numeracy learners taking courses in Further Education leading to qualifications in 2002 and 2003; compared their progress with a comparison group who also had low or no literacy or numeracy qualifications, but who did not take a Skills for Life course. The original sample comprised 2012 learners and 2,255 non learners. By wave 4 the sample had reduced to 461 learners (23% of wave 1 sample) and 468 non-learners (21% of wave 1 sample).
- 3.4 Between wave 1 and wave 4 learners experienced an increase in net annual earnings of £560 compared to £542 for non-learners. This small difference was not statistically significant. This study, therefore, did not find evidence of wage returns to college based courses in literacy and numeracy. Nor is it correct to infer that the study finds conclusive evidence of no wage return. This stronger conclusion is not supported by the evidence. Statistical significance is difficult to establish, owing to sample attrition; there is the possibility of bias brought about through sample loss; and the numbers fluctuate significantly over the period of measurement.

Bynner and Parsons 2006

- 3.5 Draws on data in the 1958 and 1970 British cohort studies. Whilst not demonstrating causality the analysis points to strong relationships between poor basic skills and income (and related outcomes).
- 3.6 Compared with women who had a poor grasp of literacy or numeracy at both age 21 and 34, women who had improved their literacy or numeracy by age 34 were more likely to be generally better off and to have savings and investments.
- 3.7 Compared with men who had a poor grasp of literacy or numeracy at both age 21 and 34, men who had improved their literacy or numeracy by age 34 were more likely to own their own home, and they were less likely to be living on state benefits and to have borrowed money from a friend, family member or other source.

¹ For further information see Appendix 3.

*Machin et al, 2001*²

- 3.8 Assessed the impact of skills improvements between age 16 and 37 using skill measurement tests in the NCDS at age 37.
- 3.9 Individuals who reported that their skills had improved generally earned more than those who did not believe their skills had improved. For example, males who claimed to have improved their numeracy skills earned 3% more than those who did not make such a claim.
- 3.10 Women who claimed to have improved their numeracy skills earned 11% more than those who made no such claim.
- 3.11 Males who move up the literacy skill distribution between the age of 16 and 37 earn more, particularly those who start at the upper end of the distribution.
- 3.12 Focussing on the *wage effect* of having Level 1 skills, relative to below this level, numeracy skills appear to have a greater effect on earnings than literacy skills. But when focussing on the *change* in skills between the ages of 16 and 37, literacy skills have a greater wage effect, for men at least, and if the male was initially at the upper end of the skills distribution at age 16.
- 3.13 These results suggest that for adults with very low basic skills, improving their numeracy to at least Level 1 will have a greater effect on earnings than improving their literacy. Adults who already have a good grounding in basic skills will see the greatest wage gains from further increasing their literacy rather than their numeracy skills. Thus, for numeracy the key seems to be to get skills to an acceptable level, while for literacy, the gains will go on rising as skills continue to be improved (at least for males.)

*McIntosh and Vignoles 2001b*³

- 3.14 Sources of data: 1958 National Child Development Study and the 1970 British Cohort Study.
- 3.15 The study estimates the potential impact on earnings from improving the literacy and numeracy skills of adults.
- 3.16 The model includes controls for a range of additional factors that might be correlated with literacy and numeracy: educational level; social class and background, type of school attended as a child, variables measuring parental interest in education, region and ability in reading and mathematics on entering school. Once these factors are controlled for the wage premium from having Level 1 or above numeracy skills is 8-10%, whilst the wage premium from Level 1 literacy skills is 2-6%.
- 3.17 Two notable features of these results: (1) the two data sets, which include two completely different groups of workers of different ages, show strikingly consistent results; (2) the large effect of numeracy on earnings, even after allowing for many other factors that might also influence earnings.

² See Appendix 2, tables 7 and 8.

³ See Appendix 2, table 5.

Having basic skills

3.18 People with higher literacy and numeracy skills earn more in the labour market than those with lower basic skills. The returns are over and above any general effect on earnings from a person's background, ability and qualifications.

De Coulon, Marcenaro-Gutierrez, Vignoles 2007⁴

3.19 Analyses the relationships between basic skills and earnings for the British Cohort Study (BCS) cohort in the 2004 labour market. Controls for prior ability as well as numerous other factors that influence earnings.

3.20 Literacy and numeracy continue to be valued in the labour market.

3.21 The raw wage premium from having level 1 numeracy is greater in the 2004 labour market, as compared to the premium in 1991. Changing economic conditions, including inflation, do not negate this result. One inference is that the recent increase in supply of numeracy skills has been met by an even greater increase in the demand for such skills.

3.22 Literacy and numeracy have a strong association with individuals' earnings. Controlling for an individual's ability and family background, an additional standard deviation in literacy results in approximately 14% higher earnings, whilst an additional standard deviation in numeracy results in 12% higher earnings. Just under 10% of the variation in earnings for this cohort can be explained by differences in literacy and numeracy skills.

3.23 Instrumental Variable results (more likely to establish causality) confirm the strong and statistically significant relationship between adult literacy and numeracy and age 34 earnings.

3.24 The Instrumental Variable results suggest a higher range of possible effects from literacy and numeracy on earnings. For example, the effect of an additional standard deviation in literacy ranges from 29% to 37%; the effect of an additional standard deviation in numeracy ranges from 29% to 32%.

Grinyer, 2006⁵

3.24 Large earnings effects for both literacy and numeracy skills.

3.25 Literacy: 12% premium for Level 1 literacy over Entry level 3 skills. The effect for Level 2 literacy appeared to be negligible, and there was no statistically significant effect for Entry level 3 literacy over Entry level 2 and below.

3.26 Numeracy: 13% earnings effect for Entry level 3 skills over Entry level 2 and below, and a further 6% effect for having Level 1 skills, the equivalent of a D-G grade at GCSE mathematics. However it is at the top end of the numeracy scale where the effects are largest, with a 19% effect for above Level 2 numeracy skills.

3.27 Gender: gender differences are also significant for the returns to literacy, with premiums significantly larger for women than men. This difference is not repeated for numeracy.

⁴ See Appendix 2, tables 9-11.

⁵ Based on data from the Skills for Life Survey. See Appendix 3 and Appendix 2, tables 15 and 16.

3.28 Age: looking at the earnings effect by age there is for both literacy and numeracy a curved age profile, with the earnings effects highest for people in their forties. There is a positive Level 1 literacy effect for the young (aged under 25) at around 10%, though for numeracy the earnings effect for the under 25s is not statistically different from zero, indicating that literacy, rather than numeracy is of most importance for the young.

McIntosh and Vignoles 2001a⁶

3.29 Sources of data: NCDS and IALS.⁷

3.30 Numeracy: Individuals with Level 1 numeracy skills earn between 16 and 21% more than individuals with numeracy skills below this level, taking no account of any other factors that might influence earnings. Controlling for family background and other demographic characteristics the premium falls to 11-12%. This figure is similar in both datasets and appears to be a robust finding.

3.31 Controlling for ability at age 7 with the NCDS the wage premium associated with Level 1 numeracy skills is 9%. Controlling for ability at age 7 and 16, and for educational achievements, the wage premium to Level 1 numeracy falls to 6%. The additional effect from numeracy, over and above the effect it has via education level and age 16 ability, is relatively small. Basic skills are highly related to qualification levels, and most of their impact on labour market outcomes works through enabling individuals to achieve better qualifications. Still, a numerically important, if statistically insignificant, impact of a 6% difference in earnings exists, even after controlling for a 'qualifications mechanism'.

3.32 Literacy: an individual with Level 1 literacy skills earns around 16% more than someone with lower level literacy, when no controls are used in the model. Controlling for background characteristics has no impact on the IALS estimate of this premium, although the NCDS coefficient is significantly reduced. Including early ability reduces the premium to 7% (statistically insignificant). Where 'educational qualifications' are added to the basic controls, this more or less eliminates the wage premium to Level 1 literacy in the NCDS, although in IALS the premium only falls to 12%. Finally, after controlling for age 7 and 16 ability and education level the Level 1 literacy effect is very small and insignificant.

Machin, McIntosh, Vignoles and Viitanen 2001⁸

3.33 Individuals with better reading and mathematics skills at age 16 have higher labour market earnings, and are more likely to be in work, even controlling for a person's attitudes and soft skills. Much of this positive link with reading and numeracy skills operates via an indirect effect on individuals' qualification level. Nonetheless, there remains an independent positive relationship between literacy and numeracy and some labour market outcomes, even after allowing for individuals' attitudes and soft skills and their eventual qualification level.

3.34 Males in the top quintile of reading ability at 16 earn 20% more than those in the bottom quintile. This wage premium is reduced to 18% once soft skills are added to the model, and falls to 7.4% once the person's qualification level is included. This effect remains statistically significant, suggesting that there is an impact of age 16 reading skills on earnings that operates over and above the effect that such reading skills have on the acquisition of qualifications.

⁶ See Appendix 2, tables 1 and 2.

⁷ For more information see Appendix 3.

⁸ Secondary analysis of NCDS.

- 3.35 Males in the top quintile in mathematics also earn 20% more than those in the bottom quintile. This premium is reduced to 18% if 'soft skills' are added to the model, and to 4% (insignificant) if the person's qualification is included.
- 3.36 Males with Level 1 numeracy skills earn 9% more than those with skill levels below Level 1 and this result is not reduced or made insignificant by the inclusion of the 'soft skill' variable.

Dearden et al 2000; Dearden, McIntosh, Myck and Vignoles 2002⁹

- 3.37 People who have numeracy skills at or above Level 1 of the BSA Standards earn around 15 to 19 per cent more than those whose numeracy is below this level. Even when education and qualification levels and family background are controlled for, people who have numeracy skills at or above Level 1 of the BSA Standards earn around six to seven per cent more than those whose numeracy is below this level.
- 3.38 People who have literacy skills at or above Level 1 of the BSA Standards earn around 15 per cent more than those whose literacy is below this level. When education and qualification levels and family background are controlled for, the evidence on literacy is inconsistent, one dataset suggesting that people who have literacy skills at or above Level 1 of the BSA Standards still earn around 11 per cent more than those whose literacy is below this level, while another dataset suggested an advantage of only one to three per cent.

Evidence from the USA¹⁰

- 3.39 The evidence is mixed, but a growing body of evidence suggests a positive impact on earnings of improving basic skills in adulthood.

Cunha et al 2007

- 3.40 At historically funded levels, public job training programs and adult literacy and educational programs, like the GED, that attempt to remediate years of educational and emotional neglect among disadvantaged individuals have a low economic return and produce meagre effects for most persons.¹¹

Tyler 2004a

- 3.41 Tests the extent to which the accumulation of basic cognitive skills, as measured by a post schooling math test, matter for young dropouts entering the 2002 labour market. Based on a sample of dropouts who were age 16-18 when administered a math test in the late 1990s, estimates indicate that a standard deviation increase in the test score is associated with 6.5% higher average earnings over the first 3 years in the labour market.

⁹ Using NCDS and the Labour Force Survey (LFS).

¹⁰ For more information see Appendix 4.

¹¹ But Comings 2009 suggests that provision in receipt of higher levels of funding than Cunha reports on will have a positive impact. See Appendix 1, p.3.

Tyler et al 2004b

- 3.42 Estimated the relative earnings of two groups of male high school dropouts who took the GED exams in 1995: those who passed the exams, obtaining the credential, and those who failed the exams. Estimates from several different specifications all show greater mean quarterly earnings growth among those who obtained a GED than among unsuccessful candidates.

Tyler 2000

- 3.43 For young white dropouts finds evidence of increased earnings for GED holders of 10-19 percent. GED earnings effects are concentrated among the lowest skilled GED holders. Results are robust across natural experiments that use differential treatment and comparison groups. This evidence may not be inconsistent with Cameron and Heckman 1991: Tyler's estimates are based only on the lowest skilled GED-holders; the sample used by Cameron and Heckman includes dropouts who vary in initial skill levels.

Cameron and Heckman 1991

- 3.44 Analyses the growing proportion of high-school persons who achieve that status by exam certification rather than through high school graduation. Exam-certificated high school equivalents are statistically indistinguishable from high school dropouts. Both dropout and exam-certified equivalents have comparably poor wages, unemployment experiences and job tenure.

Section 4 - Employment

Attaining basic skills in adulthood

- 4.1 The evidence strongly suggests that attaining or improving basic skills in adulthood improves the prospects of employment.

Metcalf and Meadows 2009

- 4.2 For employment at wave 4 there was not a statistically significant difference in the change in the proportions employed between learners and non-learners. The authors conclude that it can take a long time for those undertaking literacy/numeracy courses to move into paid employment; literacy and numeracy will not of themselves deliver workplace skills but they form a foundation which people can use to gain relevant skills.
- 4.3 The study provides convincing evidence of this. The most substantial evidence of employment effects derives from the self appraisal measures, including changes in self esteem, perceptions of literacy and numeracy skills, and commitment to education and training. These show convincing and statistically significant patterns of improvement; there was a large and significant difference between learners and non-learners.

Bynner and Parsons 2006

- 4.4 Looked at members of the BCS cohort whose literacy and numeracy skills changed between 1991 (aged 21) and 2004 (aged 34). Men who improved their literacy skills were more likely to be in full-time employment (94% compared to 81% of those whose skills were poor at 21 and remained poor). Women whose numeracy skills had improved were more likely to be in full-time employment at age 34 (43% compared to 27% whose numeracy skills were and remained poor).

Machin, McIntosh, Vignoles and Viitanen 2001

- 4.5 Males who improve their numeracy skills between the age of 16 and 37 have a great probability of being employed.

McIntosh and Vignoles 2001b¹²

- 4.6 Estimated impact of literacy and numeracy skills on the probability of employment at age 33 (NCDS) and at age 26 (BCS).
- 4.7 The raw correlations between numeracy and literacy and the probability of being employed are large and positive. Having Level 1 or above numeracy skills is associated with having a 4-6 percentage point higher probability of being employed. Having Level 1 or above literacy skills is associated with having a 5-9 percentage point higher probability of being in employment.
- 4.8 The final model controls for a range of additional factors that might be correlated with literacy and numeracy: social class and background, type of school attended as a child, variables measuring parental interest in their children's education, region and ability in reading and mathematics on entering school. Once these factors are controlled for, the coefficients are reduced and tend to become statistically insignificant, and the data sets give slightly less consistent results. Having Level 1 or above in numeracy is associated

¹² See Appendix 2, table 6.

with 1 (BCS¹³) – 4 (NDCS) percentage point higher probability of being employed, compared to those having numeracy skills below Level 1. Having Level 1 or above in literacy is associated with 3 (NCDS¹⁴) – 6 percentage point higher probability of being employed compared to those having literacy skills below Level 1.

Having basic skills

- 4.9 Having basic skills has a positive impact on employment and employability. There are gender effects, although there is no consensus on the relative importance of literacy and numeracy for men and women.

De Coulon et al 2007¹⁵

- 4.10 Having better basic skills is significantly associated with the likelihood of being in employment and full time employment at age 33/34.
- 4.11 Women: with no controls the model suggests there is a positive and significant relationship between literacy and numeracy and being in employment. Controlling for early ability and family background measures there is still a positive and significant relationship between literacy and employment. An additional standard deviation of literacy is associated with a 3.5 percentage point higher probability of being mostly in employment at age 33/34. The relationship between numeracy and employment is insignificant in this model.
- 4.12 Men: with no controls the model suggests a significant relationship between literacy and numeracy and employment for men. Controlling for early ability and family background measures there is still a positive and significant relationship between numeracy and employment. An additional standard deviation of numeracy is associated with a two percentage point higher probability of being most employed at age 33/34.

Grinyer 2006¹⁶

- 4.12 For women literacy appears to have the greatest effect on labour market participation and finding work, and this effect is largest at Level 1. Women at this level are around 7% more likely to be in the workforce and be employed than women with Entry level 3 literacy. Numeracy skills appear to have an additional positive effect, though the results are not statistically significant.
- 4.13 For men literacy is important, particularly on labour market participation. Men with Entry level 1 or 2 skills are 12% more likely to be outside the labour market than men with Entry level 3 literacy. Numeracy is also important with men at Entry level 3 being 8% more likely to be economically active than men with lower numeracy skills. Level 1 numeracy skills increase this likelihood by a further 3%.
- 4.14 Job seekers: small effect for both literacy and numeracy. People with Level 1 literacy are just under 3% more likely to be employed rather than be a job seeker than those with Entry level skills. For Level 1 numeracy the effect is smaller but still positive at 2%.

¹³ Insignificant at 10% level

¹⁴ Insignificant at 10% level.

¹⁵ See Appendix 2, tables 12 and 13.

¹⁶ See Appendix 2, tables 17 and 18.

Parsons and Bynner 2005

- 4.15 Even when combined with good literacy women's low numeracy is a significant predictor of negative outcomes, whereas poor literacy combined with good numeracy generally isn't.
- 4.16 Women with poor numeracy, irrespective of their standard of literacy, were: less likely to be in full-time work; if in work, more likely to be in semi-skilled or unskilled jobs; more likely to be engaged in home care; more likely to be in a non-working household.
- 4.17 For men and for women with poor numeracy skills, their skills will decline if not used and practised in employment. This may create a vicious circle: poor numeracy leads to limited employment, which leads to declining numeracy, which makes it harder to obtain and stay in employment.

McIntosh and Vignoles 2001a¹⁷

- 4.18 Female results using the NCDS are statistically insignificant – to be expected since the female employment rate is low in the NCDS sample. The IALS results however, which cover individuals of all ages, suggest that the employment effects of basic literacy and numeracy are greater for women than men, in all cases except for Level 2 literacy.
- 4.19 Comparing the male results, the NCDS suggests a larger numeracy effect but a smaller literacy effect, compared to the IALS results. The largest effects observed for men are therefore the literacy effects in IALS, which suggest that, in the raw data, a man with Level 1 literacy skills has a probability of employment 12 percentage points higher than a man below Level 1, while the difference is nine percentage points after controlling for family background and education.
- 4.20 For women, literacy effects also dominate numeracy effects, with a woman whose literacy skills are at Level 1 having a probability of employment 18 percentage points higher than a woman below Level 1 in the raw data, and 13.5 percentage points once family background and education is controlled for. Finally, in all cases, Level 2 effects are greater than Level 1 effects, with the exception of the female literacy results in IALS.

Machin, McIntosh, Vignoles and Viitanen 2001

- 4.21 Taking no account of any other factors, males in the top quintile of mathematics ability at age 16 have a 6.6 percentage point higher probability of being employed than those in the bottom quintile. This is reduced to 5.5 percentage points if 'soft skills' are added to the model, and to 4.8 percentage points if the person's qualification level is included.
- 4.22 For women, reading is a more important determinant of employment, although the results are generally insignificant once the person's qualification level is added to the model.

¹⁷ See Appendix 2, tables 3 and 4.

Dearden et al 2000¹⁸

- 4.23 People with Level 1 numeracy are about five percentage points more likely to be employed.
- 4.24 Even when education level is controlled for, people with Level 1 numeracy are still about two to three percentage points more likely to be employed.
- 4.25 The evidence for literacy is mixed, one dataset suggesting a five percentage points advantage for employment (zero after controlling for other factors), the other a 13 percentage points advantage (10 percentage points after controlling for other factors).

¹⁸ Using NCDS and the LFS.

Section 5 - The workplace

Hollenbeck 2006

- 5.1 Estimates impact of workplace literacy programmes. Uses data from two large nationally representative surveys: the National Household Education Survey (NHES) and the Current Population Survey (CPS).
- 5.2 When the models are estimated over the entire population, workplace literacy programme participation is estimated to increase earnings by 17% (NHES) or 11% (CPS). Part of the impact comes from the industries and occupations of participants. However, they remain substantial even when industry and occupation are controlled for, with the estimated increase falling to 13% (NHES) and 8% (CPS).
- 5.3 Estimates from the two data sets are inconsistent. Estimates from the NHES data set show that males receive a 20% higher earnings payoff from participation in literacy programmes than otherwise identical males who do not participate. The return is only slightly less when industry and occupation controls are added to the model. In the CPS estimates, males are shown to receive no payoff. On the other hand, from the CPS estimates, women receive a 14-17% earnings payoff that hardly changes when industry and occupation are added to the model. But from the NHES, the payoffs for women, while positive, are not statistically significant. Hollenbeck suggests that inconsistencies may have resulted from a combination of differences in the dependent variable and sampling error.

Appendices

APPENDIX 1: COURSE DURATION AND SKILL DEVELOPMENT 16

APPENDIX 2: TABLES 20

APPENDIX 3: NOTES ON SELECTED SOURCES..... 35

APPENDIX 4: EVIDENCE ON EARNINGS FROM THE USA 38

APPENDIX 5: IMPACT OF THE EMPLOYER TRAINING PILOTS 40

APPENDIX 6: DISTINGUISHING EVIDENCE BY METHOD 41

APPENDIX 7: REFERENCES..... 42

APPENDIX 1 - COURSE DURATION AND SKILL DEVELOPMENT

Introduction

We know of no authoritative quantitative evidence directly relating length of course to economic outcomes. However, there is a growing body of evidence relating courses, length of courses and patterns of learner engagement to learner progress and skill development. The evidence strongly suggests that length and intensity of course, together with related patterns of learning, are significant determinants of progress and skill development, and these, in turn, are necessary conditions of literacy and numeracy courses having an economic impact.

Courses and progress

The NRDC Learner Study: Warner and Vorhaus (eds.) 2008

The Learner Study took place between 2003 and 2006. One aim was to identify how far literacy, ESOL and numeracy learners progressed on their Skill for Life courses. Data were gathered from 1649 learners, each assessed twice during their course; the average interval between the assessments was 4½ months. Progress in numeracy, reading or writing was assessed during the academic years 2004/5 and 2005/6, using literacy and numeracy tests, attitude questionnaires and learner profiles.

- Numeracy learners made significant progress, moving on average from the upper end of Entry Level 3 to Level 1.
- Literacy and ESOL learners in reading: the literacy assessment included two parallel assessment instruments, each having both an easy version designed for learners at Entry level, and a less easy version designed for learners at Levels 1 and 2.
- Literacy learners made significant progress in reading. Learners who took the easy assessment on average moved from the upper end of Entry level 3 to just over the threshold into Level 1. Those who took the less easy assessment on average moved from near the upper end of Level 1 to almost the top of Level 1.
- ESOL learners on average moved from near the upper end of Entry level 3 to just into Level 1 in reading. ESOL learners aged 16-19 made significantly more progress than other age groups.
- Literacy and ESOL learners in writing: on average literacy learners did not make significant progress in writing. There were modest improvements in writing for ESOL learners. ESOL learners on average moved from within Entry level 2 to slightly below the threshold for Entry level 3.

Courses and progress: the workplace

***Evans and Wolf in press*¹⁹**

'Adult basic skills and workplace learning': longitudinal study that aims to assess the effects on individuals and organisations of engagement in workplace basic skills programmes.

- Analysis of reading test scores revealed modest improvement over time, but positive changes in performance were consistently significant only among learners for whom English is a second language. This was the case for all measurement points in the study. Second language learners may progress differently and faster. Alternatively, their greater improvement (from a lower average base) may reflect more time spent in an English-speaking country. While the positive trend over time is encouraging, the analysis offers no clear evidence that the workplace literacy courses led to any significant improvements in literacy skills.
- Courses were all 30 hours, with none approaching the 100 hours which US data suggest are the minimum to produce significant improvements (see Appendix 4). 30 hours may be too short to have a substantial impact. Equally, there may be an impact, but not of sufficient magnitude for existing instruments to measure it. (Either way, evidence on 30 hour courses cannot be generalised to include the significant number of courses of longer duration.)
- Whilst workplace literacy courses produce very small average gains in performance, participants' average performance continued to improve over a two year post-instruction period. It was the learners who used their literacy skills actively, in and out of the workplace, who showed consistent gains.
- At first follow-up, a year after course completion, participation in further education and training was significantly higher when compared to a matched sample from the Labour Force Survey. The results at the last follow-up were broadly similar, although the significance levels of differences between the sample of learners and the matched LFS sample were less.
- Both progress and continued involvement in learning were clearly related to motivation. Most of the learners were volunteers, whilst a small number were effectively forced to participate by their employers. The latter showed no increased inclination to undertake further learning or read more, whilst the former group clearly did. The changes were small and not universal, but they were statistically significant.

Course length, intensity and progress

NRDC Effective Practice Studies

The five Effective Practice Studies explored teaching and learning in reading, writing, numeracy, ESOL and ICT. They were carried out in the academic years 2003/04 and 2004/05. The targets across the two years were to recruit and gather background data on about 250 learners, mainly over 19 year olds seeking primarily to improve their literacy, language or numeracy; not those pursuing GCSE courses in the Further Education sector. The attainment and attitudes of each

¹⁹ For more information see Appendix 3.

learner were assessed at two points (in the reading study, three points) during the year in which they participated in the study.

- Progress in numeracy: significant progress between two assessments. Average number of hours between pre and post assessments = 39.
- ESOL progress: significant progress between two assessments. Learners pre and post assessed over 6-25 weeks; average weekly hours = 9.6 (minimum: 2; maximum: 32).
- Progress in writing: modest progress between two assessments. Minimum hours attendance = 50.
- Progress in reading: modest progress between the first two assessments, but no significant difference between the second and third. Average attendance = 30 hours.

White 2003

In the evaluations of the adult basic skills pathfinders, found that learners on more intensive types of provision were more likely to complete the course.

Brooks et al. 2001

In the *Progress in Adult Literacy* study carried out by NFER for the Basic Skills Agency in 1998-99, one of the few factors found to correlate with amount of progress in reading (none were found for writing) was the number of hours of literacy tuition learners had received between pre- and post-test. The largest average improvement was shown by the subset of learners who had received 51-60 hours of tuition. Since the pre- and post-test were never more than 20 weeks apart, this group of learners were those who had attended very regularly. This group's average gain was 23.8 scale points. This was the largest subgroup gain in the study and, at nearly half a standard deviation, probably the most educationally significant.

Course length, participation and progress

Evidence from the USA

The evidence on duration and intensity is reviewed in Comings 2009: 'Two studies identified approximately one hundred hours of instruction as the minimum needed by adults to achieve an increase of one grade level equivalent on a standardized test of reading comprehension (Sticht, 1982; Darkenwald, 1986).' Comings, Sum and Uvin (2000) found that, at 150 hours of instruction, adult students had a 75 percent probability of making a one (or greater) grade-level equivalent increase in reading comprehension or English-language fluency. Porter, Cuban and Comings (2005) found that fifty-eight hours of instruction led to a 0.40 grade-level equivalent increase in reading comprehension. Rose and Wright (2005) examined the national reporting system (NRS) data of three states in the United States and found that, at around 100-110 hours of participation, 50 percent of students were likely to show a one NRS level increase or pass the General Education Development (GED) test.

These studies point to 100 hours of instruction as the point at which a majority of adult students are likely to show educationally significant progress, and, therefore, it serves as a benchmark that identifies an effective programme. That is, if the majority of students are persisting for 100 hours or more each year, the programme is probably having a measurable impact on at least half of its students.

The conclusion reported here is what US evidence warrants. UK evidence, from Brooks et al for example, would support a more positive assertion, that a significant number of learners can be expected to make progress after about 50 hours.

Practice and proficiency

Reder, in press

The Longitudinal Study of Adult Learning examines the impact of literacy and numeracy development across the lifespan of youth and adults who dropped out of high school in the United States. The project followed a panel of about 1,000 randomly selected individuals over nine years. Panel members were residents of the Portland, Oregon, metropolitan area, aged 18 to 54, proficient English speakers, high school drop outs who had not received a General Educational Development (GED) or other high school equivalency credential.

Differences were identified between proficiency and practices measures as indicators of adult literacy and numeracy development. Proficiency and practices measures have **distinct dynamics of change** that reflect in different ways the influences of programme participation, life events and economic forces.

Analysis of longitudinal data provides clear evidence of **practice engagement effects** on long-term proficiency development. Adults at similar proficiency levels at one point in time wind up many years later at different proficiency levels depending in part on their earlier levels of engagement in literacy practices. Those with higher levels of engagement at an initial point in time have higher levels of proficiency at a later point in time even with initial levels of proficiency controlled.

There is also strong evidence that programmes foster higher levels of engagement in literacy practices in their students that persist after they leave the programmes. There is thus evidence linking programmes to increased engagement in practices, and linking practice engagement over longer periods of time to increased proficiency levels.

APPENDIX 2 - TABLES

MEASURING AND ASSESSING THE IMPACT OF BASIC SKILLS ON LABOUR MARKET OUTCOMES: MCINTOSH AND VIGNOLES 2001a. TABLES 1-4

Table 1 - NCDS detailed results: wage effects of level 1 and 2 numeracy and literacy skills

	(a)	(c)	(d)	(f)
<i>Males and females</i>				
Level 1 numeracy	0.147 (0.041)	0.089 (0.038)	0.077 (0.039)	0.057 (0.037)
Level 2 numeracy	0.332 (0.040)	0.180 (0.040)	0.148 (0.041)	0.076 (0.040)
Level 1 literacy	0.148 (0.044)	0.071 (0.041)	0.047 (0.042)	0.013 (0.041)
Level 2 literacy	0.282 (0.046)	0.163 (0.045)	0.134 (0.046)	0.080 (0.046)
<i>Males</i>				
Level 1 numeracy	0.148 (0.051)	0.115 (0.053)	0.087 (0.056)	0.068 (0.055)
Level 2 numeracy	0.250 (0.049)	0.170 (0.050)	0.123 (0.055)	0.069 (0.053)
Level 1 literacy	0.090 (0.056)	0.030 (0.061)	0.008 (0.061)	0.005 (0.064)
Level 2 Literacy	0.213 (0.061)	0.107 (0.067)	0.082 (0.067)	0.070 (0.069)
<i>Females</i>				
Level 1 numeracy	0.124 (0.056)	0.073 (0.062)	0.076 (0.060)	0.049 (0.055)
Level 2 numeracy	0.324 (0.064)	0.202 (0.072)	0.168 (0.073)	0.076 (0.068)
Level 1 literacy	0.135 (0.059)	0.092 (0.063)	0.055 (0.065)	0.006 (0.061)
Level 2 literacy	0.289 (0.059)	0.194 (0.065)	0.156 (0.070)	0.061 (0.067)
<i>Controls</i>				
(a) none	X			
(c) family background, ability at age 7		X		
(d) family background, ability at age 7 and 16			X	
(f) family background, ability at age 7 and 16 and education level				X

Dependent variable is log earnings. Dummy variables are entered in the same equation for individuals at numeracy and literacy Levels 1 and 2, where the base case consists of individuals with literacy or numeracy skill levels below Level 1. Heteroscedasticity-consistent standard errors are given in parentheses.

Table 2 - IALS detailed results: wage effects of level 1 and 2 numeracy and literacy skills

	(a)	(c)	(d)	(f)
<i>Males</i>				
Level 1 numeracy	0.050 (0.019)	0.042 (0.017)	0.034 (0.017)	0.027 (0.017)
Level 2 numeracy	0.076 (0.021)	0.064 (0.019)	0.052 (0.019)	0.042 (0.019)
Level 1 literacy	0.062 (0.022)	0.059 (0.020)	0.050 (0.020)	0.039 (0.019)
Level 2 literacy	0.081 (0.027)	0.075 (0.029)	0.061 (0.028)	0.046 (0.027)
<i>Females</i>				
Level 1 numeracy	0.021 (0.038)	0.044 (0.039)	0.041 (0.040)	0.020 (0.041)
Level 2 numeracy	0.039 (0.042)	0.078 (0.043)	0.057 (0.045)	0.018 (0.049)
Level 1 literacy	0.026 (0.042)	0.009 (0.043)	0.005 (0.045)	-0.037 (0.047)
Level 2 literacy	0.041 (0.045)	0.029 (0.047)	0.032 (0.049)	-0.030 (0.035)
<i>Controls</i>				
(a) none	X			
(c) family background, ability at age 7		X		
(d) family background, ability at age 7 and 16			X	
(f) family background, ability at age 7 and 16 and education level				X

Dependent variable is binary variable equal to one if the person is employed. The table shows the average change in the probability of employment on the Level 1 and Level 2 numeracy and literacy skills dummy variables (included in the same equation), where the base case consists of individuals with literacy or numeracy skill levels Below Level 1. Heteroscedasticity-consistent standard errors are given in parentheses.

Table 3 - NCDS detailed results: employment effects of level 1 and 2 numeracy and literacy skills

	(a)	(c)	(d)	(f)
<i>Males</i>				
Level 1 numeracy	0.050 (0.019)	0.042 (0.017)	0.034 (0.017)	0.027 (0.017)
Level 2 numeracy	0.076 (0.021)	0.064 (0.019)	0.052 (0.019)	0.042 (0.019)
Level 1 literacy	0.062 (0.022)	0.059 (0.020)	0.050 (0.020)	0.039 (0.019)
Level 2 literacy	0.081 (0.027)	0.075 (0.029)	0.061 (0.028)	0.046 (0.027)
<i>Females</i>				
Level 1 numeracy	0.021 (0.038)	0.044 (0.039)	0.041 (0.040)	0.020 (0.041)
Level 2 numeracy	0.039 (0.042)	0.078 (0.043)	0.057 (0.045)	0.018 (0.049)
Level 1 literacy	0.026 (0.042)	0.009 (0.043)	0.005 (0.045)	-0.037 (0.047)
Level 2 literacy	0.041 (0.045)	0.029 (0.047)	0.032 (0.049)	-0.030 (0.035)
<i>Controls</i>				
(a) none	X			
(c) family background, ability at age 7		X		
(d) family background, ability at age 7 and 16			X	
(f) family background, ability at age 7 and 16 and education level				X

Dependent variable is binary variable equal to one if the person is employed. The table shows the average change in the probability of employment on the Level 1 and Level 2 numeracy and literacy skills dummy variables (included in the same equation), where the base case consists of individuals with literacy or numeracy skill levels Below Level 1. Heteroscedasticity-consistent standard errors are given in parentheses.

Table 4 - IALS detailed results by gender: Employment effects associated with level 1 and level 2 literacy or numeracy skills

	(a)	(c)	(d)	(f)
<i>Males</i>				
Level 1 numeracy	-0.035 (0.041)	-0.040 (0.043)	-0.046 (0.043)	
Level 2 numeracy	0.074 (0.044)	0.063 (0.044)	0.033 (0.047)	
Level 1 literacy	0.120 (0.035)	0.113 (0.036)	0.090 (0.038)	
Level 2 literacy	0.238 (0.053)	0.204 (0.056)	0.162 (0.058)	
<i>Females</i>				
Level 1 numeracy	0.120 (0.039)	0.113 (0.039)	0.090 (0.040)	
Level 2 numeracy	0.184 (0.040)	0.164 (0.043)	0.123 (0.049)	
Level 1 literacy	0.180 (0.040)	0.168 (0.040)	0.135 (0.042)	
Level 2 literacy	0.165 (0.054)	0.149 (0.053)	0.085 (0.055)	
<i>Controls</i>				
(a) none	X			
(b) family background		X		
(e) family background and education level			X	

Dependent variable is binary variable equal to one if the person is employed. The table shows the average change in the probability of employment on the Level 1 and Level 2 numeracy and literacy skills dummy variables (included in the same equation), where the base case consists of individuals with literacy or numeracy skill levels Below Level 1. Heteroscedasticity-consistent standard errors are given in parentheses.

MICRO-ANALYSIS OF THE EFFECTS OF LITERACY AND NUMERACY: MCINTOSH AND VIGNOLES 2001b (TABLES 5-6)

Table 5 - Wage Premium Associated with having Level 1 skills or above, as compared to having literacy or numeracy skill levels below Level 1

Controls	NCDS – Numeracy	BCS – Numeracy	NCDS – Literacy	BCS – Literacy
None	26%	16%	16%	9%
Education level	13%	12%	8%	6%
Mathematics and reading ability on entry into school, social class and parental interest, type of school, region	8%	10%	2.4%~	6%

~ - insignificant at 10% level

Table 6 - Percentage Point Changes in the Probability of Being in Employment Associated with Level 1 skills or above as compared to having literacy or numeracy skill levels below Level 1

Controls	NCDS – Numeracy	BCS – Numeracy	NCDS – Literacy	BCS – Literacy
None	6%	4%	5%	9%
Education level	3%~	2%~	3%~	6%
Mathematics and reading ability on entry into school, social class and parental interest, type of school, region	4%	1%~	3%~	6%

~ - insignificant at 10% level

BASIC SKILLS, SOFT SKILLS AND LABOUR MARKET OUTCOMES: SECONDARY ANALYSIS OF THE NATIONAL CHILD DEVELOPMENT STUDY: MACHIN 2001 (TABLES 7-8)

Table 7 - Change in wages and skills improvement for males: dependent variable 1991-1981 change in log hourly wages

	(1)	(2)	(3)	(4)	(5)
Low qualification person who gained more qualifications by 1991	-0.026				
Literacy course taken by 1991		0.896			
Numeracy course taken by 1991		-0.051			
No. of quintiles literacy skills improved between 16 and 37			-0.215	-0.372	
No. of quintiles numeracy skills improved between 16 and 37			-0.228	-0.111	
Improved literacy skills and in quintile 1 or 2 at age 16				0.302	
Improved numeracy skills and in quintile 1 or 2 at age 16				-0.141	
Self-assessment: numeracy skills improved since last survey					0.184
Self-assessment: numeracy skills worsened since last survey					0.594***
Self-assessment: literacy skills improved since last survey					0.401***
Self-assessment: literacy skills worsened since last survey					0.456**
Constant	0.675***	0.669***	0.741***	0.743***	0.415***
Observations	504	504	368	368	504
R-squared	0.00	0.00	0.01	0.01	0.05

Standard errors in parentheses
 * significant at 10% level; ** significant at 5% level; *** significant at 1% level

Table 8 - Change in wages and skills improvement for females: dependent variable 1991-1981 change in log hourly wages

	(1)	(2)	(3)	(4)	(5)
Low qualification person who gained more qualifications by 1991	-0.026				
Literacy course taken by 1991		0.896 (0.797)			
Numeracy course taken by 1991		-0.051 (1.127)			
No. of quintiles literacy skills improved between 16 and 37			-0.215 (0.173)	-0.372 (0.239)	
No. of quintiles numeracy skills improved between 16 and 37			-0.228 (0.207)	-0.111 (0.553)	
Improved literacy skills and in quintile 1 or 2 at age 16				0.302 (0.331)	
Improved numeracy skills and in quintile 1 or 2 at age 16				-0.141 (0.584)	
Self-assessment: numeracy skills improved since last survey					0.184 (0.119)
Self-assessment: numeracy skills worsened since last survey					0.594*** (0.174)
Self-assessment: literacy skills improved since last survey					0.401*** (0.111)
Self-assessment: literacy skills worsened since last survey					0.456** (0.198)
Constant	0.675*** (0.053)	0.669*** (0.050)	0.741*** (0.057)	0.743*** (0.058)	0.415*** (0.067)
Observations	504	504	368	368	504
R-squared	0.00	0.00	0.01	0.01	0.05

Standard errors in parentheses
 * significant at 10% level, ** significant at 5% level, *** significant at 1% level

**THE VALUE OF BASIC SKILLS IN THE BRITISH LABOUR MARKET
DE COULON ET AL 2007. TABLES 9-13.**

Table 9 - Estimates of the impact of literacy on earnings at age 34

	Effect of literacy on hourly-wage at 34				
	Estimated	Std.	First stage F-	Hansen's J	N
	Coeff. for		stat of excl.	statistic (P-	
literacy	(1)	(2)	instrument	value)	
OLS	0.095***	0.018			3136
2SLS					
Instruments:					
Age 5 ability test scores	0.455***	0.131	14.84	0.778	3136
Same + Mother does most of the reading to child aged 5; Days/week reading to child aged 5	0.378***	0.113	11.37	0.537	3139
Same +mother smoked during pregnancy.	0.321***	0.104	10.51	0.327	3136
LIML					
Instruments:					
Age 5 ability test scores ; Mother does most of the reading to child aged 5; Days/week reading to child aged 5; mother smoked during	0.339***	0.113	-	0.334	3136

Data source: 1970 BCS Age 34 survey. Dependent variable is log gross hourly earnings at age 34. Results are for men and women combined. *** significant at 1%, ** significant at 5%, * significant at 10%.

²⁸ A first difference model regressing the change in wages between 1991 and 2004 against the change in standardised literacy and numeracy scores over the same period did not yield a significant correlation, partly due to small sample sizes and very large standard errors.

Table 10 - Estimates of the impact of numeracy on earnings at age 34

	Effect of numeracy on hourly-wage at 34				
	Estimated		First stage	Hansen's J	N
	Coeff. for	Std.	F-stat. of excl.	statistic	
numeracy		inst.	(P-value)		
	(1)	(2)	(3)	(4)	(5)
OLS	0.102***	0.016			3129
2SLS					
Instruments:					
Age 5 ability test scores	0.310**	0.137	15.19	0.029	3132
Age 5 ability; Mother does most of the reading to child aged 5; Days/week	0.301**	0.130	9.79	0.084	3132
Same +mother smoked during	0.282**	0.126	8.65	0.098	3129
Age 16 test maths score	0.306***	0.076	160.99	-	3132
LIML					
Instruments:					
Age 5 ability test scores ; Mother does most of the reading to child aged 5; Days/week reading to child aged 5; mother smoked during pregnancy	0.315**	0.149	-	0.096	3129

Data source: 1970 BCS Age 34 survey. Dependent variable is log gross hourly earnings at age 34. Results are for men and women combined. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 11 - Changes over time: the relationship between basic skills and earnings for men and women (combined sample) in their thirties

Variables	1995		2004	
	Coeff.	Std.	Coeff.	Std.
Standardised age 34 literacy score	0.109	(0.025)**	0.114	(0.019)**
Standardised age 34 literacy score squared	0.038	(0.009)**	0.026	(0.007)**
Standardised age 34 numeracy score	0.150	(0.026)**	0.084	(0.015)**
Standardised age 34 numeracy score squared	0.018	(0.013)	0.025	(0.009)**
Controls:				
Gender	X		X	
Age 10/11 ability test scores	X		X	
Family background variables	X		X	
Sample size	854		4664	
R-Squared	0.33		0.15	
Adj R-Squared	0.33		0.15	

Data source: For 1995 regression, NCDS Age 31 and Age 37 surveys. For 2004 regression, 1970 BCS Age 34 survey. Dependent variable is log gross hourly earnings at age 31 for NCDS and age 34 for BCS.

Results are for men and women combined. Both literacy and numeracy measures are included in the same model.

*** significant at 1%, ** significant at 5%, * significant at 10%.

Table 12 - The relationship between age 34 basic skills and employment: women only

Table 9: The relationship between age 34 basic skills and employment: women only

Variables	Regression 1		Regression 2		Regression 3	
	Coef	Std	Coef	Std	Coef	Std
Standardised age 34 literacy score	0.040***	(0.008)	0.037***	(0.009)	0.035***	(0.010)
Standardised age 34 numeracy score	0.035***	(0.008)	0.020*	(0.009)	0.018	(0.010)
Age 10 ability test scores			X		X	
Family background					X	
Highest educational level at age 34					X	
Age 5 ability test scores					X	
Sample size	4945		3659		3659	

Data source: 1970 BCS Age 34 survey. Dependent variable takes value of 1 if the individual spent more months in employment between the age of 33 and 34 than in any other status (unemployment, inactivity, long-term sickness, working in the home, full-time education). Marginal effects are reported. Results are for women only. Both literacy and numeracy measures are included in the same model.

*** significant at 1%, ** significant at 5%, * significant at 10%.

Table 13 - The relationship between age 34 basic skills and employment: men only

Variables	Regression 1		Regression 2		Regression 3	
	Coef	Std	Coef	Std	Coef	Std
Standardised age 34 literacy score	0.011**	(0.004)	0.010*	(0.005)	0.007	(0.005)
Standardised age 34 numeracy score	0.022***	(0.004)	0.023***	(0.005)	0.023***	(0.007)
Female	X		X		X	
Age 10 ability test scores			X		X	
Family background					X	
Highest educational level at age 34					X	
Age 5 ability test scores					X	
Sample size	4514		3280		3280	

Data source: 1970 BCS Age 34 survey. Dependent variable takes value of 1 if the individual spent more months in employment between the age of 33 and 34 than in any other status (unemployment, inactivity, long-term sickness, working in the home, full-time education). Marginal effects are reported. Results are for men only. Both literacy and numeracy measures are included in the same model.

*** significant at 1%, ** significant at 5%, * significant at 10%.

**A FRAMEWORK FOR ASSESSING THE ECONOMIC BENEFITS AND COSTS OF
WORKPLACE LITERACY TRAINING: HOLLENBECK 1996 (TABLE 14)**

Table 14 - Estimates of the Marginal Economic Effects from Workplace Literacy Program Participation

Dependent Variable	Population/Model					
	Total Population		Males		Females	
	1	2	1	2	1	2
Percentage increase in annual earnings (from NHES)	16.9* (8.5)	12.8° (8.1)	20.8** (10.2)	19.1** (9.6)	10.0 (14.0)	1.8 (13.3)
Percentage increase in weekly earnings (from CPS)	11.3** (5.4)	8.0° (5.0)	1.4 (7.5)	-4.2 (7.1)	17.1** (7.6)	14.2** (7.0)

Note: Entries are coefficient estimates from weighted OLS regressions, expressed as percentages. Full models are reported in table 5. The models in column 1 exclude industry and occupation, whereas industry and occupation dummy variables are included in 2. Standard errors in parentheses.

- ** Significant at the .05 level.
- * Significant at the .10 level.
- ° Significant at the .15 level.

LITERACY, NUMERACY AND THE LABOUR MARKET: FURTHER ANALYSIS OF THE SKILLS FOR LIFE SURVEY - GRINYER 2006 (TABLES 15–18)

Earnings

For literacy, Grinyer found a 12% earnings return to Level 1 literacy compared to those with Entry Level 3. The results at other levels were statistically insignificant, due to the small number of people in the survey at Entry Level 2 and below.

Table 15

		Earnings effect between:	Both sexes	Male	Female
Literacy ¹⁵		Entry level 2 or below			
		↓	10%	17%	14%
		Entry level 3			
		↓	12%*	9%	26%**
		Level 1			
	↓	2%	0%	7%	
		Level 2 and above			

*significant at 5% level, **significant at 1% level

For numeracy, Entry Level 3 had a 13% earnings return compared to those at Entry Level 2 or below, Level 1 numeracy a 6% return compared to those at Entry Level 3, and above Level 2 numeracy a 19% return, compared to those at Level 2.

Table 16

		Earnings effect between:	Both sexes	Male	Female
Numeracy		Entry level 2 or below			
		↓	13%**	13%*	8%
		Entry level 3			
		↓	6%*	2%	10%*
		Level 1			
		↓	4%	3%	8%
	Level 2				
	↓	19%**	17%*	25%	
		above Level 2			

*significant at 5% level, **significant at 1% level

Employment

Looking at employment effects, for literacy those with Level 1 literacy are 6% more likely to be in employment than those with Entry Level 3. Other estimates are statistically insignificant, though it is worth noting that the effect appears to be larger for Women, who are 8% more likely to be in employment.

Table 17

	Employed vs non-employed	Both sexes	Male	Female
Literacy	Entry level 2 or below			
	↓	0%	-2%	4%
	Entry level 3			
	↓	6%***	4%	8%**
	Level 1			
	↓	-1%	0%	-2%
	Level 2 and above			

* significant at 10%; ** significant at 5%; *** significant at 1%

For numeracy, those with Entry Level 3 are 6% more likely to be in employment than those with Entry level 2 or below. In turn, those with Level 1 are 4% more likely to be in employment than those with Entry Level 3. For numeracy, the gender difference is reversed, with the effect on employment being larger for men than for women.

Table 18

	Employed vs non-employed	Both sexes	Male	Female
Numeracy	Entry level 2 or below			
	↓	6%***	9%**	4%
	Entry level 3			
	↓	4%*	4%	3%
	Level 1			
	↓	2%	1%	3%
	Level 2			
	↓	2%	2%	7%
	above Level 2			

* significant at 10%; ** significant at 5%; *** significant at 1%

APPENDIX 3 - NOTES ON SELECTED SOURCES

British birth cohort studies: NCDS and BCS70

Britain's nationwide birth cohort studies follow the same group of people from birth into and through adulthood giving a picture of whole generations. By following up people from birth it is possible to explain how present situations relate to past circumstances and to predict future functioning.

The 1958 and 1970 British birth cohort studies are known respectively as the National Child Development Study (NCDS) and the 1970 British Cohort Study (BCS70). These are longitudinal studies that follow-up all babies born in a single week from birth in the year the study began to adulthood, with new data collected at regular intervals throughout the cohort members' lives.

Literacy and numeracy assessments were carried out on 10% samples at age 21 in BCS 70 and at age 37 in NCDS. At age 34 in BCS70, literacy and numeracy were assessed for all participating cohort members - just under 10,000. Half the cohort members' children also had their reading and mathematics development assessed.

The *Skills for Life* survey: national needs and impact survey of literacy, numeracy and ICT skills (2003)

A survey of literacy and numeracy needs in England, designed to produce a national profile over five levels of competence, corresponding with the National Standards for adult literacy and numeracy, and to assess the impact of different levels of skill on people's lives. BMRB interviewed 8,730 randomly selected adults aged 16-65 in England.

International Adult Literacy Survey (1996)

The International Adult Literacy Survey (IALS) is a large-scale, international comparative assessment designed to identify and measure a range of skills linked to the social and economic characteristics of individuals across (or within) nations. IALS provides information on the skills and attitudes of adults aged 16-65 in a number of different areas, including prose literacy (knowledge and skills needed to understand and use information from texts), document literacy (knowledge and skills required to locate and use information contained in various formats), and quantitative Literacy (knowledge and skills required to apply arithmetic operations to numbers embedded in printed materials).

Grinyer, 2006, *Literacy, Numeracy and the Labour Market: Further Analysis of the Skills for Life Survey*

Analysis of the Skills for Life Survey. Interviews with 8,000 respondents aged 16-65 in 2002/03. Their literacy/numeracy skills were measured using 2 computer-aided tests. Grinyer estimated (i) the association between literacy, numeracy and earnings controlling for an individual's observable characteristics; (ii) the impact of participating in adult literacy and numeracy courses using matching techniques to estimate the impact of post-school English or maths courses on earnings. Also estimated the impact of adult literacy and numeracy on employment outcomes, examining the probability of unemployment and economic inactivity, controlling for observable characteristics.

Strengths: (1) large-scale broadly nationally representative survey data; (2) literacy and numeracy levels of respondents were tested.

Limitations: the SfL survey was cross-sectional and therefore the estimated earnings differentials are not the same as estimating before and after earnings for a specific individual. A general limitation of matching is that it is only possible to match on observables.

Metcalfe, Meadows et al., in press, Impact of Skills for Life Learning: Longitudinal Survey of Adult Learners on College-based Literacy and Numeracy Courses

Evaluation of the impact of participation in college qualification-bearing literacy or numeracy courses. The evaluation does not include ESOL courses and courses delivered outside college, and is restricted to those aged 19 and over. It is conducted through a longitudinal survey of a representative sample of literacy and numeracy learners, and a matched group of people with low or no literacy or numeracy qualifications. The first wave occurred in 2002/03 with participants followed up one, two and three years later.

The techniques used were propensity score matching and difference in differences. The matching is essentially a way of finding someone as similar as possible (on observable characteristics) to the SfL participant except that they have not undertaken a Skills for Life course. This provides a way of establishing a good counter-factual - what would have happened to the SfL participant if they had not done the course? Difference in differences analyses the change in an indicator (such as earnings) from one wave to another compared to the change in the same indicator for the comparison group. Focusing on the change overcomes (or is intended to overcome) the problem that the participant and the comparator may differ on unobserved characteristics such as motivation.

One limitation of the study, which the authors acknowledge, is that although short literacy and numeracy tests were taken by participants, these were apparently not sufficiently detailed to register small to moderate increases in basic skills competencies. In other words it was not possible to measure any changes in basic skill competencies which occurred. This in turn meant that the study was essentially a 'black-box' style evaluation: it was possible to observe outcomes of participants and how they differed from a comparison group, but not to measure actual changes in their literacy and numeracy abilities.

Evans, K., Wolf, A., in press, Workplace Learning and Adult Basic Skills

Summary

The study was longitudinal, involving repeated collection of data from subjects over a two and a half year period, and mixed-method, involving a combination of quantitative and qualitative techniques. The courses were in literacy or literacy and IT. There were 567 learners from 53 sites enrolled in the courses. Learners were tested formally on three occasions. The first follow-up test was scheduled for a year after course completion, rather than at the end of the course, since it is well-established that gains made during an intensive learning experience are not necessarily permanent and secure. The second and final follow-up, a year and a half further on, allowed for two and a half years in which changes in learning trajectories might become evident. Detailed structured questionnaires collected information on background variables, job and training history, and attitudes and activities related to the working environment and the enterprise's social capital.

The workplace sites were drawn from four economic sectors (cleaning, food processing, health care and transport) where it was anticipated that there would be a prevalence of low skill workers.

Strengths: use of mixed methods, and use of Go! reading tests which should pick up any changes in literacy accurately.

Limitations: confined to 4 sectors of the economy, all low-skill and may not be typical. Attrition was high. No control group (for practical and cost reasons). This makes it difficult to know whether gains in literacy occurred as the result of the course - although this seems unlikely as they only occurred for the ESOL group.

Reder, S., in press, The longitudinal study of adult learning

The Longitudinal Study of Adult Learning examines the nature and impact of literacy and numeracy development across the lifespan of youth and adults who dropped out of high school in the United States. This multimethod project followed a panel of about 1,000 randomly selected individuals over a period of nine years. Periodic in-home interviews and skills assessments were complemented by qualitative work using in-depth interviews, videography and the collection of narratives and writing samples. The LSAL followed and retained over 90% of its panel. Six waves of interviews were completed, spanning about eight years of each individual's life.

The LSAL followed a target population for adult education defined as residents of the Portland, Oregon metropolitan area, age 18-44, proficient but not necessarily native English speakers, high school dropouts (i.e. did not receive a high school diploma and were no longer enrolled in school) and without a General Educational Development (GED) or other high school equivalency credential. A statistically representative sample of this population was drawn from two sampling frames: random-digit-dialling for the general population and enrolment forms from the three major adult education programmes serving the Portland metropolitan area. Sampled households were called and screened for members in the defined target population. The resulting sample contained 940 individuals. Complex sampling weights are used to construct population estimates from sample data.

APPENDIX 4 - EVIDENCE ON EARNINGS FROM THE USA

Positive evidence

Tyler 2004a

Tests the extent to which the accumulation of basic cognitive skills, as measured by a post schooling maths test, matters for young dropouts entering the 2002 labour market. Based on a sample of dropouts who were age 16-18 when administered a maths test in the late 1990s, estimates indicate that a standard deviation increase in the test score is associated with 6.5% higher average earnings over the first 3 years in the labour market. These results are the first direct evidence that young dropouts in today's economy are not relegated to jobs where basic cognitive skills are not rewarded, and they stress the importance of skills acquisition for students who may eventually drop out.

Tyler et al 2004b

The study is set using a sample of individuals aged 19-20 (N=16,300) in Florida. The data set is unique in that it is constructed from Florida General Education Development certificate (GED) and Unemployment Insurance (UI) administrative records to estimate the relative earnings of two groups of male high school dropouts who took the GED exams in 1995: those who passed the exams, obtaining the credential, and those who failed the exams. Estimates from several different specifications all show greater mean quarterly earnings growth among those who obtained a GED than among unsuccessful candidates. The advantage was small in dollar terms - only about \$1,400 annually, six years after the exams - but, given the very low initial earnings of these school dropouts, it was large in relative terms, growing from zero immediately after the 1995 exams to 13%-20% six years later. Most of these gains appear to reflect not differential wage growth between the two groups, but a differential rate of movement from non-employment to employment.

Tyler et al, 2000

'Using differential state GED passing standards as an identification strategy, we find that the signaling value of the GED increased the 1995 earnings of young white dropouts on the margin of passing the exams by 10 to 19 percent. We find no statistically significant evidence that the credential impacted the 1995 earnings of young minority dropouts in the same scoring range. Our results are robust across natural experiments that use different treatment and comparison groups. At first glance, our results may appear inconsistent with Cameron and Heckman's (1993) finding of no statistical difference at age 25 between the average earnings of GED-holders and those of observationally similar uncredentialed dropouts. However, a closer look shows that the differences can be explained by differences in samples and methodologies. In particular, our estimates are based only on the lowest skilled GED-holders, those on the margin of passing the exams. In contrast, Cameron and Heckman base their finding on a sample of dropouts varying in initial skill level, and they adopt the assumption that the impact of the GED on earnings is independent of initial skill level. If GED effects are concentrated among the least skilled and are negligible for the more-skilled dropouts, then our results pointing to large GED effects for the dropouts on the margin of passing the exams are potentially consistent with those of Cameron and Heckman.'

Negative evidence

Cunha et al 2007

'At historically funded levels, public job training programs and adult literacy and educational programs, like the GED, that attempt to remediate years of educational and emotional neglect among disadvantaged individuals have a low economic return and produce meager effects for most persons. A substantial body of evidence suggests that returns to adolescent education for the most disadvantaged and less able are lower than the returns for the more advantaged (Costas Meghir and Marten Palme, 2001; Carneiro and Heckman, 2003, and the evidence they cite; Carneiro et al., 2006). The available evidence suggests that for many skills and abilities, later remediation for disadvantage may be possible but is much more costly than early remediation to achieve a given level of adult performance (Cunha and Heckman, 2006b). The economic returns to job training, high school graduation and college attendance are lower for less able persons. (See Carneiro and Heckman, 2003, and the studies they cite.)'

Cameron and Heckman 1991

Analyses the causes and consequences of the (then) growing proportion of high-school persons who achieve that status by exam certification rather than through high school graduation. Exam-certificated high school equivalents are statistically indistinguishable from high school dropouts. Both dropout and exam-certified equivalents have comparably poor wages, earnings, hours of work, unemployment experiences and job tenure. This is so whether or not ability measure are used to control for differences. Whatever differences are found among exam-certified equivalents, high school dropouts and high school graduates are accounted for by their years of schooling completed. There is no cheap substitute for schooling. The only payoff to exam certification arises from its value in opening post-secondary schooling and training opportunities. However, exam-certified equivalents receive lower returns to most forms of post-secondary education and training.'

APPENDIX 5 - IMPACT OF THE EMPLOYER TRAINING PILOTS

The aim of the study was to assess the impact of Employer Training Pilots (ETPs) on the take-up of training by eligible employers and employees from the start of the pilots up until Summer 2004. The ETP 'offer' is of free or subsidised training leading to a basic skills or first Level 2 qualification for employees qualified to below Level 2, where the employees receive paid time off in which to train, and for which the employers are compensated. The aim was to increase the proportions of adults with basic skills and Level 2 qualifications.

Results are consistent with small positive effects of ETP on employer and employee training, but the study does not find across-the-board, systematic evidence that ETP had significantly increased employer provision of, or employee engagement in, training by the end of August 2004. This suggests that if ETP had an effect on the take-up of training over this period of the pilots' implementation, it was a small one. All of the different forms of evidence in the report lead to this conclusion.

These estimated effects are used to understand more about how much 'new' or 'additional' training has been generated by ETP - that is, training that would not have taken place if the policy had never been introduced.

The report provides a 'back of the envelope' calculation for the number of 'new', or 'additional' basic skills and Level 2 awards made to employees arising directly from ETP in its first two years. By 'new' or 'additional' awards is meant awards that would not have been made in the absence of ETP. Given an eligible population of around 1 million employees in the first wave pilot areas, and a further 1 million eligible employees in the second wave pilot areas, an effect of approximately 0.5 percentage points would imply around 5,000 new learners per year in each of the first and second wave areas, or around 15,000 in total by September 2004. If the achievement rate amongst these learners was around 75%, this would suggest around 11,000 new qualifications gained. Bearing in mind that the estimates are subject to some sampling error, the true number of 'additional' learners could be bigger than this, but equally the authors do not rule out a considerably smaller number.

APPENDIX 6 - DISTINGUISHING EVIDENCE BY METHOD

The Torgerson et al. 2003, 2004 and 2005 reports distinguished the evidence on the impact of basic skills provision on progress by method, including randomised controlled trials (RCTs), controlled trials (CTs) and correlational evidence:

On literacy

- Seven RCTs and 27 CTs.
- 2 RCTs and 3 CTs reported a positive effect for the intervention compared with the control group.
- 10 studies showed no difference (five RCTs and five CTs).

On numeracy

- Four RCTs and 8 CTs
- One RCT showed positive effect
- Six studies (three RCTs and three CTs) showed no impact, including the UK RCT.

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