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THE IMPLICATIONS OF META-ANALYSIS
FOR EDUCATIONAL RESEARCH

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The Implications of Meta-analysis for Educational Research

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ABSTRACT *Meta-analysis, as developed over the last few years by Glass and others, is a quantitative method for synthesising research results. Its use is illustrated here by means of examples ranging from irreproachable to dubious. Being simple to use and easily understood, meta-analysis will undoubtedly become popular and this increasing use may well bring about some notable changes. The well-controlled, small-scale experiment is likely to become more important and better use will be made of many existing research reports, reports which can now be dusted off and incorporated into meta-analyses. Because meta-analysis focuses on how much difference something makes (the magnitude of an effect) and not on whether or not the difference was statistically significant at a pre-specified level, its use encourages a more scientific approach to the interpretation of quantitative results. It also offers some hope that we might eventually have a clearer idea of the conditions under which research findings can be generalised. Progress in this direction will require mutual support between quantitative and qualitative research methods.*

Meta-analysis is a method of synthesising research results. In a meta-analysis the effects of variables are examined in terms of their 'Effect Size', i.e. in terms of *how much* difference they make, rather than only in terms of whether or not the effects are statistically significant at some (frequently arbitrary) level such as 0.05. The kinds of data for which it is most suitable are data arising from true experiments, i.e. from interventions with experimental and control groups, although in their important book Glass, McGaw & Smith (1981) also deal with extracting Effect Sizes from correlational studies.

The emphasis on the size or magnitude of an effect, while fundamental in the physical sciences, represents a very significant shift of emphasis in social science research. A number of possible implications are considered below.

dependent variables in primary studies: a non-explicit mixture of tradition, prior evidence and intuition, which probably should be more often related to explicit theories (cf. Hargreaves, 1981; Fitz-Gibbon & Morris, 1975).

Campbell & Stanley (1966, p. 17) noted that generalisability rested essentially on vague notions of the 'stickiness' of nature. Results would generalise better closer to home than further away, better with a more similar sample than with a more different sample and so on. But similar or different on what variables and what are the variables which make a region or a group homogeneous and generalisable-to? Analyses of context variables via meta-analysis might begin to suggest some general principles of generalisation as well as to direct researchers in particular fields to the particular variables they should specify in describing their sample, treatment, location and personnel.

Any description of procedures, location, personnel, is only a partial description. What kind of information is important, and what is unimportant to the outcomes of an experiment? Bertrand Russell warned that the major characteristics of an epoch may well be the very aspects of life on which nobody comments. Similarly, a crucial aspect of an experiment might be an aspect which seemed too obvious for comment to the experimenter. Hence there is a need for 'thick description' within which might be buried aspects which only later appear important. Qualitative accounts should always accompany quantitative work.

Meta-analysis and Qualitative Research—a new need for mutual support

The value of qualitative accounts, such as ethnographies, for recording context variables has just been mentioned. Another instance of mutual support between qualitative and quantitative work occurs when quantitative analyses support experiential evidence. When we find the experience of teachers, qualitative, anecdotal and descriptive data pointing to the same conclusions as those arrived at by quantitative research we shall have more faith both in the conclusions and in *all* the methods employed to reach those conclusions. To take one example, a meta-analysis has demonstrated peer tutoring to be exceptionally effective (Hartley, 1977), and this finding fits entirely with the experience of many teachers, as documented in books (e.g. Gartner, Kohler and Riessman, 1971; Allen, 1976), articles (Ebersole, 1972; Bond, 1982) and surveys (Fitz-Gibbon, 1977). When Thelen wrote,

Cross-age tutoring works. I can think of no other innovation which has been so consistently perceived as successful (Thelen, 1969, p. 230),

he was presumably referring to his own perceptions, experiences, anecdotal evidence, etc. That the judgement of this informed impression has now received support from meta-analyses of more than 200 studies (Hartley, 1977; Cohen, Kulik and Kulik, 1980) is an example of the kind of convergence between experiential and experimental data which makes us hopeful that social science is proving cumulative and informative; that social science is indeed a science. It may prove to be an untidy and difficult science, like meteorology or medicine, but this is no excuse for our not trying the scientific method a little more thoroughly.

It may encourage readers who feel grave misgivings about social science *qua* science to know that Glass, the main proponent of meta-analysis, is no thoughtless, naive or dogmatic positivist. In an article in 1979, for example, he considered the possibly unpredictable nature of educational problems. Of meta-analysis, Glass *et al.* concluded cautiously, "The approach we call meta-analysis seems to be too plainly

reasonable to be false in any simple sense. Whether it will be useful is a different matter" (Glass, McGaw & Smith, 1981, p. 231).

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Note

This is the second of two articles on meta-analysis. The procedures of meta-analysis were described and illustrated in the first article, which also dealt with some commonly raised objections. This article explores implications that meta-analysis may have for the conduct of research in the social sciences.

REFERENCES

- ALLEN, V. (Ed.) (1976) *Children as Teachers: theory and research on tutoring* (London, Academic Press).
- BOND, J. (1982) Pupil tutoring: the educational conjuring trick, *Educational Review*, 34(3), pp. 241-252.
- BRONFENBRENNER, U. (1975) The ecology of human development in retrospect and prospect. Invited address at the final plenary session of the conference on Ecology Factors in Human Development, University of Surrey, Guildford, 13-17 July.
- CAMPBELL, D. T. & STANLEY, J. C. (1966) *Experimental and Quasi-experimental Designs for Research* (Chicago, Rand McNally).
- CARVER, R. P. (1978) The case against statistical significance testing, *Harvard Educational Review*, 48(3), pp. 378-399.
- COHEN, P. A., KULIK, J. A. & KULIK, C. C. (1982) Educational outcomes of tutoring: a meta-analysis of findings, *American Educational Research Journal*, 19(2), pp. 237-248.
- EBERSOLE, E. H. (1972) The Soto pupil-team program for reading: an experiment in structural tutoring, *Improving Human Performance*, 1(4), pp. 39-42.
- FITZ-GIBBON, C. T. (1977) *A Survey of Tutoring Projects* (Los Angeles, Center for the Study of Evaluation).
- FITZ-GIBBON, C. T. & MORRIS, L. M. (1975) Theory based evaluation, *Evaluation Comment*, 5, pp. 1-4.
- GARTNER, A., KOHLER, M. & RIESSMAN, F. (1971) *Children teach Children: learning by teaching* (New York, Harper Row).
- GLASS, G. V. (1979) Policy for the unpredictable (uncertainty, research and policy), *Educational Researcher*, 8(9), pp. 12-14.
- GLASS, G. V., MCGAW, B. & SMITH, M. L. (1981) *Meta-analysis in Social Research* (London, Sage).
- GLASS, G. V. & SMITH, M. L. (1979) Meta-analysis of research in class size and achievement, *Educational Evaluation and Policy Analysis*, 1, pp. 2-16.
- GREENE, J. C. (1980) Individual and teacher/class effects in aptitude treatment studies, *American Educational Research Journal*, 17(3), pp. 291-302.
- GUSTAFSSON, J. E. (1978) A note on class effects in Aptitude X Treatment Interactions, *Journal of Educational Psychology*, 70(2), pp. 142-146.
- HARGREAVES, D. H. (1981) Schooling for delinquency, in: L. BARTON & S. WALKER (Eds) *Schools, Teachers and Teaching* (London, Falmer).
- HARTLEY, S. S. (1977) Meta-analysis of the effects of individually paced instruction in mathematics, *Doctoral dissertation*, University of Colorado.
- THELEN, H. A. (1969) Tutoring by students, *The School Review*, 77, pp. 229-244.

