

## WHAT IS EVIDENCE-BASED EDUCATION?

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*ABSTRACT: This paper argues that education should become more evidence-based. The distinction is made between using existing research and establishing high-quality educational research. The need for high-quality systematic reviews and appraisals of educational research is clear. Evidence-based education is not a panacea, but is a set of principles and practices for enhancing educational policy and practice.*

*Keywords:* evidence, research, systematic review, meta-analysis, methodology, Cochrane Collaboration, sociology, professional development

### 1. INTRODUCTION

In most societies education is constantly being asked to do more and more things, to higher and higher standards, with greater accountability and finite (if not diminishing) resources. Its agenda is often driven by political ideology, conventional wisdom, folklore, and wishful thinking as it strives to meet the needs and interests of the economy, business, employers, law and order, civil society, parental choice, and, at least rhetorically, the children, young people, and adults who make up the learning community (Apple, 1982; Apple and Weis, 1983; Ball, 1990, 1993; Bowles and Gintis, 1976; Giroux, 1983, 1992; Willis, 1977). Much of this impetus represents the triumph of hope over reason, sentiment over demonstrated effectiveness, intuition over evidence. Increasingly, the direction of change in educational thinking and practice is top-down from central governments, think tanks, opinion formers, educational regulators (such as OFSTED), the media, and academic departments whose research is often selective, unsystematic, and prone to political or scientific bias (or both). Some recent examples from the United Kingdom include: the form and content of the National Curriculum; the introduction of standardised tests and league tables as a means of 'raising standards' and supposedly increasing parental

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choice; the substitution of 'trendy' teaching methods based on activity-based, student-centred, self-directed learning and problem solving, with whole-class teaching based on 'rows and columns' classroom organisation, didactic instruction, and a more passive approach to learning, often by rote.

It is often unclear whether these developments in educational thinking and practice are better, or worse, than the regimes they replace. This is in part because educational activity is often inadequately evaluated by means of carefully designed and executed controlled trials, quasi-experiments, surveys, before-and-after studies, high-quality observational studies, ethnographic studies which look at outcomes as well as processes, or conversation and discourse analytic studies that link micro structures and actions to macro level issues. Moreover, the research and evaluation studies that do exist are seldom searched for systematically, retrieved and read, critically appraised for quality, validity and relevance, and organised and graded for power of evidence. This is the task of evidence-based education.

## 2. USING VS ESTABLISHING EVIDENCE

Evidence-based education operates at two levels. The first is to utilise existing evidence from worldwide research and literature on education and associated subjects. Educationalists at all levels need to be able to:

- pose an answerable question about education;
- know where and how to find evidence systematically and comprehensively using the electronic (computer-based) and non-electronic (print) media;
- retrieve and read such evidence competently and undertake critical appraisal and analysis of that evidence according to agreed professional and scientific standards;
- organise and grade the power of this evidence; and
- determine its relevance to *their* educational needs and environments.

The second level is to *establish* sound evidence where existing evidence is lacking or of a questionable, uncertain, or weak nature. Practitioners of evidence-based education working at this level need to be able to plan, carry out, and publish studies that meet the highest standards of scientific research and evaluation, incorporating the methods of the social sciences, the natural sciences, and the humanistic and interpretive disciplines. The objective of evidence-based

education at this level is to ensure that future research on education meets the criteria of scientific validity, high-quality, and practical relevance that is sometimes lacking in existing evidence on educational activities, processes, and outcomes (Hargreaves, 1996, 1997; Hillage *et al.*, 1998; Tooley and Darby, 1998).

This view of evidence-based education is derived quite explicitly from the University of Oxford Master's programme in Evidence-Based Health Care. This programme offers health professionals of all types the opportunity to develop their professional skills whilst maintaining full-time professional practice. A central feature of the Oxford programme in Evidence-Based Health Care is that students learn by attempting to solve clinical and population-based problems that *they* bring to the course. This approach to learning, and teaching, is explicitly based on the problem-solving, self-directed model of adult education developed by Knowles (1990) and derived from the learning theory of Piaget, Bruner, Vygotsky, and the 'constructivist' school of learning (Davies, 1999).

The need for both levels of evidence-based practice in education seems clear. There have been a number of recent criticisms about the gap between the teaching and the research communities, the relevance, applicability and quality of educational research, the non-cumulative nature of good educational research, and its effective dissemination (Hargreaves, 1996, 1997; Hillage *et al.*, 1998. Tooley and Darby, 1998). Hargreaves (1996:7), for instance, has called for an end to:

second-rate educational research which does not make a serious contribution to fundamental theory or knowledge; which is irrelevant to practice; which is uncoordinated with any preceding or follow-up research; and which clutters up academic journals that virtually nobody reads.

Such broad-brush characterisations of educational research have, not surprisingly, received a strong and critical response from the educational research community (Norris, 1996; Gray, 1996; Edwards, 1996; Hammersley, 1997), and a debate that has often shed more heat than light. There is a risk that observations such as those of Hargreaves may promote a narrowly utilitarian and philistine approach to research and intellectual life. What constitutes the relevance of research, for instance, depends to a large extent on what questions are being asked, in what context, and for what practical ends. The demands of practice in one context may make a seemingly narrow and esoteric piece of research highly relevant and very enlightening for those who use it. Similarly, research that

is apparently more generalisable, cumulative, and based on highly representative samples for some purposes may be of little value to those with different practice needs and in quite different contexts from those in which the research took place. There is no such thing as context-free evidence.

Some of the criticisms of educational research, however, do have some validity. Hammersley, who has responded most critically to Hargreaves' 1996 lecture, acknowledges, with apparent sincerity, that educational research does lack a cumulative character and that it needs 'to move to a situation where new research builds more effectively on earlier work, and where greater attention is given to testing competing interpretations of data, whether descriptive or explanatory' (Hammersley, 1997: 144). Also, the claim that there is a gap between educational research and teachers (Hargreaves, 1996; Hillage *et al.*, 1998) is undoubtedly true, though perhaps in different ways to those suggested by these critics. The problem is not so much that teachers do not undertake research, or that they are often excluded from determining the research agenda (both of which may be true), but that there is often not a culture of teachers using research to inform their everyday school practice. Contrary to Hargreaves' claim about medicine, the same situation prevails in many areas of clinical practice. One of the ways in which evidence-based health care has had some influence in recent years is in getting clinicians to be clearer about the clinical problems for which they require solutions, and utilising existing evidence effectively and critically to help them solve these problems. There is no question of evidence replacing clinical judgement or experience, but of uniting these two dimensions of knowledge to provide a sound basis for action. Evidence-based practice can provide a similar basis for professional knowledge and action in education. It can also ensure that those who undertake educational research are properly trained in research methods, and understand its underlying theoretical and methodological principles, thereby enhancing its quality.

### 3. SOME OBJECTIONS

Some objections from the educational community to such a model of evidence-based education can be anticipated, and have been expressed by respondents to Hargreaves' (1996) call for teaching to be a research-based profession (Norris, 1996; Gray, 1996; Edwards, 1996; Hammersley, 1997). It is claimed that education is unlike health care, and medicine especially, because its activities, processes, and outcomes are complex and culturally, or contextually, specific.

Consequently, it is argued, there are problems of measurement and causation in educational research that are not found in medicine and health care. Medicine and health care, however, face very similar, if not identical, problems of complexity, context-specificity, measurement, and causation that Hammersley (1997) has identified in education. The activities, processes, and outcomes of health care are also highly complex, often indeterminate, and context/culture specific, making their measurement both difficult and controversial (Le Grand and Illsley, 1986; Wilkinson, 1986; Samphier, Robertson and Bloor, 1988; MacBeth, 1996). The generalisability of evidence-based health care is one of its major concerns, as it is of all epidemiology and clinical practice. The uncertain relationship between how people behave in hospitals and in their own and other environments (i.e. ecological validity) is a well documented problem in the medical and health care literature (Christmas *et al.*, 1974; Andrews and Stewart, 1979; Newcombe and Ratcliff, 1979; Davies and Mehan, 1988; Davies, 1996), with clear parallels with students' educational performances in schools and colleges on the one hand and in the 'real world' on the other. Greenhalgh and Worrall (1997) have recently argued that the concept of context-sensitive medicine is appropriate to describe the skill of applying the findings of research to the demands of everyday clinical practice.

So far as the measurement of outcomes is concerned, the only discrete and (usually) uncontroversial outcome of health care is death (or survival). Almost every other outcome of health care depends on whether one is concerned with objective or subjective dimensions of health and illness, the contexts within which health and illness occur, or the improvement, maintenance, or deterioration of people's health status. Central to these problems is the interaction of signs and symptoms on the one hand and variations in health and illness behaviour according to social class, gender, ethnicity, and cultural practices on the other. For Hammersley to claim that 'unlike in most areas of medicine, in education the "treatments", consist of symbolic interaction, with all the scope for multiple interpretations and responses which that implies', is to ignore his own detailed knowledge of both medical practice and the extensive sociological work on health and illness that has been inspired by symbolic interactionists such as Goffman (1959, 1963, 1964), Glaser and Strauss (1965, 1967), Davis (1963), Fagerhaugh and Strauss (1977), and Strong (1979).

The claim that medicine and health care are based on the natural sciences and their methodologies, whereas education is much more firmly embedded in social science and its approaches to research and evaluation, is also unsustainable. The rejection of natural

science as the only basis of modern health care has come from such diverse sources as Balint (1957), Capra (1982), Laing (1965) and Sacks (1990), and the professional training and accreditation bodies of nursing and almost all allied professions, including medicine. Similarly, educational research draws upon the methodological principles and practices of the natural and the social sciences. Whilst it is undoubtedly the case that experimental and quasi-experimental research is harder to achieve in many aspects of education than it is in some aspects of health care, it is not unknown in educational research and other areas of social scientific inquiry (Oakley, 1998). Randomised controlled trials are difficult to undertake in evaluations of teaching or learning effectiveness, though their potential has been recognised by some researchers (Boruch *et al.*, 1978; Oakley and Harris, 1996; Oakley, 1998). Consequently, researchers who evaluate educational methods or initiatives tend to rely more heavily on controlled comparisons of matched schools, classrooms, or communities, and to develop models of the effects of extraneous variables (Anderson, 1998).

An associated problem, often mentioned by people in the educational community, is that education is, and must be, concerned with *qualitative* research whereas health care is much more concerned with *quantitative* research and evaluation. This is also a false polemic, and one that is unsustainable when one examines research studies in education and health care. A recent review article on research methods in American educational research concluded that

results are consistent with those of other studies in that the most commonly used methods were ANOVA and ANCOVA, multiple regression, bivariate correlation, descriptive statistics, multivariate analysis, non-parametric statistics and t-tests. The major difference in current methodology is the increase in the use of qualitative methods. (Elmore and Woehlke, 1996)

The journals reviewed by Elmore and Woehlke represent the more positivistic tradition of American educational research. Other journals, such as the *Harvard Educational Review*, *Anthropology and Education Quarterly*, *Qualitative Studies in Education*, *Social Psychology of Education*, and *Linguistics and Education* have a tradition of publishing more qualitative research, and the proliferation of articles using qualitative methods and discourse analysis confirms the increase in these types of research in the educational field. This trend is also evident in the British educational research literature.

Another common feature of educational and health care research is

the use of systematic reviews and meta-analyses. Indeed, meta-analysis and systematic reviews have their origins in educational research following the pioneering work of Glass (Glass, McGaw and Lee Smith, 1980). Glass's work on meta-analysis, like that of Kulik and Kulik (1989), has been described as 'a form of literature review (that) is not meant to test a hypothesis but to summarise features and outcomes of a body of research' (Bangert-Drowns, 1985). Others in the educational research field (Hunter and Schmidt, 1995; Hedges, 1992; Rosenthal, 1995) have used meta-analysis in a way that is more akin to that found in health care research, as a way of data-pooling and 'the use of statistical methods to combine the results of independent empirical research studies' (Hedges, 1992). Meta-analysis in educational research has the same problems as in health care research, such as ensuring the comparability of different samples, research designs, outcome and process measures, identifying confounding factors and bias, and determining the attributable effects of the intervention(s) being assessed. As Preiss (1988) points out 'the researcher will have several options when cumulating empirical studies and readers will have questions regarding judgment calls made during meta-analysis'.

#### 4. WHAT IS EVIDENCE?

A key issue in developing evidence-based education, and evidence-based health care, is the uncertainty as to what counts as evidence. For those who ask questions such as 'does educational method (or health care intervention)  $x$  have a better outcome than educational method (or health care intervention)  $y$  in terms of achieving outcome  $z$ ', evidence consists of the results of randomised controlled trials or other experimental and quasi-experimental studies. Other types of question, for which valid and reliable evidence is sought in both educational and health care research, require evidence about the strength and pattern of relationships between different variables that effect the processes and outcomes of education (and health care). These are best provided by survey and correlational research using methods such as simple and multiple correlation, regression analysis, and analysis of variance.

Yet other questions are more concerned about the *processes* by which educational and health care activities are undertaken and the *meanings* that education or health care have for different people (e.g. learners/patients, teachers/health care professionals, school governors, health care executives, purchasers, etc). The ways in which teachers and doctors typify students and patients, and use categories

and practices that open up, and close down, opportunities for advancement in education (Cicourel and Kitsuse, 1963; Cicourel and Mehan, 1985; Mehan *et al.*, 1996) or health care (Strong, 1979; Davies, 1979), are important topics about which high quality evidence is needed. Evidence is also required about the *consequences* of educational and health care activities on students' and parents' sense of self and their sense of social worth and identity. These types of question require more qualitative and 'naturalistic' research methods such as ethnography, detailed observations, and face-to-face interviews.

Other evidence may be sought about the patterns and structures of interaction, conversation, and discourse by means of which both educational and health care activities are accomplished. Such questions focus on naturally occurring activities between teachers and students, health professionals and patients, and between professionals. Studies such as those by Button and Lee (1987); Fisher and Todd (1983); Silverman (1987), in health care and by Cazden (1988); Mehan (1977, 1996), and Spindler, D (1982) in education represent types of research and evidence from within the conversation analysis and discourse analysis tradition.

Evidence is also required about ethical issues of educational or health care practice, such as whether or not it is right or warrantable to undertake a particular educational activity or health care intervention. Each of the methodological approaches mentioned above may inform these issues, but none will resolve them without additional considerations about the moral and ethical issues of universal versus selective action, informed choices, social inequalities and social justice, resource allocation and prioritisation, and the values underlying education and health care. There is a considerable literature on the ethics of research and professional practice in health care (Brazier, 1987; Fulford, 1990; Gillon, 1985; Veatch, 1989; Weiss, 1982) and education (Adair, Dushenko and Lindsay, 1985; Frankel, 1987; Kimmel, 1988) which the competent practitioner needs to include in his or her considerations of appropriate evidence for best practice.

##### 5. BIBLIOGRAPHIC AND DATA-BASE PROBLEMS

A third objection to evidence-based education is that the data-bases which serve educational research are less developed, and contain lower-quality filters, than those found in medical and health care research. It does seem that the ERIC Clearing House for educational research is less

universal, comprehensive and systematically indexed than MEDLINE and other data-bases in health care (e.g. CINAHL), social science (SOCIOFILE, PSYCLIT, ECONLIT) and biological sciences (BIOLOGICAL ABSTRACTS), and that many studies in education fail to appear on it. This is an issue of improving the reporting and indexing of educational research and changing its reporting practices.

Educational research has also lacked a centralised data-base for the preparation, maintenance and dissemination of systemic reviews of education such as the Cochrane Collaboration, Best Evidence, and the Centre for NHS Reviews and Dissemination. The Cochrane Collaboration has already begun to assemble a data-base of reviews and meta-analysis of social and educational research. The Social, Psychological and Educational Controlled Trials Register (SPECTR) is an extension of The Cochrane Controlled Trials Register in health care (Milwain, 1998; Petrosino *et al.*, 1999). To date, handsearching, electronic database searching and the searching of reference lists have identified over 5000 references to studies in education, criminology and psychosocial-learning research. These studies do not include research which uses methodologies other than experimental or quasi-experimental designs. Such studies also need systematic identification, review, and critical appraisal if the full range of educational research is to be used in the ways suggested in this paper.

This indicates an urgent need for the development of such infrastructural arrangements in education (see Hillage *et al.*, 1998: 53), and the financial support of central governments and the major research councils to develop and maintain them. The existence of many high-quality educational research centres throughout the world which can undertake systematic reviews and meta-analyses on different aspects of education suggests that a similar network of collaboration in educational research is feasible.

In short, the inadequacy of data-bases and bibliographic sources in education is a real problem, but one that is surmountable with appropriate effort and resources. The need for the continuing professional development of teachers, educational researchers, policy makers, and school governors, so that the principles and practices of evidence-based education can be nurtured and introduced into everyday educational life, is also clearly indicated.

## 6. EVIDENCE AND PROFESSIONAL JUDGEMENT

Establishing best practice, in both education and health care, is more than a matter of simply accessing, critically appraising, and

implementing research findings. It also involves integrating such knowledge with professional judgement and experience. Much professional practice in education and health care is undertaken on the basis that things have always been done a certain way, or they carry the authority and legitimacy of some charismatic, highly valued practitioner. The role of 'common-sense' and 'back to basics' is also favoured by politicians and those charged with developing national educational policy.

Whilst tradition, charismatic authority, and experience can work against change and the development of best practice, they do have some merit. A teacher's experience and judgement can be much more sensitive to the important nuances of contextual and cultural factors than the findings of research alone, however thorough and valid that research may be. The question of the *relevance* of high-quality research to more local issues of teaching and learning (or treatment and change of health status) has already been noted, and is one which demands the highest levels of professional skill, judgement, and experience. Just as evidence-based health care means 'integrating individual clinical expertise with the best available external evidence from systematic research' (Sackett *et al.*, 1996), so evidence-based education means integrating individual teaching and learning expertise with the best available external evidence from systematic research. Indeed, a central feature of evidence-based education must be the two-way process of broadening the basis of individuals' experience and judgement by locating it within the available evidence, and generating research studies and evidence which explore and test the professional experience of teachers, students and other constituents of learning communities.

## 7. CONCLUSION

Education seems to be in a position remarkably similar to that of medicine and health care five or ten years ago. There are many research journals which contain a broad range of reports on research using different methodologies and addressing a diverse range of educational issues. Some of this research is of a high quality, some less so. The demands being made upon teachers and others who provide education call out for educational practice to be based on the best available evidence as well as the professional skills, experience, and competence of teachers. To do this, the educational research literature needs to be better registered, indexed, classified, appraised, and made accessible to researchers and teachers alike.

Educators need access to this research and to be able to search and critically appraise it in order to determine its relevance (or lack of relevance) to *their* schools, students, and educational needs. Whether this is called evidence-based education, research-based education (Hargreaves, 1996), literature-based education (Hammersley, 1997), or context-sensitive practice (Greenhalgh and Worrall, 1997) is immaterial.

Evidence-based education, like evidence-based health care, is not a panacea, a quick fix, cookbook practice or the provider of ready-made solutions to the demands of modern education. It is a set of principles and practices which can alter the way people think about education, the way they go about educational policy and practice, and the basis upon which they make professional judgements and deploy their expertise.

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