SOME RE-THINKING OF THE PSYCHO-EDUCATIONAL DIAGNOSTIC PROCESS FROM THE PERSPECTIVE OF DEVELOPING A COMPUTER-GUIDED EXPERT SYSTEM

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It has become customary to refer to educational applications of computer technology, e.g., in fostering learning, as computer-assisted; whereas in the research project with which we are engaged, we refer to "computer-guided diagnosis." What's in a name? As things are turning out, quite a lot.

Computers seem to have been with us for ever, but we have to continually remind ourselves that—as a fact of everyday life, one might almost say "as an everyday necessity"—the microcomputer has been around for barely a decade. In developing a computer-based system to facilitate psycho-educational diagnosis, one is continually reminded that this is a new field. There is not a substantial history of research from which to benefit. There have been what are now regarded as classic, pioneering examples of diagnostic Expert Systems, which are documented in detail in books on Artificial Intelligence, but already some of their procedures are becoming recognized as analogous to the T-model Ford in the evolution of the automobile—essential, and to be honored, but perhaps not exactly the last word.

Attempting to computerize the diagnostic process, or at least attempting to effect a two-way dialogue between the human diagnostician and the computer (as assistant and/or consultant and/or colleague) also causes introspection about the processes which take place during good conventional diagnosis—and to realise that some of those processes take place at an unconscious, subliminal, semi-automatic level. These processes have to be brought to conscious awareness and expressed in such a way that they are comprehensible to the computer and, incidentally, to the diagnostician. So, although we might have started out with a fairly firm idea of the final model which we had in mind, the process of getting to that model has been a learning experience and an experience which has caused ideas about the "final model" to be fluid rather than carved in stone. However, some firm ideas and convictions are emerging:

(1) Referring back to the question asked at the outset of this paper about "what's in a name?", our first—and current—intention was, and is, to produce an ancillary aid for the diagnostician (i.e., for the educational psychologist, resource teacher, consultant, NOT for every classroom teacher). In its short history, the term "computer-assisted ..." has come to have the connotation...
that certain data are fed into the computer, which then juggles numbers and comes up with the solution, whether it be a categorical classification, a complete WISC-R report, or whatever.

(2) Psychometrically-based Expert Systems cannot have more than an extremely limited value for individual diagnosis. This paper is not the place to indulge in statistics, but most readers will be familiar with the "probabilistic" model which is so beloved by psychometricians. As an example, when a student's WISC-R IQ is assessed at 100, we are admonished to report the IQ to be within some band, or range, of scores. Thus, if we measure a child's IQ and find it to be 100, we can say that is "probably" (95 per cent certainty) between 91 and 109, depending on the test's reliability. If we also measure the student's educational achievement and assess it as 90, and if the achievement test has the same reliability as the intelligence test, then we can say that the student's achievement quotient is probably between 81 and 99. But when we estimate the under-achievement (I chose IQ 100 so as not to get into complications associated with statistical regression) as 10 points—100 minus 90—that 10 point discrepancy is subject to an error of about 14 points for the same 95 per cent certainty. So we can say that the discrepancy between predicted ability and actual ability is probably somewhere between 24 and -4, i.e., from quite severe under-achievement to marginal over-achievement. As we advance further into the diagnostic process, it can be seen how bogged down we get in error by, say, correlating ability/achievement discrepancy with performance on some relatively unreliable diagnostic test such as the subtests of the Gates-McGintie or Brigance. Decisions drown in accumulated errors.

Some of the early Expert Systems substituted "Certainty Factors" (i.e., an expert diagnostician subjectively estimates the validity of each piece of diagnostic information) for mathematically-derived validity indices. But rather than solving the problem, such a procedure aggravates it, applying sophisticated mathematics to doubtful, unverifiable anecdotal data. "Certainty Factors" is a euphemism for "guesses"—informed guesses, granted, but still the guesses of human experts; in our case, people such as resource teachers, psychologists, me.

(3) A further problem faced by diagnostic systems which rely primarily on psychometric data is that they become obsolete immediately a test which is used by the system is revised. For example, the computer program MAC (Multidimensional Actuarial Classification) by McDermott (1980) contains a prodigious amount of technical data about the tests which it covers (which means that loading up the program is slow and tedious, not a fatal flaw, but irritating). But immediately as one of its relatively small repertoire of component tests is revised, e.g., when the fourth edition of the Stanford-Binet (Thorndike, Hagen, & Sattler, 1986) appeared, all the inter-correlations contained in M-MAC memory which related to the Binet test were no longer applicable.

(4) Then there is the matter of copyright. It is a sad fact of life to the idealistic academic or clinician, but publishing companies are very reluctant to have technical information—e.g., IQ conversion tables—copied on disks. And, mundane though this matter might seem, it means that permission has to be sought. If permission is not obtained, then that instrument may not be included in the total diagnostic package; if permission is obtained—at a