View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Digital Education Resource Archive

Research Report DCSF-RW052

The Involvement of Business in Education: A Rapid Evidence Assessment of the Measurable Impacts

AIR UK

department for children, schools and families

Research Report No DCSF-RW052

The Involvement of Business in Education: A Rapid Evidence Assessment of the Measurable Impacts

AIR UK

The views expressed in this report are the authors' and do not necessarily reflect those of the Department for Children, Schools and Families.

© National Centre for Social Research 2008
ISBN 978 1 84775 213 0

Contents

Executive Summary **3**
Background and objectives ..4
Method ..4
Findings ..4
Measurable impact on Attainment *4*
Success characteristics *5*
Other measurable impacts *6*
Conclusions ..6

Introduction **8**
Policy Context ..8

Scope **9**
Population *9*
Interventions *10*
Context *10*
Outcomes *11*

Methodology **11**
Selection of Studies 12

Findings **15**
Impact on measurable standards 15
Success Characteristics 16
Other measurable impacts 16

Details and Findings of the Included Studies **17**

Discussion of Findings **28**

Conclusions **29**

References **31**

Annexes **33**
Annex A: Sources Searched for Evidence 33
Annex B: Integrated Quality Assessment and Data Extraction Framework 34
Annex C: Documents excluded 41

EXECUTIVE SUMMARY

This review of the most robust evidence on the impact of education links with employers specifically focussed on measurable impacts. We found that:

There are positive impacts of employers' involvement with education. However, there have been only a few studies that provide us with evidence of a measurable improvement in grades, or other measures of students' attainment.

Other positive impacts include preparedness for work, developing job and work skills, improving work-based competencies, attitudes and behaviours, enhanced employability and higher initial wage rates. Although not directly related to student attainment, the authors would argue that these findings provide valuable evidence of the impact and importance of business involvement in education.

- In 'Business Involvement in Mathematics', communication and exchange of ideas between teachers and the business community about the curriculum and teaching was a key contributory factor to the positive impacts.
- For mentoring to be effective it should be part of whole-school approach to raise attainment, and that there should be clear selection criteria for students receiving mentoring.
- In the Increased Flexibilities Programme (IFP), which provided vocational learning opportunities for young people, having employers as visiting speakers, and having them on the steering group of the IFP partnerships, contributed to students gaining higher qualifications.
- Having employees working with schools as an actual work assignment, rather than as an extracurricular activity, was a key feature of the success of the IBM business links with education.

Positive impacts on students' outcomes other than objective measures of student attainment included:

- Lower drop-out rates, improved attendance, increased academic course taking, and the increased likelihood of graduating on time. (Kemple and Snipes, 2000).
- Higher rates of enrolment and continuity in post-secondary education, sustained higher levels of employment, and higher hourly wage rates.
- Teachers' and students' positive attitudes towards the job shadowing opportunities that the programme provided

It was noted that

- There is more quantity than quality of research on the impact of business links on directly measurable education outcomes

- Of the higher quality studies, some found positive impacts on academic attainment. But, a similar number did not detect any impact.
- No high quality research has detected a negative impact on attainment

BACKGROUND AND OBJECTIVES

This is a report of a Rapid Evidence Assessment (REA) of the available research literature on the impact of education links with employers. This REA was commissioned by the Department for Children, Schools and Families (DCSF) to help answer the following questions:

- What evidence is there in England, the UK, and from abroad, about the size of the impact on measurable standards of pupils (attainment grades) that can be achieved by employers getting involved with schools and education?
- What are the characteristics of the employer activities, interventions and involvement that have the most impact?
- If there is little evidence of the direct impact on attainment, what evidence is there of other measurable impact on other outcomes for children and young people, such as attendance, behaviour, or any robustly quantified estimates of any other impacts?

METHOD

Having defined the scope of the review, in consultation with DCSF, the research literature was searched using electronic databases, print sources (textbooks and journals), the grey literature, and personal contact with experts in this area.

161 documents were initially identified, 135 of which were ‘potentially relevant’ to the scope of this review once the abstracts had been read. When these 135 documents were considered against the scope of the review, only 42 of them met these requirements. These 42 documents were then assessed for scientific quality using explicit and transparent criteria designed to select only the most robust quantitative research , and 15 of these documents met these criteria. These 15 documents constitute the evidence base for this review.

FINDINGS

Measurable impact on attainment

Few of the studies identified by this review measured the impact of education links with employers in terms of students’ academic attainment. Of those than did, positive impacts on students’ academic attainment were found in the following;

- Business Involvement in Mathematics Program amongst Latino students in Salinas, California (Henderson and St. John, 1997). These positive impacts were sustained over the course of the programme.
- Business Mentoring in Schools in England (Miller, 1998, 1999).

- Increased Flexibilities for 14-16 Year Olds Programme in England (Golden et al, 2004, 2005, 2006).
- Re-inventing Education Program in the USA (Center for Children & Technology, 2004).
- Work-based Learning (Swail and Kampits, 2004).

No impacts (positive or negative) on students' academic attainment were found in the following initiatives:

- Career Academies in the USA (Kemple and Snipes, 2000).
- African-American Work-Based Mentoring Program in the USA (Linnehan, 2001).
- Cornell Youth Apprenticeship Project in the USA (Hamilton and Hamilton, 2000).
- Lansing Area Manufacturing Partnership in the USA (MacAllum et al, 2002).

In all of these studies, some positive impacts of education links with employers were identified, but these impacts were on outcome measures other than students' academic attainment (see Research Question 3 below).

Success characteristics

- Henderson and St. John (1997) found that the "communication and exchange of ideas about the curriculum and teaching" (Henderson and St John, 1997: 52) was a key contributory factor to the positive impacts of the Business Involvement in Mathematics Program. This enabled a more 'real world' and problem-solving approach to mathematics education to be taken by teachers and students. Students' visits to the workplace, job shadowing, and work experience were also identified as positive features of this programme.
- In the Business Mentoring in Schools study, Miller noted that mentoring should be "part of whole-school approach to raise attainment" (Miller,1999: 77), and that there should be clear selection criteria for students receiving mentoring (e.g., those unmotivated or underachieving). Miller also argued that there should be a "coherent relationship between business and community mentoring, staff mentoring and other raising attainment strategies" (ibid). He also suggested that mentors should be well briefed on GCSE coursework and deadlines and that there should be good monitoring data on mentored students.
- In the Increased Flexibilities for 14-16 Year Olds Programme (IFP), Golden et al. (2005) found that having employers as visiting speakers, and having them on the steering group of the IFP partnerships, contributed to students gaining higher qualifications.
- The Reinventing Education Programme (Center for Children & Technology, 2004) found that having IBM employees working with schools as an actual work assignment, rather than as an extracurricular activity, was a key feature of the success of this initiative in US high schools. This IBM initiative also required schools to display "vision for innovation and commitment to reform", as

well as proven leadership, high academic standards, reform experience, public commitments from leaders, and broad parent involvement. These somewhat exacting requirements suggest that not all schools or school environments would be able to benefit from the technological involvement of a company such as IBM, and that there may be a considerable selection effect of the effectiveness of such an initiative.

Other measurable impacts

There were a number of positive impacts on students' outcomes other than objective measures of student attainment. These included:

- Lower drop-out rates, improved attendance, increased academic course taking, and the increased likelihood of graduating on time (Kemple and Snipes, 2000).

- Graduates from the Lansing Area Manufacturing Partnership (LAMP) had higher rates of enrolment and continuity in post-secondary education, sustained higher levels of employment, and higher hourly wage rates than programme participants in the comparison group, despite the fact that "there was no detectable difference between LAMP graduates and the comparison group in terms of cumulative grade point average" (MacAllum et al, 2002).

- Students who took part in the Cornell Youth Apprenticeship (Hamilton and Hamilton, 1993, 2000) not only failed to benefit in terms of academic achievement, but also "only a small proportion of apprentices enrolled in higher level courses". This was so despite the considerable involvement of employers in the funding, training and supervision of apprentices. However, Hamilton and Hamilton found that apprentices did succeed where they were placed in workplaces in which they could directly learn work-related skills. The authors also found that where teachers, counsellors, parents and workplace mentors communicated to apprentices "the vital importance of academic achievement" (Hamilton and Hamilton, 2000:4) the results were positive. This occurred in only a few cases.

- The Business Involvement in Mathematics initiative, which did find improvement in students' academic achievements, also found other benefits. These included teachers' and students' positive attitudes towards the job shadowing opportunities that the programme provided. The teachers expressed the view that "these support systems are just as important as changes in curricular and pedagogical approaches to mathematical education" (Henderson and St. John, 1997: 57).

CONCLUSIONS

The evidence reviewed in this report suggests that there are positive impacts of employers' involvement with education. These impacts, however, in terms of improving standardised measures of academic attainment, have seldom been demonstrably measured.

Other positive impacts have been found in terms of preparedness for work, developing job and work skills, improving work-based competencies, attitudes and behaviours, enhanced employability and higher initial wage rates.

To robustly quantify the measurable impact of the involvement of business in education would require very thorough evaluations in future. To date though, we have found only a small amount of strong evidence that has attempted to quantify the impact of business involvement with education on students' academic achievement.

INTRODUCTION

This is a report of a rapid evidence assessment (REA) of the available research literature on the impact of education links with employers. This REA was commissioned by the Department for Children, Schools and Families (DCSF) to answer the following questions:

1. What evidence is there in England, the UK, and from abroad, about the size of the impact on measurable standards of pupils (attainment grades) that can be achieved by employers getting involved with schools and education?

2. What are the characteristics of the employer activities, interventions and involvement that have the most impact?

3. If there is little evidence of the direct impact on attainment, what evidence is there of other measurable impact on other outcomes for children and young people, such as attendance, behaviour, or any robustly quantified estimates of any other impacts?

POLICY CONTEXT

A consistent theme throughout the Government's approach to the reform of public services since 1997 has been diversity of provision and greater choice for citizens. This, in turn, has brought about the involvement of the public, private and third sectors in the sponsorship, support and governance of public services.[1]

In education, this has resulted in a number of initiatives such as the expansion of work-related learning in the curriculum for students aged 14-19 years, and the greater involvement of schools and colleges with employers. This can take a number of forms, such as employers

- giving presentations or providing information to students on their business or sector

- providing projects and materials for work-related learning and enterprise activities

- offering enterprise opportunities in the workplace to help provide the five days' enterprise experience working through lead Education Business Link Consortia in their region to support the Learning and Skills Council-funded Enterprise Adviser Service

- providing labour-market information to help teachers and learners increase their awareness of the extent and diversity of local and national employment opportunities.[2]

The Specialist Schools Programme is another example of the Government's attempts to involve the wider community in schools and colleges and, thereby, "to establish distinctive identities through their

---

[1] Prime Minister's Office of Public Services Reform, 2001, *Reforming Our Public Services: Principles to Practice*, London, Cabinet Office.

[2] *Employer Involvement in 14 to 19*, available at: www.techernet.gov.uk/teachingandlearning/14to19/collaboration/employerinvolvement.

chosen specialisms and achieve their targets to raise standards".[3] This has allowed some schools and colleges to have greater contact with employers and local businesses, and to develop specialist status in business, enterprise and technology.

Developing employers' links with education, and vice versa, has been seen by the government and some employers' organisations as one way of responding to the latters' frequently made remarks about the lack of student preparedness to meet the demands of the workplace. The CBI's Employment Trends Survey 2007, for instance, found that "the majority of employers feel that school leavers lack skills vital for employment."[4] One of the suggestions from the CBI to improve students' employability skills is the expansion of "education-business link activities, such as work experience, shadowing, site visits, mentoring, presentations by employers, mock interviews and enterprise activities.[5]

It is against this backdrop that DCSF commissioned this review, with the explicit goal of determining what is known about the measurable impact on students' attainment of employers' involvement in school and colleges. This review will feed in to discussion of the National Council for Educational Excellence (NCEE). The NCEE is an advisory committee established in June 2007 by the Prime Minister. The Council focuses on what we need to do as a country to achieve world-class education performance for all children and young people. It aims to:

- act as a sounding board for ideas about how to do this;
- mobilise the wider community - encouraging them to work with early years providers, schools, and colleges to achieve educational excellence.

There is a wealth of evidence of the broader impact of business involvement on pupils and teachers, and on so called 'soft skills' such as self confidence and esteem. The focus of this review of the research literature on education links with employers is on measurable outcomes.

SCOPE

In order to identify appropriate and relevant evidence on the impact of education-employers' links on students' achievement, AIR UK and DCSF agreed the scope of the review. This was done by identifying the Population, Intervention, Context, and Outcomes (the 'PICO' method).

Population

The main focus of the project was on Key Stages 3 and 4, and on KS 1 and 2 to the extent that there is any evidence on science, technology, engineering and, mathematics (STEM) initiatives – e.g. the science ambassadors initiatives. KS 1 (children aged 5-7 years) were excluded from the review, other than for STEM initiatives.

---

[3] *What Are Specialist Schools*, The Standards Site, department for Children, Schools and Families, available at www.standards.dfes.gov.uk/specialistschools/what_are/?version=1.

[4] CBI Employment Trends Survey, 2007, London, Confederation of British Industry. Summary available at www.cbi.org.uk/

[5] *Ibid.*

Interventions

The following employer interventions/initiatives were included:

- Employer involvement in mentoring, coaching and counselling (including electronic mentoring, coaching, counselling) of students
- Employer-provided or sponsored skills development for the workplace
- Employer-led support to schools, colleges and teachers about business and enterprise
- STEM initiatives
- Business buddying with head teachers, teachers and students
- Reading buddies, number partners, etc. (with KS2 pupils)
- Employer-led/supported volunteers in schools (especially reading and mathematics)
- Role modelling initiatives
- Workplace internships and other forms of work experience
- Apprenticeship programmes

The following employer interventions/initiatives were excluded:

- Employer-based structural or financial initiatives (school buildings, sponsorships, organisational/institutional arrangements)
- City academies and specialist schools (being evaluated separately)
- Employer-based youth development programmes
- Employer-based youth community programmes

Context

The project focused primarily on evidence about education links with employers in England, then Scotland, Wales and Northern Ireland, then other countries. The problem of transferability of initiatives from other countries was acknowledged. On the other hand, it was also acknowledged that the most robust evidence may be found in other countries (especially the USA). International evidence was included but special attention was given by AIR UK to flagging up any likely problems of transferability of evidence from countries with different educational systems and arrangements.

It was also agreed that the focus of the project should be on employer links with education in the state school sector.

The following were excluded from scope:

- Employers links with schools, colleges (teachers and pupils) in the independent sector

- Initiatives from Independent-State Schools Partnerships (ISSPs)

Outcomes

This review is primarily interested in the relationship between education/employer links and school attainment/achievement. The latter refers to standardised measures of attainment/achievement such as:

- SATS
- GCSEs
- GCE 'A' Levels
- NVQs
- Other measures of attainment (e.g. Scottish Highers, Baccalaureate, High School graduation certification)
- Apprenticeship qualifications
- Completed secondary schooling (with certification)
- Other qualifications/measures of attainment

Although 'soft skills' (e.g. pupil motivation, behaviour, attendance, etc.) are important potential benefits of business involvement in schools, this review had a strong focus on measured outcomes, especially attainment. So, soft skills were only in scope to the extent that they could have a demonstrated indirect effect on attainment.

METHODOLOGY

This rapid evidence assessment was undertaken using the following structured sequence of procedures:

1. Clarifying the research questions (using the PICO procedure mentioned above);
2. Searching for appropriate and relevant studies using electronic databases websites, print sources, websites, cross-referencing from studies resulting from searches, and contacts with experts and stakeholders in this area of inquiry (see Annex A);
3. Developing and adapting search terms in light of what was identified during searching;
4. Retrieval of documents for reading and critical appraisal;
5. Initial mapping of the research literature to identify the range and types of evidence;
6. Critical appraisal of the studies identified, to separate high from low quality studies, using clear and explicit quality assurance criteria (see Annex B);
7. Mapping of the critically appraised evidence, to identify included and excluded studies;

8. Data extraction – identifying the key data and findings from the included studies, using clear and explicit criteria (see Annex B);
9. Analysis and synthesis of the findings;
10. Preparation of the final report.

SELECTION OF STUDIES

Using the scope of the review (see above) the initial searches for appropriate and relevant studies were organised around two clusters:

Cluster A: Support to Students or Teachers:

- Employer involvement in mentoring, coaching and counselling (including electronic mentoring, coaching, counselling) of students
- STEM initiatives
- Business buddying with head teachers, teachers and students
- Reading buddies, number partners, etc. (with KS2 pupils)
- Employer-led/supported volunteers in schools (especially reading and mathematics)
- Role modelling initiatives

Cluster B: Workplace Development and Business Culture:

- Employer-provided or sponsored skills development for the workplace
- Workplace internships and other forms of work experience
- Apprenticeship programme
- Employer-led support to schools, colleges and teachers about business and enterprise

The electronic databases and other sources of evidence listed in Annex A were searched for studies that were potentially relevant to Clusters A and B, using the search terms that are also presented in Annex A. 161 documents were identified as potentially relevant to this review based on the abstracts presented in the electronic databases. These 161 documents were then subjected to a three-stage process of assessment for relevance, quality, and data extraction (see Annex B).

- 135 of the 161 potentially relevant documents were identified as actually relevant against the specific requirements of the scope of the review (see Annex B for criteria).
- The full text documents of 135 documents were retrieved and read by the research team, and assessed for scientific quality against the criteria presented in Annex B.

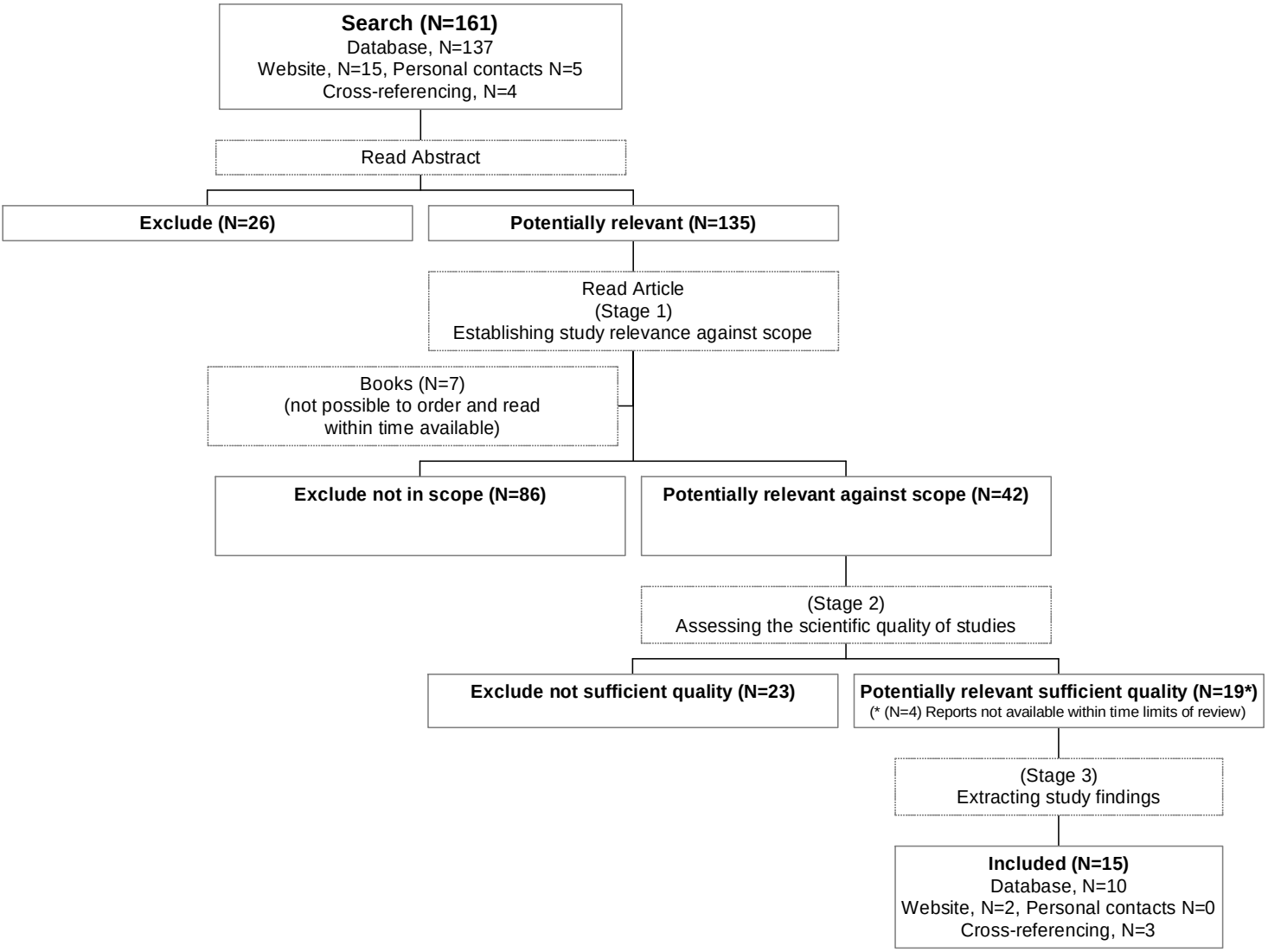
- 15 documents[6] met these criteria of scientific quality, and proceeded to Stage 3 of the selection process for data extraction (Annex B). The data extracted from these studies were entered into a file of ‘emerging findings’.

- All documents identified through these search procedures and assessment stages were entered into an Access database. The abstract for each document, where available, was copied into one central document. Duplicated references and abstracts were eliminated.

[6] There are 15 documents relating to 12 studies about 10 initiatives.

Figure 1 provides an overview of the process of searching and assessment, with the number of documents that were included or excluded at each stage.

Figure 1: Consort Diagram of the Selection Process



FINDINGS

Descriptions and key findings from the fifteen included documents on education links with employers are presented below. These findings provide the following summary answers to the key questions of this review:

IMPACT ON MEASURABLE STANDARDS

WHAT EVIDENCE IS THERE IN ENGLAND, THE UK, AND FROM ABROAD, ABOUT THE SIZE OF THE IMPACT ON MEASURABLE STANDARDS OF PUPILS (ATTAINMENT GRADES) THAT CAN BE ACHIEVED BY EMPLOYERS GETTING INVOLVED WITH SCHOOLS AND EDUCATION?

Few of the studies identified by this review measured the impact of education links with employers in terms of students' academic attainment. Of those than did:

Positive impacts on students' academic attainment were found in the following initiatives:

- Business Involvement in Mathematics Program[7] amongst Latino students in Salinas, California (Henderson and St. John, 1997). These positive impacts were sustained over the course of the programme.
- Business Mentoring in Schools in England (Miller, 1998, 1999).
- Increased Flexibilities for 14-16 Year Olds Programme in England (Golden et al., 2004, 2005, 2006).
- Re-inventing Education Program in the USA (Center for Children & Technology, 2004).
- Work-based Learning (Swail and Kampits, 2004).

No impacts (positive or negative) on students' academic attainment were found in the following initiatives:

- Career Academies in the USA (Kemple and Snipes, 2000).
- African-American Work-Based Mentoring Program in the USA (Linnehan, 2001).
- Cornell Youth Apprenticeship Project in the USA (Hamilton and Hamilton, 2000).
- Lansing Area Manufacturing Partnership in the USA (MacAllum et al, 2002).

In all of these studies, some positive impacts of education links with employers were identified, but only on outcome measures other than students' academic attainment (see Research Question 3).

[7] Throughout the report, the American spelling ('program') is used when an American reference is cited.

SUCCESS CHARACTERISTICS

WHAT ARE THE CHARACTERISTICS OF THE EMPLOYER ACTIVITIES, INTERVENTIONS AND INVOLVEMENT THAT HAVE THE MOST IMPACT?

- Henderson and St. John (1997) found that the "communication and exchange of ideas about the curriculum and teaching" (Henderson and St John, 1997: 52) was a key contributory factor to the positive impacts of the Business Involvement in Mathematics Program. This enabled a more 'real world' and problem-solving approach to mathematics education to be taken by teachers and students. Students' visits to the workplace, job shadowing, and work experience were also identified as positive features of this programme.

- In the Business Mentoring in Schools study, Miller noted that mentoring should be "part of whole-school approach to raise attainment" (Miller,1999: 77), and that there should be clear selection criteria for students receiving mentoring (e.g., those unmotivated or underachieving). Miller also argued that there should be a "coherent relationship between business and community mentoring, staff mentoring and other raising attainment strategies" (ibid). Miller also suggested that mentors should be well briefed on GCSE coursework and deadlines and that there should be good monitoring data on mentored students.

- In the Increased Flexibilities for 14-16 Year Olds Programme (IFP), Golden et al. (2005) found that having employers as visiting speakers, and having them on the steering group of the IFP partnerships, contributed to students gaining higher qualifications.

- The Reinventing Education Program (CCT, 2004) found that having IBM employees working with schools as an actual work assignment, rather than as an extracurricular activity, was a key feature of the success of this initiative in US high schools. This IBM initiative also required schools to display "vision for innovation and commitment to reform", as well as proven leadership, high academic standards, reform experience, public commitments from leaders, and broad parent involvement. These somewhat exacting requirements suggested that not all schools or school environments would be able to benefit from the technological involvement of a company such as IBM, and that there may be a considerable selection effect of the effectiveness of such an initiative.

OTHER MEASURABLE IMPACTS

IF THERE IS LITTLE EVIDENCE OF THE DIRECT IMPACT ON ATTAINMENT, WHAT EVIDENCE IS THERE OF OTHER MEASURABLE IMPACT ON OTHER OUTCOMES FOR CHILDREN AND YOUNG PEOPLE, SUCH AS ATTENDANCE, BEHAVIOUR, OR ANY ROBUSTLY QUANTIFIED ESTIMATES OF ANY OTHER IMPACTS?

There were a number of positive impacts on students' outcomes other than objective measures of student attainment. These included:

- Lower drop-out rates, improved attendance, increased academic course taking, and the increased likelihood of graduating on time (Kemple and Snipes, 2000).

- Graduates from the Lansing Area Manufacturing Partnership (LAMP) had higher rates of enrolment and continuity in post-secondary education, sustained higher levels of employment, and higher hourly wage rates than programme participants in the comparison group, despite the fact that 'there was no detectable difference between LAMP graduates and the comparison group in terms of cumulative grade point average" (MacAllum et al, 2002).

- Students who took part in the Cornell Youth Apprenticeship partnership (Hamilton and Hamilton, 1993, 2000) not only failed to benefit in terms of academic achievement, but also "only a small proportion of apprentices enrolled in higher level courses". This was so despite the considerable involvement of employers in the funding, training and supervision of apprentices. However, Hamilton and Hamilton did find that apprentices succeeded where they were placed in workplaces in which they could directly learn work-related skills. Hamilton and Hamilton also found that where teachers, counsellors, parents and workplace mentors communicated to apprentices "the vital importance of academic achievement" (Hamilton and Hamilton, 2000:4) the results were positive. This occurred in only a few cases.

- The Business Involvement in Mathematics initiative, which found improvement in students' academic achievements, also found other benefits. These included teachers' and students' positive attitudes towards the job shadowing opportunities that the programme provided. The teachers expressed the view that "these support systems are just as important as changes in curricular and pedagogical approaches to mathematical education" (Henderson and St. John, 1997: 57).

DETAILS AND FINDINGS OF THE INCLUDED STUDIES

INCREASED FLEXIBILITIES FOR 14-16 YEAR OLDS PROGRAMME (GOLDEN ET AL., 2004, 2005, 2006)

DESCRIPTION OF THE INITIATIVE

The Increased Flexibilities for 14-16 Year Olds Programme (Golden, et al. 2004) was launched by the (then) Department for Education and Skills (DfES) and aimed to broaden opportunities for young people through the creation of "enhanced vocational and work-related learning opportunities for 14 to 16 year olds of all abilities who can benefit most". The opportunities also included vocational GCSEs. The IFP was provided for two cohorts of students, the first in 2002 and the second in 2003.

To provide students with a curriculum that better suited their needs, around 300 partnerships were launched within Local Skills Council areas, each headed by a 'Lead Partner' (the majority of which were Further Education colleges). The authors estimated that this included approximately 2,000 schools and over 90,000 pupils. The partnerships were not only associated with schools and colleges, but also training providers and local employers.

SUMMARY OF OUTCOMES

Golden et al. (2005) have evaluated the effectiveness of the implementation of the IFP, including the involvement of employers and businesses in the IFP partnerships. The evaluation measured the impact of the vocational qualifications and new work-related learning opportunities provided by the IFP on young people's skills, knowledge, attitudes, attendance, attainment and post-16 progression. Findings from the first cohort indicate that IFP partnerships that had education-business involvement in their

steering groups, and those that used employers as visiting speakers, achieved higher outcomes in qualifications than similar students in partnerships where this was not the case. The report detailing outcomes from the second cohort (Golden, et al, 2006) did not include any mention of education-business partnerships.

BUSINESS MENTORING IN SCHOOLS (MILLER, 1998, 1999)

DESCRIPTION OF INITIATIVE

The research literature is replete with studies that extol the virtues of mentoring programmes, and the importance of employers' links with education in providing such programmes. Very few studies, however, provide empirical evidence to support these claims. An exception to this is Andrew Miller's work on business mentoring in schools in England. Miller (1999) undertook an evaluation of business mentoring in seven schools. The initiative involved one-to-one mentoring, small group mentoring, and a combination of the two. Mentors came mainly from the business community including an international investment bank. The objective of the mentoring programme was to raise attainment, particularly in GCSE courses.

SUMMARY OF OUTCOMES

- Miller (1999) has evaluated this mentoring programme. In all there were 90 mentored and 93 control group students involved in the evaluation. Students' GCSE grades were matched against their predicted scores on the YELLIS (Year Eleven Learning Information System) assessment.

The key findings from Miller's evaluation were:

- significant differences between schools, between boys and girls, between mentored and control group students in GCSE performance against YELLIS predictions;

- in the school which had a group mentoring scheme there were no significant differences between the mentored and the control groups for either boys or girls;

- "the impact of mentoring on girls was significant in four out of the seven schools. The 46 mentored girls scored an average 2.26 GCSE points above YELLIS compared to 1.87 GCSE points for control group girls. The mentoring value added score for girls was 0.39" (Miller, 1999:76);

- "the impact of mentoring on boys was significant in four out of the seven schools. The 44 mentored boys had an average score of -1.72 GCSE points below YELLIS compared to -2.13 for the 49 control group boys. The mentoring value added score for boys was 0.41" (ibid).

- in two schools the mentored students did worse than the control students (boys in one school, and girls in another school)."

Commenting on these findings, Miller notes that:

"school co-ordinators regarded the impact of business mentoring on attainment as indirect According to this view higher self-worth and the resulting improved motivation could be the factors that lead to improved GCSE performance."

(Miller, 1999:75).

Miller also suggests that mentoring should be “part of whole-school approach to raise attainment” (Miller,1999:77), and that there should be clear selection criteria for students receiving mentoring” (e.g. those unmotivated or underachieving). Furthermore, Miller argues that there should be a coherent relationship between business and community mentoring, staff mentoring and other raising attainment strategies. Mentors should be well briefed on GCSE coursework and deadlines. It is also important that monitoring data are collected on mentored students.

AFRICAN-AMERICAN WORK-BASED MENTORING PROGRAM (LINNEHAN, 2001)

DESCRIPTION OF INITIATIVE

As part of the US School-To-Work initiative this work-based mentoring programme was for African-American students in urban high schools. Work experience for these students was integrated into the schools’ academic curricula with the support of employers as mentors. Employer-mentors conducted tutorials during work experience, and “identified work activities that, in conjunction with the school activities, will help students achieve their academic standards” (Linnehan, 2001:313).

SUMMARY OF OUTCOMES

The initiative was evaluated using a non-experimental design, but did involve a comparator group. Sixty-eight students were mentored and 134 were not. While there was no significant difference between the mentored group and the comparator group in terms of GPA or attendance, there was a significant difference within the mentored group depending on length of participation in the mentoring programme. Those who participated for more than six months recorded higher GPAs than those who participated for a shorter time.

SUMMER BUSINESS INSTITUTE (DONOHUE ET AL., 2005)

DESCRIPTION OF INITIATIVE

The Las Vegas Summer Business Institute (SBI) is an example of how businesses can get involved in introducing high school students to the world of work, business and entrepreneurship. On being selected to participate in the SBI program, students were matched for part-time employment (32 hours/ week) in local businesses, as well as with business mentors, on the basis of students’ interests. Mentors were members of the Las Vegas business community and were instructed to assist their assigned students in understanding and appreciating business, as well as assisting students in their professional development.

After attending a program orientation in which program guidelines are explained, students were invited to a welcome dinner. Students subsequently worked from Monday through to Thursday for 8 weeks at their place of employment. During this time students attended a weekly guest lecture and either job social skills training or financial management training. Guest lectures given by local businessmen and businesswomen focused on professional development issues (e.g., teaching youth about potential career paths, means necessary to accomplish career goals, entrepreneurial opportunities for self-employment, methods of writing effective employment, college opportunities).

Students also assisted in a fund-raising event to raise money for a local charity. Lastly, students attended an SBI graduation ceremony. During the ceremony, students received a graduation certificate by a County Commissioner. Additionally, some received scholarships based on their efforts in the SBI

program (e.g., conduct during workshops, completion of workshop homework assignments, and participation in fund-raising event).

SUMMARY OF OUTCOMES

Donohue et al (2005) reported on an evaluation of the Las Vegas SBI. Ninety-two adolescents, predominantly ethnic minority high school students, participated in a structured Summer Business Institute (SBI). Participating youth were randomly assigned to receive either job social skills or financial management skills training components. Students who received the job social skills training component were more likely to recommend their employment agency to others than were youth who received the financial management component. They rated their overall on-the-job work experience more favourably, and demonstrated higher scores in areas that were relevant to the skills that were taught in the job social skills workshops.

The financial management component also appeared to be relatively effective, as youths who received this intervention improved their knowledge of financial management issues more than youth who received job social skills, and rated their workshops as more helpful in financial management, as well as insurance management.

A relative strength of the SBI and its component interventions appeared to be its cost-effectiveness. Indeed, program development costs were substantially lowered by structuring workshops to accommodate 40-50 youth concurrently (i.e., a lead facilitator provided information relevant to the respective skill/content, and student participants were then rotated into small groups/pairs to practice skills or discuss content, whereas the lead facilitator and two assistant facilitators provided feedback).

BUSINESS INVOLVEMENT IN MATHEMATICS EDUCATION (HENDERSON AND ST. JOHN, 1997)

DETAILS OF INITIATIVE

Henderson and St John (1997) undertook a random allocation trial of three methods of teaching mathematics to Latino middle school students (aged 12-14 years) in Salinas California. These students tended to be disproportionately “at risk for [sic] educational failure and underachievement” (Henderson and St. John, 1997:2), but will require competence in mathematics to meet the needs of the jobs in which they are likely to be employed.

The initiative undertaken and evaluated by Henderson and St John consisted of randomly allocating students to one of three methods of teaching mathematics:

Thematic - which consisted of “a contextualised approach in which there are explicit real world connections for mathematical ideas…[and] rich opportunities to solve and form mathematical problems together in shared contexts” (op cit: 5). This approach, which was called Mathematics in Manufacturing, was “developed as a three way collaboration among the school, the university, and the business partner” (op cit:8). The Thematic method of teaching was given to students with mixed ability in mathematics.

Traditional - which consisted of teaching mathematics using textbook-based methods only, without ‘real world’ problem-solving challenges. The Traditional method was given to students of similar ability based on prior mathematics achievement.

Blend – which consisted of a combination of textbook-based and project-based approaches to teaching mathematics. The Blend method of teaching was also given to students with mixed ability in mathematics.

SUMMARY OF OUTCOMES

The evaluation of this initiative measured students' achievement on standardised tests of mathematics, as well as their self-perceptions and their attitudes towards mathematics. So far as students' performance on standardised tests of achievement (the main focus of this review) are concerned the following outcomes were recorded:

In the first year of the trial, the three treatment groups all showed improvement in test scores. By the end of the year the greatest gain in mathematical achievement occurred amongst the Blend group of students.

With all three methods of teaching mathematics, the higher achieving students at the beginning of the year made significant gains in test scores. However, amongst the lower achieving students at the outset, only those in the Thematic and Blend groups made significant gains in test scores.

In the second and third years of the trial gains in the levels of achievement were maintained across the three methods of teaching. The Thematic and Blend methods of teaching showed parallel gains throughout, "both of which were greater than the gains registered by the students in the Traditional treatment" (op cit: Henderson and St John note that "the improvement in the rate of change for the Blend group during year 3 was particularly striking" (ibid).

Henderson and St John's report on this evaluation is detailed and complex, and is more about pedagogical methods than about business involvement in education. The overall success of the Thematic and Blend methods of teaching mathematics is evidence that for many students problem-based learning seems to achieve better outcomes than a more passive textbook-based approach. What is interesting for this review of employers' links with education is that this initiative and evaluation was inspired and supported by the business community in the form of the California Academic Partnership Programme. This partnership between the business community, schools and the University of California was brought about by the acknowledgement that "the kind of jobs in which former generations found some degree of security and upward social mobility are being exported to developing countries….[and that] a major portion of the more satisfying and remunerative careers will require competence in mathematics" (op cit: 3). Hence the interest of the business community in developing this initiative, which included job shadowing and experience in the workplace, as well as 'real world' problem-based mathematical teaching and learning. Henderson and St John conclude their report by noting that the school's relationship with the business partner has continued beyond the life of the California Academic Partnership Programme.

CAREER ACADEMIES (COFFEE AND PESTRIDGE, 2001; KEMPLE AND SNIPES, 2000; SHORR AND HON, 1999)

DESCRIPTION OF INITIATIVE

Career Academies are one of the oldest and most widely established high school reforms in the United States. They have existed for more than 30 years and have been implemented in more than 1,500 high

schools across the USA. Career Academies UK has been established to raise the aspirations of 16 to 19-year-olds in the UK, and to develop partnerships between employers, teachers and students[8]. An evaluation of a Career Academy initiative in the UK (Huddleston, et al 2006) – the Academy of Finance programme – did not meet the scope of this review because it did not measure student attainment. However, this study does note students' reports of increased practical experience in a business environment, increased students' self-confidence, and the establishment of professional contacts and networks.

Career Academies have been described as "schools within schools that link students with peers, teachers, and community partners in a disciplined environment, fostering academic success and mental and emotional health" (Coffee and Pestridge, 2001:1). They are aimed at students in grades 9-12 of US high schools (ages 14-17 years). The curricula of career academies "combine academic and occupation-related course requirements that aim to promote applied learning and to satisfy college entrance requirements" (Kemple and Snipes, 2000:1).

Career academies attempt to build stronger connections between school and work, providing students with a range of career development and work-based learning opportunities" Coffee and Pestridge (2001:2). Partnerships with local employers are a key feature of career academies and have been established "to build sequences of career awareness and work-based learning opportunities for their students" (ibid). Employers' activities include mentoring and job shadowing, which allows students to observe employees at work. Career academies also work with institutions of higher education to give students college credit for completion of course work.

Kemple and Snipes 2000 have noted that:

"The original Academies were designed primarily to prevent dropping out of high school and to increase preparation for work among students who began high school at high risk of school failure. There is now widespread agreement that Career Academies should seek to prepare students for both work and college, and that they should include a broad cross-section of students, including those who are highly engaged in school". (ibid)

SUMMARY OF OUTCOMES

The Manpower Development Research Corporation (MDRC) has undertaken a five-year evaluation, using a large-scale, multi-site random assignment research design, to determine the impact of career academies on student outcomes. The principal investigators of this evaluation have noted "that this design provides a uniquely rigorous way of comparing the performance of students who had access to an academy with the performance of a truly comparable group of students who did not have access to the programs (Kemple and Snipes, 2000:3).

The key findings of the five-year evaluation of career academies are:

- the career academies substantially improved high school outcomes among students at high risk of dropping out. For this group, the academies reduced dropout rates, improved attendance, increased academic course-taking, and increased the likelihood of earning enough credits to graduate on time.

[8] Further details of Career Academies UK are available at: http://www.careeracademies.org.uk/

- among students least likely to drop out of high school, the career academies increased the likelihood of graduating on time. The academies also increased vocational course-taking for these students without reducing their likelihood of completing a basic core academic curriculum.

- when the findings are averaged across the diverse groups of students in the full study sample, it appears that the career academies produced only slight reductions in dropout rates and modest increases in other measures of school engagement.

- the career academies did not improve standardised math and reading achievement test scores, either on average or for any subgroup of students.

(Kemple and Snipes, 2000).

Another evaluation of a Career Academy initiative (Shorr and Hon,1999) did find increases in some (11 out of 19) students' GPAs following their participation in the Academy's mentoring programme. However, these impacts were modest and there was no comparison or control group. Also, the remaining students who participated in the programme (N=8) had lower GPAs in the following semester.

These findings will be disappointing to those who seek evidence that employers' involvement with education improves student attainment. Kemple and Snipes note, however, that "the types of standardised measures of achievement used in this evaluation, and in many school districts, may not adequately capture learning gains that academy students achieve relative to their non-academy counterparts" (Kemple and Snipes, 2000:6). It is not possible to say, without much more detailed analysis, whether the assessments of mathematics and reading used in England would detect any additional improvement than those used by the MDRC evaluation. Even if this was not the case, the other gains in students' outcomes - lower drop out rates (especially amongst high-risk students), increased academic and vocational course-taking, increased likelihood of graduating from secondary school on time – would seem to be a positive outcome from the types of involvement in education provided by the career academies.

RE-INVENTING EDUCATION (CENTER FOR CHILDREN AND TECHNOLOGY, 2004)

DESCRIPTION OF INITIATIVE

Reinventing Education is an initiative from IBM which is based on the company's belief that "business has a tremendous responsibility to improve education, and that IBM's technical expertise, working in collaboration with school leadership, could make meaningful contributions to schools" (Center for Children & Technology (CCT), 2004:2). The Reinventing Education programme focuses on cultivating long-term, flexible educational research and development partnerships with urban school districts and state education departments. The programme offers the following initiatives to schools and school districts:

- Implemented programs that will serve as best practice models for other school reform initiatives
- New technology tools that improve teaching and learning;
- Effective, ongoing programs for teachers' professional development;
- Sustained reform momentum after the life of the IBM grants;
- Scaled reform within and among multiple sites;
- Encouragement to states and districts to contribute equal or greater amounts in developing and sustaining the Reinventing Education solutions.

(CCT, 2004)

The Reinventing Education programme "recruited and paid the salaries of full-time IBM employees from its research laboratories and consulting organizations to work elbow-to-elbow with educators in the classrooms. The initiative was not an extracurricular activity, but an actual work assignment" (CCT, 2004:4). IBM required partnership school districts to "display a vision for innovation and commitment to reform…with proven leadership and a document [sic] history of innovation in improving schools". It also required schools that had "high academic standards, reform experience, public commitments from leaders at the state level to the district superintendent to the school, broad parent involvement, and potential collaboration with other national reform initiatives. Notwithstanding these somewhat exacting requirements, CCT claims that "what works well in one school district or state can work equally well in another" (CCT, 2004:3).

SUMMARY OF OUTCOMES

In 1997, the EDC Center for Children and Technology (CCT) began a long-term evaluation study of the sites where the program was launched. Five years later, CCT claims to have found that IBM's Reinventing Education program produced "successful solutions that are addressing long-standing barriers to public school reform" (Centre for Children and Technology, 2004:3). These barriers included the development of teachers over the life-span of their careers, how information is shared and used, and how learning is measured. The evaluation also "revealed that the intense partnership process, which distinguishes Reinventing Education from other school reform efforts, leads to real change in the way schools went about the business of teaching children" (ibid).

The CCT evaluation of Reinventing Education suggests that "technology investment, coupled with professional development and careful programme planning, can result in significant gains in student achievement" CCT, 2004:7). Summarising the impact of Reinventing Education on students' achievement, the CCT reports as follows:

"An analysis of student test scores at two case study schools in West Virginia over three years indicates a relationship between high use (more than 10 instructional hours) of a Learning Village lesson and an increase in student outcomes measured by Stanford Achievement Test – Nine (Stanford 9) test scores. Where there was a greater professional development push and higher use of lessons, students outperformed the control group (random selection of students from the county where the school is located) in every test category." (CCT, 2004:7).

The CCT report concludes that the student outcome improvements hold up across grade levels and across the main academic areas (reading, language arts, listening comprehension, mathematics, social studies, and science). It should be noted, however, that the sample size reported in the CCT (2004) paper was small (N=68 in the 'test' school, and N=44 in the 'control' school), and that the 'test' school was randomly matched (and not randomly allocated) with a sample of students in the 'control' school. This research design – matched controls – is generally less robust than a research design in which students are randomly allocated to the 'test' and 'control' groups, or are matched using a propensity score design[9]. Consequently, caution is necessary when interpreting the statistical findings from such evaluations.

CORNELL YOUTH APPRENTICESHIP DEMONSTRATION PROJECT (HAMILTON AND HAMILTON, 1993, 2000)

DESCRIPTION OF INITIATIVE

The Cornell Youth Apprenticeship Demonstration Project was developed in 1991 "to create an enduring programme that will enable participants to move from adolescence into adulthood as productive workers, active citizens, and caring family members" (Hamilton and Hamilton, 1993). The Apprenticeship Programme involved employers in manufacturing and engineering technology, administration and office technology, and health care. Hamilton and Hamilton note that "employers participating in the project have described their motives as self-interest, concern about the quality of the workforce in the region, and civic responsibility" (Hamilton and Hamilton, 1993:6). Employers assumed the costs of paying, training and supervising apprentices, and they acknowledged that this might benefit other employers if apprentices worked elsewhere once they had finished the four year course.

The apprenticeship system enables young people to combine school with carefully planned and supervised work experience over a four year period, including two years of community college (equivalent to Colleges of Further Education in England). The aim of the programme is to recruit students who probably would not enrol in college, but who do not have severe academic or behavioural problems. According the Hamilton and Hamilton (1993) "the modal GPA of the first wave of students who

[9] For a more detailed discussion of these alternative research designs see *The Magenta Book* (GSR 2007), Chapter 7, available at http://www.nationalschool.gov.uk/policyhub/evaluating_policy/magenta_book/chapter7.asp.

were recruited was ‘C’, and the mean grade was B-…. Half of these students reported that the highest level of education achieved by either parent was high school graduation” Hamilton and Hamilton (1993:5).

SUMMARY OUTCOMES

The Cornell Youth Apprenticeship Demonstration Project evaluated the programme in terms of:

- School performance records (including grades achieved, national test scores, and attendance);
- Survey of students/apprentices self-perceptions and competencies;
- Apprentice progress reports (coaches ratings of apprentices on nine competencies);
- Interviews with apprentices
- Interviews with coaches, mentors and managers;
- Observations in the workplace;
- Portfolios – students’ collections of progress reports, projects, work schedules, etc.

(Hamilton and Hamilton, 1993:8)

Using these data sources, the authors investigated the impact of this programme on work-based learning, academic achievement and continuation in the occupational area. The sample included 7 high schools, 11 employers and 100 students. Academic achievement was measured by GPA (academic courses only) and course enrolment. A questionnaire was also administered to a comparison group (convenience sampling, not a matched sample). The design was not randomised.

The findings showed that there were no significant differences between the apprentices and the comparison group in terms of academic achievement. In addition, only a small proportion of apprentices enrolled in higher-level courses. Follow-up interviews revealed that “too many of them found their career prospects limited or their plans slowed by the need to take remedial courses before enrolling in courses that are part of college degree programs leading to desired occupations” (Hamilton and Hamilton, 2000:4). Commenting on why students/apprentices experienced such difficulties with academic achievement, the authors noted:

‘A program must be designed specifically to affect the outcomes that will be used to evaluate its effectiveness. The strongest impact was also the most direct. We arranged for young people to be placed in workplaces where they could learn work-related skills, and they succeeded. We hoped they would work harder in school and choose to take more rigorous courses because they could see at work why academic achievement is important. We learned from this effort that teachers, counsellors, parents and workplace mentors need to understand and communicate to apprentices the vital importance of academic achievement. This did happen in a few cases with positive results for individual apprentices.’

THE LANSING AREA MANUFACTURING PARTNERSHIP (LAMP) PILOT PROGRAMME (MACALLUM ET AL., 2002)

DESCRIPTION OF INITIATIVE

The LAMP program is a career preparation program open to high school seniors interested in exploring the world of manufacturing. The LAMP programme offers students a unique opportunity to take an in-depth look at the world of manufacturing. Throughout the year, students apply concepts learned in the classroom to real-world experiences within the automotive/manufacturing setting. LAMP's employer-driven curriculum emphasises project-based learning, team teaching, and the opportunity for staff and students to establish close, ongoing interactions with employees. In September 2000, LAMP received the PEPNet Award from the U.S. Department of Labour and the National Youth Employment Coalition for programmatic effectiveness.

Three local partners comprise the LAMP partnership: the Ingham Intermediate School District, the United Auto Workers, and the General Motors Corporation. These partners developed and launched a School-to-Career (STC) programme designed to provide young people with exposure to all aspects of the automotive manufacturing industry.

SUMMARY OF OUTCOMES

The LAMP Longitudinal Study (MacAllum et al, 2002) consists of a comprehensive follow-up study of LAMP participants (N=128) and a comparison group (N=128). The study tracked the educational and employment trajectories of LAMP students from the Classes of 1998, 1999, and 2000 following their high school graduation. The findings indicate that LAMP graduates had high rates of enrollment and continuity in post-secondary education, had sustained high levels of employment, higher hourly wage rates, and were progressing toward their career goals. There was no detectable difference, however, between the LAMP graduates and the comparison group in terms of cumulative grade point average (GPA). This study has a number of reporting weaknesses that make it difficult for the independent analyst to concur with the findings of the authors. In particular, there are very few details about the experimental and comparison groups, and the nature of the matching of the two samples is inadequately explained. Also, there are no statistical tests of significance reported.

WORK-BASED LEARNING – EDUCATIONAL POLICY INSTITUTE (SWAIL AND KAMPITS, 2004)

DESCRIPTION OF INITIATIVE

A number of studies report on initiatives that involve work-based leaning for secondary school students. Few of these met the scope of this review, mainly because they did not measure in any systematic way student attainment as an outcome. One study of work-based learning that did measure student attainment is part of a US national survey by the Educational Policy Institute (Swail and Kampits, 2004). Work-based learning included: job shadowing, internships, career academy, youth apprenticeships, school-sponsored enterprise, and tech prep programmes.

SUMMARY OF OUTCOMES

A sample of 1613 first-year university undergraduate students, two-thirds of whom had participated in work-based learning while in high school, had their high school transcripts analysed for achievement in

GPA. Students who participated in any of the work-based learning opportunities achieved higher GPAs than those students who did not. These higher levels of achievement were sustained in higher education. The difference in these levels of attainment at university, however, when compared with those students who did not participate in work-based learning in high school, was modest.

DISCUSSION OF FINDINGS

There is no shortage of literature on employers and/or business involvement in education. Much of this literature, however, was excluded from the scope of this review, mainly because it is largely anecdotal, programmatic[10], or not evaluated to even modest scientific standards. There is a particular shortage of studies of employers' links with education that have used robust research designs (either 'experimental' or 'quasi-experimental') that can provide robust evidence of an impact. Many studies are descriptive and/or are based on single group before and after designs without a true comparator or counterfactual[11]. Another weakness of the studies in this area is that they have small sample sizes with low statistical power. This can lead to either inconclusive findings or to erroneous conclusions.

One current study that is using an experimental design (a randomised controlled trial), but has not yet reached a stage where it can report any findings on students' attainment, is the evaluation of the 'Time to Programmes'[12] by Business in the Community (2008). Initial findings from the evaluation of these programmes will not be available until September 2008. These programmes use employees from businesses and public sector organisations in Northern Ireland to provide volunteer support with children's reading, counting and IT skills. The 'Time To' website (Business in the Community, 2008) claims that these programmes have a positive impact on children's 'confidence and self-esteem, on their enjoyment of learning and on their ability to interact with adults.' Given the experimental design of this evaluation, and the number of children and primary schools involved, this initiative should yield robust evidence on the education impact of business involvement in schools.

IMPACT ON MEASURABLE STANDARDS

This review indicates that there is more research literature on the role of employers in the development of vocational, employment and work skills than there is in the development of academic achievement. Only a few of the studies identified by this review have examined the impact of employers' links with education in terms of improvement of students' attainment on standardised academic tests. Of these, five studies had a positive effect (Center for Children & Technology, 2004; Golden et al, 2004, 2005, 2006; Henderson and St. John, 1997; Miller, 1998, 1999; Swail and Kampits, 2004).

Those studies that have measured an impact on standardised tests of attainment have not always found significant differences with comparator or control groups. These include the MDRC evaluation of Career Academies by Kemple and Snipes (2000), the Cornell Youth Apprenticeship Project (Hamilton and Hamilton, 1993), the Africa-American Work-Based Mentoring Programme (Linnehan, 2001), and the

[10] By programmatic we mean the documents simply describe a programme of activities that the authors would like to see introduced to the educational system.

[11] A counterfactual provides a comparative measure of what impact would have been achieved by some other intervention, or by doing nothing at all.

[12] These are: 'Time to Read', 'Time 2 Count', and Time to Compute', each of which is a mentoring programme linking employers with Key Stage 2 students.

Lansing Area Manufacturing Partnership project. These possibly disappointing findings may well be a result of either insensitive measures of academic attainment, or small sample sizes and low statistical power, or both.

CHARACTERISTICS OF SUCCESSFUL INITIATIVES

Initiatives demonstrating an impact on academic achievement included characteristics such as clear communication, a range of practical experiences for students, high standards in schools, and the level of involvement by business. Communication between teachers and business regarding curriculum, coursework and teaching was noted as an essential feature in the success of two studies (Henderson and St. John, 1997; Miller, 1998, 1999). Practical experiences provided for students were another feature of successful initiatives, including workplace visits, job shadowing, work experience (Henderson and St. John, 1997) and visiting speakers from the business community (Golden, 2005).

The importance of standards was also highlighted in relation to the selection criteria for students (Miller, 1998, 1999) as well as the academic standards, level of parental and community involvement, vision and commitment exhibited by schools (Center for Children & Technology, 2004). There is some evidence that the more that employer or business involvement can be built into the everyday work of business and schools it is likely to have a greater impact (Center for Children & Technology, 2004). Whilst the findings from the Re-Inventing Education initiative of IBM are encouraging, the success is dependent upon exacting prerequisite conditions that may limit its applicability to many schools in England.

IMPACT ON OTHER OUTCOMES

It is worth noting that studies that were not able to identify strong or significant outcomes on standardised measures of academic attainment often did find other positive outcome measures such as preparedness for work, work-oriented skills and competencies, and improved employability and wages. Compared to the number of studies evaluating the impact on attainment, many more have examined impact in terms of students' general readiness for work, specialised job skills and competences, and behavioural, attitudinal or motivational factors. Students' self-reports and perceptions are also more commonly used as measures of impact than objective standardised measures of attainment or performance. Although not directly relevant to student attainment, the authors would argue that these findings provide valuable evidence of the impact and importance of business involvement in education.

CONCLUSIONS

The evidence reviewed in this report suggests that there are positive impacts of employers' involvement with education. These impacts, however, in terms of improving standardised measures of academic attainment, have seldom been demonstrably measured.

Other positive impacts have been found in terms of preparedness for work, developing job and work skills, improving work-based competencies, attitudes and behaviours, enhanced employability and higher initial wage rates.

To robustly quantify the measurable impact of the involvement of business in education would require very thorough evaluations in future. To date though, we have found only a small amount of strong evidence that has attempted to quantify the impact of business involvement with education on students' academic achievement.

The improvements apparent in preparedness for work in some of the evidence that has been identified by this review is encouraging. But, a deeper understanding would require a stronger evidence base.

REFERENCES

Business in the Community. (2008). Time to Programmes. (Accessed on http://www.timetoni.com/foreward).

Confederation of British Industry (2007). CBI Employment Trends Survey. London: Confederation of British Industry. (Accessed on www.cbi.org.uk).

Center for Children & Technology (2004). The Reinventing Education Initiative from an Evaluation Perspective: The Role of Innovative Technology Partnerships in Addessing Significant Challenges to Education Improvement. CCT Research Summary. (Descriptive report accessed from http://www.eric.ed.gov).

Coffee, J.N. and Pestridge, S. (2001). The Career Academy Concept. OJJDP Fact Sheet. http://www.ncjrs.org/pdffiles1/ojjdp/fs200115.pdf. (Accessed from http://eric.ed.gov).

Donohue, B., Conway, D., Beisecker, M., Murphy, H., Farley, A., Waite, M., Gugino, K., Knatz, D., Lopez-Frank, C., Burns, J., Madison, S. and Shorty, C. (2005). Financial Management and Job Social Skills Training Components in a Summer Business Institute. Behavior Modification, Vol 29(4), pp. 653-676.

Golden, S., Nelson, J., O'Donnell, L. and Rudd, P. (2004). Evaluation of Increased Flexibilities for 14-16 Year Olds: Profile of partnerships and students 2002 and 2003. Research brief: RB558 (Accessed on www.dfes.gov.uk/research).

Golden, S., O'Donnell,L., Benton, T. and Rudd, P. (2005). Evaluation of Increased Flexibilities for 14-16 Year Olds Programme: Outcomes for the First Cohort. Research brief: RB668 (Accessed on www.dfes.gov.uk/research).

Golden, S., O'Donnell, L., Benton, T. and Rudd, P. (2006). Evaluation of Increased Flexibility for 14 to 16 Year Old Programme: Outcomes for the second cohort. Research brief: RB786 (Accessed from www.dfes.gov.uk/research).

Government Social Research (2007). The Magenta Book. London: HM Treasury. (www.nationalschool.gov.uk/policyhub/evaluating_policy/magenta_book/chapter7.asp)

Hamilton, M.A. and Hamilton, S.F. (1993). Toward a Youth Apprenticeship System: Report from the Youth Apprenticeship Demonstration Project in Broome County, New York. Ithaca, NY: Cornell University.

Hamilton, S.F. and Hamilton, M.A. (2000). Research, intervention, and social change: Improving adolescents' career opportunities. In 'Negotiating adolescence in times of social change'. Crockett, Lisa J. (Ed); Silbereisen, Rainer K. (Ed); pp. 267-283. New York, NY, US: Cambridge University Press.

Henderson, R. W. and St. John, L. (1997). Thematically Integrated Middle School Mathematics: A School-University-Business Partnership. (Report) California University, Santa Cruz, CA. (Accessed on http://www.eric.ed.gov).

Huddleston, P., Maguire, S., Muir, F., Hirst, C. and Thompson, J. (2006). Evaluation of the Academy of Finance Programme. (Accessed on http://www.careeracademies.org.uk/foundation/files/CareerAcademyReport.pdf).

Kemple, J. and Snipes, J. (2000). Career Academies: Impacts on Students' Engagement and Performance in High School. Accessed http://www.mdrc.org/publications/41/execsum.html

Linnehan, F. (2001). The relation of a work-based mentoring program to the academic performance and behavior of African American students. Journal of Vocational Behavior, 59(3), pp. 310-325.

MacAllum, K., Yoder, K., Kim, S. and Bozick, R. (2002). Moving forward: College and career transitions of LAMP graduates. Findings from the LAMP longitudinal study. Report by National Institute for Work and Learning (Accessed on www.eric.ed.gov).

Miller, A. (1998). Business and community mentoring in schools. Research brief (RB43) (Accessed on www.dfes.gov.uk).

Miller, A. (1999). Business mentoring in schools: Does it raise attainment? Education & Training, vol 41, pp. 73-78.

Prime Minister's Office of Public Services Reform (2001). Reforming Our Public Services: Principles to Practice. London: Cabinet Office.

Shorr, A. and Hon, J. (1999). They said it couldn't be done: Implementing a career academy program for a diverse high school population. Journal of Education for Students Placed at Risk, Vol 4(4), pp. 379-391.

Swail, W.S. and Kampits, E. (2004). Work-Based Learning & Higher Education: A Research Perspective. American Higher Education Report Series. (Accessed on www.eric.ed.gov)

ANNEXES

ANNEX A: SOURCES SEARCHED FOR EVIDENCE

Type of sources	Specific source	Number of documents potentially meeting PICO
Electronic database	British Education Index (BEI)	0
	Applied Social Sciences Index and Abstract (ASSIA)	9
	Education Resources Information Centre (ERIC)	83
	PsychInfo	24
	Psychology & Behavioural Sciences Collection	0
	EconLit	14
	Social Science Citation Index (SSCI)	7
Cross-referencing		4
Websites	Department for Children, Schools and Families	3
	Career Academies UK	1
	Institute of Education	1
	National Foundation of Educational Research	10
Personal contacts		5

ANNEX B: INTEGRATED QUALITY ASSESSMENT AND DATA EXTRACTION FRAMEWORK

STAGE 1 – ESTABLISHING STUDY RELEVANCE AGAINST SCOPE

Verification of Study's Eligibility

Is this study eligible for this REA? Check the following:	YES (specify[13])	NO	N/A
Population:			
Primary school pupils 5-7 years and 7-11 years (preferably in England; other countries possible)	☐	☐	☐
Secondary school pupils 11-14 years, 14-16 years, 16-18 years (preferably in England; other countries possible)	☐	☐	☐
Employers, businesses, entrepreneurs, companies, etc.	☐	☐	☐
Interventions/Initiatives			
Employer involvement in mentoring, coaching and counselling (including electronic mentoring, coaching, counselling) of students	☐	☐	☐
STEM initiatives (specify)	☐	☐	☐
Business buddying with head teachers, teachers and students	☐	☐	☐
Reading buddies, number partners, etc. (with K1/KS2 pupils)	☐	☐	☐

[13] Population: If 'Yes', specify 'student, teacher, admin'.

Employer-led/supported volunteers in schools (especially reading and mathematics)	☐	☐	☐
Role Modelling initiatives	☐	☐	☐
Employer-provided or sponsored skills development for the workplace	☐	☐	☐
Workplace internships and other forms of work experience	☐	☐	☐
Apprenticeship programmes	☐	☐	☐
Employer-led support to schools, colleges and teachers about business and enterprise	☐	☐	☐
Context England	☐	☐	☐
Other countries of the UK (specify)	☐	☐	☐
Other countries of the world (specify)	☐	☐	☐
State sector (non-independent schools)	☐	☐	☐

Outcomes	YES	NO	N/A
SATS	☐	☐	☐
GCSEs	☐	☐	☐
GCE ‘A’ Levels	☐	☐	☐
NVQs	☐	☐	☐
BTEC	☐	☐	☐
Scottish Highers	☐	☐	☐
Baccalaureate	☐	☐	☐
High school diploma	☐	☐	☐
Apprenticeship qualifications	☐	☐	☐
Completed secondary schooling (with certification)	☐	☐	☐
Other qualification	☐	☐	☐
Non-qualification achievement (specify)	☐	☐	☐

STAGE 2 – ASSESSING THE SCIENTIFIC QUALITY OF STUDIES

Quantitative /Experimental Studies and Surveys

1. Internal Validity (Quality) of Primary Studies	Yes	No	N/A
Was the sample size adequate (was there adequate statistical power)?	☐	☐	☐
Are the experimental and control groups truly comparable?	☐	☐	☐
Was study carried out properly?	☐	☐	☐
Is there evidence of:			
Selection bias?	☐	☐	☐
Performance bias?	☐	☐	☐
Attrition bias?	☐	☐	☐

2. Adequacy of Reporting of Primary Studies			
Have the following details of the study been reported?			
Design	☐	☐	☐
Methods	☐	☐	☐
Participants	☐	☐	☐
Interventions	☐	☐	☐
Outcomes	☐	☐	☐
Have appropriate statistics been used in the analysis of data?	☐	☐	☐
Have the appropriate statistics been fully reported?	☐	☐	☐
Has any attrition rate been explained?	☐	☐	☐
Has an intention to treat analysis been undertaken (if appropriate)?	☐	☐	☐
Are there any missing data that need to be gathered/followed-up?	☐	☐	☐
Do the findings and analysis support the author’s conclusions?	☐	☐	☐

3. Questions About the Relevance and External Validity of Primary Studies:

Are the samples in the study similar to the groups that are of interest to this REA?

☐ ☐ ☐

Are the outcomes measured in the study the same outcomes that are of interest to this REA? ☐ ☐ ☐

Are there any contextual factors mentioned in the study that would limit its relevance to this REA? ☐ ☐ ☐

Qualitative Studies

4. Research Design, Sample and Data Collection	Yes	No	N/A
Are the underlying assumptions of this study clear?	☐	☐	☐
Has the research design of this study been justified?	☐	☐	☐
Are the following presented in the study:			
sample design	☐	☐	☐
case selection	☐	☐	☐
analytical approach	☐	☐	☐
documents used	☐	☐	☐
Have any reasons for non-participation of subjects been made clear?	☐	☐	☐
Has any sample attrition been made clear?	☐	☐	☐
Have the data collection procedures been made explicit?	☐	☐	☐
5. Findings			
Are there any findings from this study that are relevant to this REA?	☐	☐	☐
Are the findings of this study supported by the evidence presented?	☐	☐	☐
Has this study enhanced our understanding of this topic?	☐	☐	☐
Have the research findings addressed the original aims of the study?	☐	☐	☐
Has the scope for drawing wider inferences from this study been explained? `	☐	☐	☐
6. Analysis and Reporting			
Are contextual features of this study made clear?	☐	☐	☐
Does the evidence presented represent a diversity of perspectives?	☐	☐	☐
Are the links between data, interpretation and conclusions clear?	☐	☐	☐
Is the reporting of the study coherent?	☐	☐	☐

STAGE 3 – EXTRACTING STUDY'S FINDINGS

Does this study provide empirical findings of an impact of employers'/ business links with education on any of the above outcomes? ☐ ☐ ☐

If so, record as much detail as possible about this impact:

Does this study provide empirical findings about contextual factors that may be responsible for the observed impact on school attainment? (i.e. what needs to be in place for the observed impact to be achieved in practice?) ☐ ☐ ☐

If so, record as much detail as possible:

Does this study provide any findings about negative or adverse effects of employers'/business links with education? ☐ ☐ ☐

If so, record as much detail as possible:

Are there any other findings from this study that might inform policy and practice about employers'/business links with education? ☐ ☐ ☐

If so, record as much detail as possible:

ANNEX C: DOCUMENTS EXCLUDED

Documents excluded not in scope

Anyansi-Archibong, C., Czuchry, A.J., House, C.S. and Cicirello, T. (2000). Trends and Lessons Learned in Interdisciplinary and Non-Business Case Method Application. Journal of SMET Education: Innovations and Research, 1 (3), pp. 41-49.

Armstrong, P. (1997). Delivering Modern Apprenticeships. Further Education Development Agency Matters, 1 (16). Accessed on http://www.eric.ed.gov

Bacolod, M. and Hotz, V. J. (2006). Cohort Changes in the Transition from School to Work: Evidence from Three NLS Surveys. Economics of Education Review, 25 (4), pp. 351-73.

Bahr, M.W., Walker, K., Hampton, E.M., Buddle, B.S., Freeman, T., Ruschman, N., Sears, J., McKinney, A., Miller, M. and Littlejohn, W. (2006). Creative Problem Solving for General Education Intervention Teams: A Two-Year Evaluation Study. Remedial and Special Education, 27 (1), pp. 27-41.

Bishop, J.H. and Mane, F. (2005). Raising Academic Standards and Vocational Concentrators: Are They Better Off or Worse Off? Education Economics, 13 (2), pp. 171-87.

Bocock, J. and Edwards, J. (1998). Assuring Quality in Collaborative Provision. Further Education Development Agency Bulletin, 2 (2).

Borman, K., Boydston, T. and Katzenmeyer, W. (2007). Managing Policy Issues in Carrying Out Systemic Reform: Lessons for Principals from Chicago, El Paso, Memphis and Miami. In Learner-centered leadership: Research, policy, and practice. Danzig, et al (Ed).pp. 221-238. Mahwah, NJ, US: Lawrence Erlbaum Associates.

Brand, B. (2003). Essentials of High School Reform: New Forms of Assessment and Contextual Teaching and Learning. Report, American Youth Policy Forum, Washington, DC, USA. Accessed on http://eric.ed.gov

Business in the Community. (2008). Time 2 Count. Accessed on http://www.timetoni.com/count.php

Business in the Community. (2008). Time to Compute. Accessed on http://www.timetoni.com/compute.php

Business in the Community. (2008). Time to Read. Accessed on http://www.timetoni.com/read.php

Choutka, C.M., Edwards, L.L., Jacobson, L.A., Jitendra, A.K., Sacks, G. and Starosta, K. (2004). Early reading instruction for children with reading difficulties: meeting the needs of diverse learners. Journal of Learning Disabilities, 37 (5), pp.421-439.

Combs, K.A. (2000). Factors influencing the implementation of technology in a magnet high school.

Dissertation Abstracts International Section A: Humanities and Social Sciences, 61(2-A), pp. 492.

Crawford, D.L., Johnson, A.W. and Summers, A.A. (1997). Schools and Labor Market Outcomes. Economics of Education Review, 16 (3), pp. 255-69.

Cuneo, T., Bell, S. and Welsh-Gray, C. (1999). Planning for Accountability. Thrust for Educational Leadership, 28 (3), pp. 18-21.

Cunningham, R. (1997). With a Little Help. Lamp, 79 (2), pp. 2-3.

Daniel, P.A., Cimochowski, A.M., King, A.I., Bruckerhoff, C.E., and Bruckerhoff, T.F.S. (1997).

CPMSA Comprehensive Partnerships for Minority Student Achievement. Annual Report. Hartford Public Schools, Hartford, CT, USA. Accessed on http://www.eric.ed.gov

de Anda, D. (2001). A qualitative evaluation of a mentor program for at-risk youth: the participants' perspective. Child and Adolescent Social Work Journal; 18 (2), p.97-117.

Demie, F. (2005). Achievement of Black Caribbean pupils: Good practice in Lambeth schools.

British Educational Research Journal, 31(4), pp. 481-508.

Dewsbury, A. (2002). Research Strategy 2002-5. Influencing the Future: Informing Policy and Improving Practice through Research. Learning and Skills Development Agency, London, United Kingdom (Ref. no. 1314R). Accessed on http://www.eric.ed.gov

Edwards, S. and Hand, T. (1993). Safeway supermarkets resource pack: a partnership between industry and schools to produce a resource pack. Early Child Development and Care, 94, p.117-27.

Ferguson, M.V. (2001). Partnerships 2000: A decade of growth and change. Report. National Association of Partners in Education, Alexandria, VA, USA. Accessed on http://www.eric.ed.gov

Ferreira, M. (2001). Building Communities Through Role Models, Mentors, and Hands-on-Science. School Community Journal, Vol 11(2), pp. 27-37.

Hamilton, M.A. and Hamilton, S. (2002). Why mentoring in the workplace works. In A critical view of youth mentoring. Rhodes, Jean E. (Ed); pp. 59-89. San Francisco, CA, US: Jossey-Bass.

Hamilton, M.A. and Hamilton, S.F. (1997). Learning Well at Work: Choices for Quality. (Report) National School-to-Work Opportunities Office, Washington, DC; Cornell Univ., Ithaca, NY. Dept of Human Development and Family Studies. Accessed on http://www.eric.ed.gov

Hamilton, S.F. and Hamilton, M.A. (1999). Creating new pathways to adulthood by adapting German apprenticeship in the United States. In From education to work: Cross-national perspectives. Heinz, Walter R. (Ed); pp. 194-213. New York, NY, US: Cambridge University Press.

Holt, D.M., McAllister, P. and Ingram, E.C. (2002). Technology 2000: Using Electronic Portfolios for the Performance Assessment of Teaching and Learning. Computers in the Schools, 18 (4), pp185-198.

Huddleston, P., Maguire, S., Muir, F., Hirst, C. and Thompson, J. (2006). Evaluation of the Academy of Finance Programme. (Accessed on http://www.careeracademies.org.uk/foundation/files/CareerAcademyReport.pdf).

Hughes, K.L., Karp, M.M. and Orr, M.T. (2002). Business partnerships for American education: employer involvement in the National Academy Foundation's high school career academies. Journal of Vocational Education and Training, 54 (3), pp.365-94.

Hughes, M. (2003). Successful Engagement: Guidance for Colleges and Providers on Effective Employer Engagement in Post-16 Learning. Learning and Skills Development Agency, London, United Kingdom (Ref. No. 1530). Accessed on http://www.eric.ed.gov

Hughes, M. and Smeaton, B. (2001). Searching for Excellence in FE Colleges. Report from Learning and Skills Development Agency. Accessed on http://www.eric.ed.gov

Imel, S. (1999). School-to-Work. Myths and Realities No. 4. ERIC Clearinghouse on Adult, Career, and Vocational Education, Columbus, OH, USA. Accessed on http://www.eric.ed.gov

Ireland, E., Golden, S. and Speilhofer, T. (2002). Professional development: A review of teachers' placements in business and industry. Report accessed on http://www.nfer.ac.uk

Jones, C., Potter, M. and Ebrahim, N. (2001). Managing Curriculum Change in Schools. Learning and Skills Development Agency, London, United Kingdom. Accessed on http://eric.ed.gov

King, J.T. (2007). A study of the San Antonio Education Partnership (SAEP): Family, school and community. Dissertation Abstracts International Section A: Humanities and Social Sciences, 68(5-A), 2007, pp. 1749.

Knouse, S.B.,Tanner, J.R. and Harris, E.W. (1999). The relation of college internships, college performance, and subsequent job opportunity. Journal of Employment Counseling, 36 (1), p.35-43

Learning and Skills Development Agency. (2003). E2E: A Summary of the e2e Learning Framework.

Learning and Skills Development Agency, London, United Kingdom. Accessed on http://eric.ed.gov

Lerman, R. I. (2001). Improving Career Outcomes for Youth: Lessons from the U.S. and OECD Experience. Research and Evaluation Monograph Series. Accessed on http://www.eric.ed.gov

Lewis, M.V. (1997). Characteristics of Successful School-to-Work Initiatives: What the Research Says. Information Series No. 370, Center on Education and Training for Employment, Columbus, OH, USA. Accessed on http://www.eric.ed.gov

Lupart, J. and Wilgosh, L. (1998). Undoing Underachievement and Promoting Societal Advancement of Women and Girls. Gifted Education International, 12(3), pp.159-69.

MacAllum, K. and Charner, I. (2000). Beyond the Success of the Students: Effects of Participation on School-to-Career Partners. Paper presented at the Annual Conference of the Association for Career and Technical Education/International Vocational Education and Training Association (74th, San Diego, CA). Accessed on http://eric.ed.gov

MacAllum, K., Taylor, S.H., and Johnson, A.B. (1999). Manufacturing Educational Change: Impact Evaluation of the Lansing Area Manufacturing Partnership Pilot Program. Executive Summary. Report prepared for the UAW-GM Center for Human Resources. Accessed on http://www.eric.ed.gov

McCombs, G.B., Ufnar, J.A. and Shepherd, V.L. (2007). The Virtual Scientist: connecting university scientists to the K-12 classroom through videoconferencing. Advances in Physiology Education, 31 (1), pp. 62-66.

Medrich, E., Merola, L., Ramer, C. and White, R. (2000). School-to-Work Progress Measures: A Report to the National School-to-Work Office for the Period July 1, 1997-June 30, 1998. Report, MPR Associates, Berkeley, CA.; Academy for Educational Development, Washington, DC, USA. Accessed on http://www.eric.ed.gov

Merton, B. (1998). Skilled! Report, Guidance & Materials on Basic Skills & Youth Work. Report, Community Education Development Centre, Woodway Park School, Coventry, United Kingdom. Accessed on http://www.eric.ed.gov

Moore, S. (2001). Get Real: Work-Related Teaching and Learning. Guide published by Learning and Skills Development Agency, London, United Kingdom. Accessed on http://www.eric.ed.gov

Mullen, C.A. (2006). Leadership mentoring in schools, universities and businesses. Mentoring & Tutoring: Partnership in Learning, 14(3), pp. 271-273.

(no author). (1997). Case Study: Walhalla High School, Walhalla, S.C. Report, Southern Regional Education Board, Atlanta, GA, USA. Accessed on http://www.eric.ed.gov

(no author). (1997). Employers, Families and Education. Report, U.S. Government Printing Office, Superintendent of Documents, Washington, DC, USA. Accessed on http://www.eric.ed.gov

(no author). (1998). Learning from Experience: Case Studies of Employer-Linked Charter Schools. Report, Public Policy Associates, Inc., Lansing, MI.; National Alliance of Business, Inc., Washington, DC.; Michigan Future, Inc., Ann Arbor, MI, USA. Accessed on http://www.eric.ed.gov

(no author). (2002). Annual National Report of the Australian Vocational Education and Training System, 2001. Volume 1: National Overview; Volume 2: Commonwealth, State & Territory Reports. Report, ANTA Publications, Brisbane, Australia. Accessed on http://www.eric.ed.gov

(no author). (1997). Using Quality To Achieve Standards. How Educators and Business Can Take Action Together. Successful Strategies Series. Brochure, National Alliance of Business, Washington, DC, USA. Accessed on http://www.eric.ed.gov

National Alliance of Business (1998). Improving the Quality of Teaching. The Business Role. Successful Strategies Series. Guide, National Alliance of Business, Washington, DC, USA. Accessed on http://www.eric.ed.gov

Nyyssola, K. (1999). New Challenges in the Cooperation between Education and Training and Working Life. Final Report. Conference Proceedings, Tampere, Finland. Accessed on http://www.eric.ed.gov

Ofsted. (2007). The annual report of Her Majesty's Chief Inspector of Education, Children's Services and Skills 2006/7. Accessed on http://www.ofsted.gov.uk

Ofsted. (2004). The responsiveness of colleges to the needs of employers. Accessed on http://www.ofsted.gov.uk

Okudan, G.E. and Mohammed, S. (2006). Facilitating design learning in a cooperative environment: Findings on team functioning. International Journal of Engineering Education, 22 (3), pp. 496-502.

Oliver, C.A. and Fergusson, J. (2007). Astrobiology: A pathway to adult science literacy? ACTA Astronautica, 61 (7-8), pp. 716-723.

O'Shea, D. (2001). High Tech Educators Network Evaluation. Report, Ray Marshall Center for the Study of Human Resources, University of Texas at Austin, Austin, TX, USA. Accessed on http://www.eric.ed.gov

O'Shea, D. (2002). Capital Area Education and Careers Partnership School-to-Career Grant: An Assessment of Year Four Activities and Prospects. Report. Ray Marshall Center for the Study of Human Resources, University of Texas at Austin, Austin, TX, USA. Accessed on http://www.eric.ed.gov

O'Shea, D.P. and King, C.T. (2000). Capital Area Education and Careers Partnership School-to-Career Grant: An Assessment of Early Accomplishments, Constraints and Prospects. Report, Texas Univ., Austin. Center for the Study of Human Resources. Austin, TX, USA. Accessed on http://www.eric.ed.gov

Pea, R.D., Tinker, R., Linn, M., Means, B., Bransford, J., Roschelle, J., His, S., Brophy, S. and Songer, N. (1999). Toward a learning technologies knowledge network. Educational Technology Research and Development, 47 (2), pp. 19-38.

Reeve, F., Gallacher, J. and Ingram, R. (2007). A Comparative Study of Work-Based Learning within Higher Nationals in Scotland and Foundation Degrees in England: Contrast, Complexity, Continuity. Journal of Education and Work, 20 (4), pp.305-318.

Rosenbaum, J.T., Martin, T.M., Farris, K.H., Rosenbaum, R.B. and Neuwelt, E.A. (2007). Can medical schools teach high school students to be scientists? FASEB Journal, 21 (9), pp. 1954-1957.

Ryan, P. (2001). The School-to-Work Transition: A Cross-National Perspective. Journal of Economic Literature, 39 (1), pp. 34-92.

Sanders, N.M. (2002). A Search for Effects of High Schools' Work-Related Programs on Early Employment Success in the New Economy. Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, LA, April 1-5, 2002). Accessed on http://www.eric.ed.gov

Scales, P.C., Foster, K.C., Mannes, M., Horst, M.A., Pinto, K.C. and Rutherford, A. (2005). School-Business Partnerships, Developmental Assets, and Positive Outcomes among Urban High School Students: A Mixed-Methods Study. Urban Education, 40 (2), pp144-189.

Shilling, C. (1987). Work-experience and schools: factors influencing the participation of industry. Journal of Education Policy, 2, p.131-47.

Smith, P.J., et al. (2002). Training young people through a school/enterprise partnership: A longitudinal study. Education & Training, 44(6), pp. 281-289.

Spielhofer, T., White, G., Walker, M. and Sims, D. (2006). National Evaluation of Determined to Succeed. Phase 1: early implementation processes across Scotland. Report, Scottish Executive Social Research. Accessed on http://www.scotland.gov.uk

Stern, D., Hopkins, C., McMillion, M. and Stone, J. (1990). Work experience for students in high school and college. Youth and Society, 21, p.355-389.

Streeter, K.R. (1999). The effects of Rational-Emotive Education on academic performance and career perspectives of at-risk elementary students. Dissertation Abstracts International: Section B: The Sciences and Engineering, 59(7-B), pp. 3728.

Stuart, V.B. (2000). Reasons for selecting a teaching career and remaining in the profession: A conversation with 10 African American Roanoke City teachers. Dissertation Abstracts International Section A: Humanities and Social Sciences, 61(6-A), pp. 2264.

Taylor, A. (2006). The Challenges of Partnership in School-to-Work Transition. Journal of Vocational Education & Training, 58 (3), pp. 319-336.

Taylor, A.C. (2005). Improving the academic achievement of African American males: A case study of African American male perceptions of attempted instructional strategies. Dissertation Abstracts International Section A: Humanities and Social Sciences, 66(5-A), pp. 1643.

Taylor, J. (2007). Estimating the Impact of the Specialist Schools Programme on Secondary School Examination Results in England. Oxford Bulletin of Economics and Statistics, 69 (4), pp. 445-471.

Taylor, S. (2001). Getting Employers Involved: Improving Work-Based Learning through Employer Links. Report and Good Practice Guidelines. Guide published by Learning and Skills Development Agency, London, United Kingdom. Accessed on http://www.eric.ed.gov

Tuckett, A. (1997). Lifelong Learning in England and Wales. An Overview and Guide to Issues Arising from the European Year of Lifelong Learning. Guide published by National Institute of Adult Continuing Education, Leicester, United Kingdom. Accessed on http://www.eric.ed.gov.

Vazsonyi, A.T. and Snider, J.B. (2008). Mentoring, competencies, and adjustment in adolescents: American part-time employment and European apprenticeships. International Journal of Behavioral Development, Vol 32(1), pp. 46-55. DOI: 10.1177/0165025407084051

Visher, M.G., Teitelbaum, P. and Emanuel, D. (1999). Key High School Reform Strategies: An Overview of Research Findings. New American High Schools: High Schools at the Leading Edge of Reform. Report, U.S. Department of Education, Office of Vocational and Adult Education, Washington, DC, USA. Accessed on http://www.eric.ed.gov

Vos, R. (2002). Collaborating To Close the Achievement Gap. Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education (54th, New York, NY, February 23-26, 2002). Accessed on http://www.eric.ed.gov

Westhead, P. (2001). Outcomes reported by students who participated in the 1994 Shell Technology Enterprise Programme. Entrepreneurship and Regional Development, 13 (2), pp. 163-185.

Westhead, P. and Matlay, H. (2006). Skills Associated with Employment Positions in SMEs and Favourable Attitudes toward Self-Employment: Longitudinal Evidence from Students Who Participated in the Shell Technology Enterprise Programme. Technology Analysis and Strategic Management, 18 (1), pp. 93-124.

Williams, M., Thorogood, L. and Jones, D. (2002). How school volunteers can help to raise standards and enthusiasm for literacy. Early Child Development and Care, 172 (4), pp. 371-377.

Wiseman, A.W. and Alromi, N. (2002). Education-Work Linkage and Policy: A Cross-National Analysis of Contextual Influences on School to Work Transition. Paper presented at the Annual Meeting of the American Educational Research Association (AERA) "Validity and Value in

Educational Research" (83rd, New Orleans, LA, April 1-5, 2002). Accessed on http://www.eric.ed.gov

EXCLUDED - NOT SUFFICIENTLY QUANTITATIVE OR RIGOROUS FOR PURPOSE OF MEASURING OUTCOMES

Bottoms, G. and Presson, A. (1997). Work-Based Learning: Good News, Bad News and Hope. Research Brief. Report 7, Southern Regional Education Board, Atlanta, GA, USA). Accessed on http://www.eric.ed.gov

Brown, B.L. (2003). CTE and Work-Based Learning. ERIC Digest, 252. Accessed on http://www.eric.ed.gov

Cavanagh, S. (2007). Citizen Schools: An After-Hours Adventure--Professionals Mentoring Middle-Grades Students. Education Week, 26 (19) p1.

Golden, S. (2008). Evaluation of the fourth cohort of participants in the Young Apprenticeship programme. Accessed on http://www.nfer.ac.uk

Gruenbaurn, P, Robison, D.F.W., Airola, C,, End, S. and Lemlem, A. (2006). Technological creativity in low-income neighborhoods36th Annual Frontiers in Education (FIE Oct 28-31 2006). 36th Annual Frontiers in Education Conference, Proceedings pp.112-116.

Guinta, C. (1997). Corporate partnerships help rescue at-risk students. School Business Affairs, 63 (9), pp. 21-24.

Hood, L.K. and Rubin, M.B. (2004). Priorities for Allocating Corporate Resources to Improve Education. Report, Office of Community College Research and Leadership, Champaign, IL, USA. Accessed on http://www.eric.ed.gov

Hughes, K.L., Bailey, T.R., Mechur, M.J. (2001). School-to-Work: Making a Difference in Education. A Research Report to America. (Report) Columbia University, New York, NY, USA, Inst. on Education and the Economy. Accessed on http://www.eric.ed.gov

Johnson, A.B., McDonald, D. and MacAllum, K. (2002). The Lansing Area Manufacturing Partnership: A School-to-Success Story. Report accessed on http://www.eric.ed.gov

Kenney, L.M. and Collet-Klingenberg, L. (2000). Manufacturing and Production Technician Youth Apprenticeship Program: A Partnership. Peabody Journal of Education, 75 (3), pp. 51-63.

(no author). (1997). Connecting Learning & Work: The Rural Experience. Proceedings of the School-to-Work in Rural Communities in the Northeast, Technical Assistance Conference (Saratoga Springs, New York, November 17-18, 1997). Accessed on http://www.eric.ed.gov

(no author). (1999). Redefining Public Education: The Promise of Employer-Linked Charter Schools.

Report by Public Policy Associates, Inc., Lansing, MI.; National Alliance of Business, Inc., Washington, DC.; Michigan Future, Inc., Ann Arbor). Accessed on http://www.eric.ed.gov

(no author). (1997). Case Study: North Laurel High School, London, Kentucky. Report, Southern Regional Education Board, Atlanta, GA, USA. Accessed on http://www.eric.ed.gov

(no author). (1998). School-to-Career Initiative Demonstrates Significant Impact on Young People. Report, Jobs for the Future, Boston, MA, USA. Accessed on http://www.eric.ed.gov

(no author). (1999). Intuitions Confirmed. The Bottom-Line Return on School-to-Work Investment for Students and Employers. National Employer Leadership Council, Washington, DC, USA. Accessed on http://www.eric.ed.gov.

Neumark, D. and Allen, A. (2002). From Michigan's School-to-Work to Career Preparation System: How Do We Know It's Working? Policy Report 11, Education Policy Center, Michigan State University. Accessed on http://www.eric.ed.gov

Ofsted. (2006). Evaluation of the Young Apprenticeships Programme. Accessed on http://www.ofsted.gov.uk

Rahn, M.L., O'Driscoll, P. and Hudecki, P. (1999). Taking Off! Sharing State-Level Accountability Strategies. Using Academic and Vocational Accountability Strategies To Improve Student Achievement. Guide, National Center for Research in Vocational Education, Berkeley, CA, USA. Accessed on http://www.eric.ed.gov

Rudy, D.W. and Rudy, E.L. (2001). Report on Career Pathways: A Success Story in Berrien County, Michigan. Report, Berrien County Intermediate School District, Michigan, USA. Accessed on http://www.eric.ed.gov

Smith, V. and Hughes, M. (2003). Making the Difference: Provider Support for Learner Retention and Achievement in Work-Based Learning. Report, Learning and Skills Development Agency, London, United Kingdom (Ref. No. 1392). Accessed on http://www.eric.ed.gov

Steedman, H. (2001). Benchmarking Apprenticeship: UK and Continental Europe Compared. Report, Centre for Economic Performance, London School of Economics, London. Accessed on http://www.eric.ed.gov

Stickney, E.M. and Alamprese, J.A. (2001). Providing Opportunities for All Students: Findings from the Process Evaluation of Connecticut's School-to-Career System. Report, Connecticut State Department of Education, Bureau of Career and Adult Education. Accessed on http://www.eric.ed.gov

Wonacott, M.E. (2002). Career Academies as Smaller Learning Communities. In Brief: Fast Facts for Policy and Practice. Information analyses, NDCCTE, Ohio State University, Columbus, OH, USA. Accessed on http://www.eric.ed.gov

Qualitative studies (Excluded not appropriate for desired purpose)	Are the underlying assumptions clear?	Has the research design been justified?	Is the sample design presented?	Is the case selection presented?	Is the analytical approach selected?	Have the documents used been presented?	Have any reasons for non-participation been made clear?	Has any sample attrition been made clear?	Have the data collection procedures been made explicit?	Are there any findings relevant to this REA?	Are the findings supported by the evidence presented?	Has this study enhanced our knowledge of this topic?	Have the research findings addressed the aims of the study?	Has the scope for drawing wider inferences been explained?	Are the contextual features of the study clear?	Does the evidence represent a diversity of perspectives?	Are the links between data, interpretation & conclusions clear?	Is the reporting of the study coherent?
No author (Connecting Learning & Work) (1997)	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	NA	NA
Smith, V. and Hughes, M. (2003)	Yes	No	Yes	No	No	Yes	No	No	Yes	No	No	No	Yes	No	No	No	Yes	No
Cavanagh, S. (2007)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
No author (Redefining Public Education) (1999)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bottoms, G. and Presson, A. (1997)	Yes	No	No	No	No	No	No	No	No	Yes	Yes	Yes	NA	Yes	No	No	Yes	Yes
No author (Case Study: North Laurel High School) (1997)	No	No	No	No	No	No	No	No	NA	Yes	Yes	No	Yes	No	No	No	Yes	No
Ofsted (2006)	Yes	No	No	No	No	NA	No	No	No	No	NA	No	No	No	No	No	No	NA
Golden, S. (2008)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Johnson, A.B., McDonald, D. and MacAllum, K. (2002)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
No author (Intuitions Confirmed) (1999)	NA	NA	NA	NA	NA	NA	NA	NA	NA	Yes	No	NA	NA	NA	NA	NA	NA	NA
Stickney, E.M. and Alamprese, J.A. (2001)	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	No	NA	No	No	NA	Yes	No	Yes	Yes
Wonacott, M.E. (2002)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rahn, M.L., O'Driscoll, P. and Hudecki, P. (1999)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hood, L.K. and Rubin, M.B. (2004)	Yes	Yes	Yes	No	No	NA	No	NA	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Guinta, C. (1997)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hughes, K.L., Bailey, T.R., Mechur, M.J. (2001)	Yes	Yes	NA	Yes	Yes	NA	NA	NA	Yes	Some	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Kenney, L.M. and Collet-Klingenberg, L. (2000)	Yes	No	No	No	No	No	NA	NA	No	Yes	NA	Yes	Yes	Yes	Yes	No	Yes	Yes
Steedman, H. (2001)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Quantitative studies (Excluded not sufficient quality)	Was the sample size adequate (for statistical power)?	Are the experimental and control groups truly comparable?	Was the study carried out properly?	Is there evidence of selection bias?	Is there evidence of performance bias?	Is there evidence of attrition bias?	Has the design been reported?	Have the methods been reported?	Have the participants been reported?	Have the interventions been reported?	Have the outcomes been reported?	Have appropriate statistics been used in the analysis?	Have the appropriate statistics been fully reported?	Has any attrition rate been explained?	Has an intention to treat analysis been undertaken?	Are there any missing data that need to be followed-up?	Do the findings and analysis support the conclusions?	Are the samples in the study similar to the groups of interest?	Are the outcomes measured the same outcomes of interest?	Are there any contextual factors that would limit its relevance?
no author (School-to-Career Initiative) (1998)	Yes	No	No	Yes	No	Yes	I/S	I/S	I/S	Yes	Yes	No	No	I/S	No	Yes	NA	Yes	Yes	No
Gruenbaurn, P, Robison, D.F.W., Airola, C,, End, S. and Lemlem, A. (2006)	No	NA	Don't know	No	No	Yes	I/S	I/S	I/S	Yes	Yes	I/S	No	I/S	No	NA	I/S	Yes	No	No
Rudy, D.W. and Rudy, E.L. (2001)	NA	NA	NA	NA	NA	NA	NA	NA	NA	Yes	I I/S	No	No	NA	NA	NA	NA	Yes	Yes	NA

I/S = insufficient information

Note= Two documents excluded as not sufficient for our purpose (Brown, 2003; Neumark and Allen, 2002) were not reporting on a study and therefore not included in the tables (not relevant).

ABOUT AIR UK

AIR UK is a non-partisan, non-profit organisation devoted to providing excellence in research, analysis and technical assistance to governments, industry, organisations, and the general public in order to improve the quality of life.

AIR UK is the UK subsidiary of the American Institutes for Research (AIR), which has been providing research-led advice and expertise worldwide for over 60 years.

AIR has 1,300 staff, more than half of whom hold advanced degrees. It operates in 28 countries.

Ref: DCSF-RW052

ISBN: 978 1 84775 213 0

© National Centre for Social Research 2008

www.dcsf.gov.uk/research

Published by the Department for
Children, Schools and Families

department for
children, schools and families