A CRITIQUE OF STERNBERG'S AND GARDNER'S CONCEPT OF MULTIPLE INTELLIGENCES.

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I would like to make it clear at the outset that I believe both Sternberg's and Gardner's work to be steps in the right direction. What is more, the paper by Hatch and Gardner (1986) leads me to think that they may, in the end, come to conclusions which are much more radical than those they have already published.

That said, the problems with these approaches are:

1. That the re-orientations they advocate are not sufficient to challenge widely held - and socially damaging - assumptions which are deeply embedded in most psychologists' thinking about ability and the measurement practices they employ. In the first place, replacing "g" with 3 (or even 6) variables in no way comes to terms with the diversity of cognitive abilities, let alone the total range of abilities. In the second place, Sternberg's "academic", "practical", and "social" intelligence are not really different types of intelligence but rather intelligence applied and developed in relation to alternative types of activity which may or may not be *valued*. Once one has said that, one can see that intelligence could be applied and developed in the course of undertaking very many other types of activity which may be valued. Furthermore many other cognitive and other abilities could be brought to bear to undertake these activities effectively. Sternberg's formulation does not encourage us to address the issue this way. It therefore prevents us moving forward. It neither gets the values to the front of our measurement model nor identifies the range of cognitive and other competencies which can be deployed to undertake valued activities effectively. (We may note in passing that, despite Sternberg's discussion of tacit (ie self-generated) knowledge, his measures of these varieties of "intelligence" do not even index the ability to *reason* - ie to form new constructs. Like most "intelligence" tests they measure *reproductive* ability and and do not help us to solve the two main problems involved in trying to assess people's ability to form *new* constructs in their own particular domains of expertise and specialisation. The first of these major problems is that it is necessary to find some way of indexing the respondents' *ability to solve problems or form new constructs on the basis of the information he has already acquired [and regardless of whether he has evolved that information for himself or got it from other people]. The second is to do so in relation to the tasks which the respondent values and in connection with which he has built up expertise).*

2. That Sternberg's formulation does not sufficiently undermine psychologists' preoccupation with making fine discriminations between people within only one area of ability and their tendency to overlook the fact that the main sources of variance between people are (i) in the *areas* in which they have knowledge, eductive ability, and expertise and (ii) their *patterns* of competence. In view of the crucial need to get a rough fix on this wide range of abilities, I cannot see that it is other than socially dysfunctional to use long tests to get an "accurate" measure of each of three types of "cognitive ability". The suggestion I will make in the course of this paper is that it would be more than sufficient to find out whether people display, high, average, or low levels of the ability to form new constructs whilst carrying out tasks they care about if that information were to set in the context of data on (i) what they care about and (ii) the other competencies they bring to bear in the course of attempting to undertake these activities. In other words, I would like to turn our current preoccupations in psychometrics on their side and, instead of making fine discriminations in relation to one or two variables, make present/absent discriminations (or descriptive statements) in relation to many potentially important variables in order to give a much more comprehensive, and therefore much more objective, picture of the individual.

3. That their theoretical formulations are incorrect and inappropriate to deal with the problems.

Although Sternberg acknowledges that his model is not a model of the mind, I am bothered by:

A. His general reinforcement of the notion of a single factor of "Ability". Thus, he speaks about the need to encourage more "able" people to study the problems of "intelligence". This formulation acknowledges none of Calvin Taylor's findings. Taylor (1963) showed (i) that there are many different types of outstanding scientist who do very different things, who contribute in different ways to scientific advance, and who need to be part of a team made up of people who have different concerns and abilities and who do very different things, (ii) that none of these abilities are related to conventional assessments of academic ability (which are measures of *reproductive* rather than eductive ability

and overlook most other important types of intelligence), and (iii) that only one of these types of ability (namely the ability to make the kind of observations needed to secure personal advancement) seems to be represented in Sternberg's framework.

B. The acceptance, in the componential sub-theory, of the appropriateness of the designation of the two main components of "g" as "fluid" and "crystallised" intelligence. My interpretation of the available evidence is that the ability which is often labelled "crystallised intelligence" is not a crystallised form of fluid intelligence, but, from a psychological point of view, a very different ability. It is found in different people, has different psychological origins, and results in very different behaviour. Despite this, in day to day life, it works very closely with "fluid intelligence" - better termed "eductive ability". What has been termed "fluid intelligence" is better called "eductive" ability, and what has been termed "crystallised intelligence" is better termed "reproductive" ability. The relationship between the two seems to me to have been admirably articulated by Spearman(1923/27) over 50 years ago:

"To understand the respective natures of eduction and reproduction - in their trenchant contrast, in their ubiquitous co-operation, in their genetic inter-linkage - to do this would appear to be for the psychology of individual abilities the very beginning of wisdom...".

One wishes that Sternberg had followed this advice. If I were restricted to making not more than three pieces of information about a person's "intelligence", I would still prefer these two to the scores on Sternberg's academic, practical and social intelligence scales. That comment is, of course, not quite fair because what Sternberg really wants us to do is to assess both eductive and reproductive ability in each of his three domains. But, in that context, it *is* fair to suggest that he has not succeeded in providing us with the means of doing so because what he has got is not merely a set of measures of the respondents' already crystallised knowledge in these areas *but measures of the ability to recognise knowledge which Sternberg has crystallised in these areas*. The measures therefore fall into the trap into which most multiple-choice measures of "academic ability" fall: they measure only the ability to recognise something which the examiner knows rather than the ability to generate new constructs of one's own.

Eductive and Reproductive abilities really are different forms of intelligence; Academic, Practical and Social Intelligences are *not*. These abilities involve the application of both eductive and reproductive ability - and other forms of cognitive ability as well as many other competencies - to the achievement of different types of goal.

C. The emphasis on "learning" and problem-solving to the virtual exclusion of perception and problem-identification. It seems to me that perception is itself crucially dependent on a conceptual base and that perception and problem identification are inextricably linked. Without a perceptual/conceptual (if non-verbal) "Gestalt" one cannot have a problem. It is the concepts which enable us to see things in the booming buzzing confusion.

4. The Experiential Sub-theory does not deal adequately with the relationship between central and local processing (if, indeed, that is the correct way to think about it at all).

A. What Sternberg terms central and local processing seem to me to continually interact in a dynamic way to result in the continuous re-formulation and adjustment of high level schemata and to the continuous use of high level schemata to adjust "local processing" to changing circumstances. Local processing does not seem to me to be hived off and isolated in the way that the model suggests. Indeed, the more one thinks about it, the more unsatisfactory this initially appealing idea becomes. It seems to me that the automatization of thoughtways and physical habits and their relationship to cognition and thinking has posed a continual problem for American learning theorists and that Sternberg's formulation is no more likely to be successful than the previous ones.

In fact, I still have a preference for a theory based on the ability to form high level non-verbal constructs rather than one based on separate processing. Let me illustrate. Sternberg introduces his theory with the observation - which I do not dispute - that:

"The greater knowledge base of the expert is the result, rather than the cause, of the expertise, which derives from the expert's ability to organise effectively information he or she has encountered in many, many hours".

However, he then goes on to say that "...the expert is more proficient at learning new tasks because global processing resources are more readily available for the intricacies of the task... In essence, a loop is set up whereby packing more information and processes into the local system enables one to automate more processing and thus to have global resources more available".

I would prefer to say something like: "the expert is able to identify and solve more problems (note the absence of a reference to 'learning') because he or she is better able to form new, high-level, non-verbal constructs which make it easy to handle complex events".

I have to confess that I do not know what either a "global process" or a "non-verbal construct" would look like if one met them on a clear day. Despite this, the two formulations would point researchers in very different directions.

B. I am not at all sure about the relationship between global and local processing.

I have already made a connection between automated thoughtways and physical habits. In this context it is interesting to note that Spearman argued that the intellectual grasp of the whole is crucial to manual dexterity: Complex habits are not put together by combining parts one with another. Rather sub-routines are perfected in and through the formation of more global activities. Deft movements in typewriting or piano-playing are acquired as parts of higher level, meaningful, activities.

The same is true in the intellectual area. To perceive a problem one must start with an overall Gestalt or at least a hypothesis as to what the whole might be. To analyse one must be able to perceive more than the overall Gestalt. One must have - possibly unverbalised - hypotheses about what it is important to attend to within the whole. Analysis does not mean "to chop up into random bits". It means to investigate potential relationships suggested by one's understanding of the whole. Nevertheless one must also have symbolic representations of the parts (which does not mean that one must be able to describe them in words). I don't think these can be meaningfully described as "local" processes, although they do "chunk" the processing. The ability to perceive all of these things is based on what one has drawn from experience, and thus on reproductive ability.

It is important to note, too, that the common statement that problem-solving involves coming to see the relationship between variables, is misleading. The "variables" between which a "relationship" has to be "discerned" are usually not obvious and have themselves to be educed in the context of one's emerging understanding of the whole. One needs to discern the totality of variables and their relationship in order to see the variables. It is a totality of variables and relationships which one has to come to see in - or squeeze out of - the booming, buzzing confusion. This is what Spearman meant when he said that the perception of a variable tended to evoke instantly a knowledge of a relationship and vice-versa.

My point is, of course, that perceiving is intimately bound up with symbolic thinking. Thus, in contrast to what many people have argued, it is not the seeing of similarities and differences which is important but the tendency to evolve constructs which make it possible to educe meaning and significance and, as a result, to see the similarities and differences.

What I am saying is that it is on the ability to form high level non-verbal constructs that we should focus. And, although I have already admitted that I do not know what that means, it seems to me to be a formulation which is less likely to mislead than the central and local processing metaphor.

Let me be more specific. If one thinks of Piaget's studies of conservation of volume, it is not "automated local processing" which is required to make the necessary leap. Nor is it the "ability to hold length, breadth and height in mind at once" which is required. What is required is the concept of volume. Once acquired, this concept transforms the world - because one now has a single concept which enables one to summarise three dimensions ... but which can be instantly decomposed into those three.

C. A final problem I have with this "global" and "local" processing idea is that, introspectively, "global" processing often seems to me to come from the fringes - from, for example, feelings in my muscles which tell me that something is wrong, or that, if I pause and reflect, I will find that I have a problem - or a better way of "thinking" about a set of issues about which I am already "thinking".

5. The contextural sub-theory does not seem to me to adequately reflect either the range of potentially valued activities nor the fact that eductive ability is required to develop an understanding of (a) the workings of organisational system (tacit knowledge of requirements for promotion) and (b) the significance of body language (social intelligence). These seem to be the same ability applied to different goals. However, the ability can only be assessed whilst the individual is pursuing goals which he or she cares about. By calling the process a different type of intelligence Sternberg both obscures the issues and does not encourage psychologists to study the possibility that eductive ability may be displayed in relation to still other goals.

In fact Sternberg ducks the most important question - which has to do with the multiple talents which may be deployed cumulatively and substitutively in the service of intelligent, competent behaviour - by saying that it is necessary to set limits on his discussion in order to keep it within manageable bounds. Unfortunately, this leads to major crimes of omission. In the first place, he deals with only a few of the cognitive competencies which relate to effective behaviour. Secondly, and more importantly, he fails to mention the wide variety of talents which are required for intelligent and competent behaviour.

There is actually an alternative way of keeping the discussion within manageable bounds. This hinges on substituting the goal of trying to get a rough fix on multiple talents for the goal of trying to get an accurate measure of only three of the domains in which eductive ability could be displayed.

Both the problem and the solution can be illustrated by reference to Grid 1. Down the side are listed a range of competencies which could contribute cumulatively and substitutively to effective behaviour. [Those shown on the grid are only a sub-set from a longer list which is published in *Competence in Modern Society* (Raven, 1984)]. A number of types of behaviour which might be valued are shown across the top of the Grid. Once again, many more could be listed.

Three things are immediately obvious. (1) it would be easy to identify many more "types" of "intelligence" than academic, practical and social. (2) there are many more "types" of cognitive ability than fluid and crystallised ability. (3) that "intelligent", competent, behaviour can be achieved in many different ways - such as by persuading other people to help rather than thinking things out for oneself.

Clearly it is essential to give the goals in relation to which cognitive and other capacities are developed and displayed a much more central place in psychological theorising and psychometric practice. Instead of striving to develop value-free measures we need to develop value-based measures. Sternberg would have done better to make *that* point instead of of claiming to identify three "types" of intelligence.

Something else which the Grid illustrates is that it is necessary to *elicit* the individual's goals before attempting to assess cognitive or any other type of ability. Instead, as illustrated in the following quotations, Sternberg *tells* his respondents that they have certain goals and then tries to find out whether *they* know something which *he* thinks they need know to pursue the goals (which *he* has chosen) effectively. His aim is to find out how much "tacit" knowledge - ie knowledge which is not widely circulated and which the respondents must therefore have themselves built up - they possess. I have no doubt that, if he could find out, that would be extremely valuable information. But the introductions to his questions read: "Your goals are to become one of the top people in your field and to get tenure" ...., or again, "Your goal is rapid promotion to the top of the company". How can one expect people who do not value these goals to have the information? What is more, if one did value these objectives, surely there is more than one way of achieving them.

This hardly seems to be an appropriate way in which to investigate the problems with which he is concerned. Ironically, from the point of view of finding a way forward, these questions actually do seem to be useful because, viewed as expressive behaviour, they seem to tell us a great deal about Sternberg's own concerns and knowledge. We could therefore begin to fill in a version of Grid 1 for Sternberg. This suggests that it would *not* be impossible to adopt this approach more generally.

This is not, however, the most serious limitation of Sternberg's measures. Much more serious is their failure to tackle the problem posed by the fact that high levels of eductive ability are dependent on the development of idiosyncratic schemata which make it possible to think about issues which are personally important. In many ways it seems to me that Schon (1983), has made a more significant contribution in this area by describing the processes of reflection which are required to behave competently in many occupations and the way in which that process is communicated from one generation of professionals to another.

The Way Forward

Having criticised Sternberg's measures, I may now add a few more reflections of my own on the way forward:

The Measurement of High Level Eductive Ability

One problem which I think I am, in the light of the comments I have made, obliged to deal with is: How is one going to measure eductive ability - the ability to form high level constructs - whilst people are undertaking activities which they care about?.

The solution to this problem, however, as is so often the case in science, is perhaps to be found by recognising that, as psychologists, we have been preoccupied with the wrong problem.

We have created a trap for ourselves by over-emphasising the importance of "intelligence", with the result that we are inclined to think that it is very important to make reliable and accurate discriminations between people along this dimension. If we suspend belief in this proposition for the time being, we can entertain the notion that it might be preferable to describe people by reference to present or absent designations across a large number of variables - including several, possibly relatively independent, types of cognitive ability.

It might actually not be too difficult to do this: I have little difficulty noticing whether those I work with are good or poor at forming new constructs, verbalising, prising information out of other people, locating information in books, and so on whilst they are undertaking the tasks they have been engaged to carry out. What is more, I am prepared to believe that they may be better at doing these things in relation to tasks they care about. Certainly my children are.

The import of these remarks is that the word "measure" in the question of how we are going to "measure" eductive ability blocks progress. If we free ourselves from the notion that we must have really 'accurate" measures of a small number of dimensions, we may well be able to make observations which are adequate to our needs and purposes.

Clearly what I have just said can be extended to the other competencies listed down the side of Grid 1 and the longer list from which they are drawn.

Other ways of getting this information include projective methods (because people tend to see other people as thinking and exercising these other competencies if they do it themselves) and Behavioural Event Interviews (in which people are systematically interviewed about important events in their life).

It seems to me that one of the most basic errors which psychologists have made in this area has been their attempt to isolate *thinking* from related activities which contribute to thought - such as discussing the problem with other people, persistence in trying to find new ways of thinking about the problem, and waking up at night to capture fleeting feelings on the fringe of consciousness etc. It does not seem to me to be too far fetched to argue that, if we really wish to assess someone's capacity to think, we need to find out how often they do these other things whilst trying to understand their problems.

It follows from these observations that one way of indexing people's ability to exercise the components of competence listed in Grid 1 would be to ask them what they think the consequences would be if they were to try to do so in relation to problems which they themselves have identified. I have elsewhere (Raven 1984, 1988) shown that there is considerable evidence that this can indeed be done.

Fostering Problem-Solving Ability.

I would like finally to comment on the exercises for developing Social and Practical Intelligence which Sternberg has published in *Practical Intelligence* (Sternberg, 1986).

It seems to me that these fall into the same category as other exercises designed to promote the development of "thinking" (cf Chance, 1986; Jacobs 1977, Feuerstein, 1979). Although Sternberg (1985) criticises these approaches because of their lack of generalisability, it is unlikely that his own will fare much better. In the first place, they fall into the classical academic trap of seeking to *convey information*, rather than to *develop competencies* (such as eductive ability). More importantly, they, like most of these other techniques, do not recognise either just how specific are the problems which people try to think about or just how much time and energy is required to think about them. This is serious, not just because it reinforces the tendency of American psychologists to overlook the conative (time and effort) component of behaviour, but also because such exercises contribute to the climate in which little time is budgeted for *thinking* in research submissions and because it contributes to the elimination of time to read, reflect and dream from educational programmes which, as a result, become increasingly contented oriented and stress time-on-task.

Once again, I would like to share the results of some of my own work on what can be done to promote the development of problem solving ability. Together with Sigel and his colleagues (1984, 86, 88.. and Kohn and Schooler (1978), my colleagues and I (Raven, 1980; Raven, Johnstone & Varley, 1985) have studied the processes which promote the development of eductive ability in homes and schools.

The Home

One important activity seemed to involve a specific variety of the cluster of activities which are described as 'democratic child rearing practices". The parents concerned discussed their actions and their probable consequences with their children. They shared their thinking about society and what the long term consequences of their actions - for themselves and for society - were likely to be. They set out to earn their children's respect by reasoning with them and discussing the long term (intangible) consequences of their actions. In these ways they promoted their children's ability to think.

But parents who adopted the relevant form of democratic child rearing practices also promoted their children's cognitive development in other ways. They modelled cognitive processes in action, and their children shared in their planning, their reasoning, their anticipation of the future. Discussion of the future required their children to practice paying attention to exactly what was said - because such statements cannot be checked against the environment. This encouraged what Donaldson (1978) has called disembedded thinking - ie thinking about abstractions which are not supported by the concrete here and now. These parents shared their attempts to resolve value conflicts and thus again deal with abstractions, and general principles, through reasoning. By sharing with their children their attempts to understand and tackle their own problems they demonstrated the efficacy of taking thought.

They also encouraged their children to plan, to invent, to find relevant information in the course of undertaking activities *which the children themselves cared about*. In this way they encouraged them to be sensitive to cues which tell one when one has the germ of a creative idea, to tolerate false starts in the knowledge that something worth while will come of such a blundering and seemingly inefficient process, to initiate action, monitor its effects and take corrective action, to develop confidence in their ability to initiate new thoughts and new activities and to take the actions which are needed to ensure that something positive - and not necessarily something which was envisaged at the outset - comes of it. They ensured that they experienced the delights and satisfactions which come from the completion of a worth while task. In all these ways it would seem likely that they promoted the development of their children's cognitive ability.

It is vital to notice that the implication of this is (as I have discussed more fully in a recent article in *Teachers College Record* [Raven 1987]) that the promotion of the development of eductive ability is not value free: discipline strategies, thinking about society, delegation of responsibility for decision taking to children, and even encouraging children to ask questions and make their own observations are among the most contentious of child-rearing practices.

The School

When we looked at schools, we found that the 5% or so of teachers who make effective use of enquiry-oriented project work to foster competencies going beyond the 3Rs - and to foster higher levels of these competencies than show up in conventional tests - behaved more like parents than teachers: they encouraged their pupils to identify and tackle problems which they (the children) cared about and which they, the teachers, did not know how to answer. In such situations the children could observe, reason, communicate, problematise, and invent. They encouraged them to take their questions and their observations to people in the universities and thus come to feel that they were both capable of asking, and had a right to ask, questions and make meaningful observations. Because their teachers did not know where the work would lead or how to answer pupils's questions, because they had to monitor each child's reactions, identify his or her motives and incipient patterns of competence, invent developmental experiences from which each child might benefit, monitor the child's reactions and take corrective action when necessary, the teachers modelled adventurous behaviour which relied on eductive ability. They modelled real learning instead of the tired communication of out of date knowledge which we all associate with schools. In all these ways they fostered cognitive development in their pupils and encouraged them to develop very different perceptions of themselves, the workings of society, and their own role in that society.

Winter, McClelland and Stewart (1981) have observed these processes at work in university settings. Kohn and Schooler (1978) and Jaques (1976) have documented the effects of what Kohn calls "the substantive complexity of work"; the more demands are made on cognitive processes the greater the increase throughout life - provided "problem solving" is indexed in appropriate ways. Klemp, Munger and Spencer (1977) have documented similar effects on competence in general. Grannis (1983) has shown that the most menial kinds of work, in general, make more demands on cognitive and other competencies than school.

The main implication of this research for child-rearing, education and staff development is that the primary need is to create situations in which people can use such eductive ability as they possess and thereby practice and develop this and other capacities. The need is to discover the kinds of task which engage their enthusiasm. In other words, it is to discover their *values*. If developmental environments in which a wide range of pupils with different values and patterns of competence are to be able to identify and develop their talents are to be created, it will be necessary to legitimise the notion that it is both possible and desirable to cater differently for people with different values. This notion is, at present, in serious conflict with the concepts of equality which inform decisions about educational policy. Beyond that, there is a need for tools to help teachers to identify pupils' values and areas of competence, to invent the types of developmental experience from which they might benefit, and to monitor their reactions to those experiences and modify them in appropriate ways.

SUMMARY

Sternberg's work will only marginally ameliorate the crimes which psychologists, teachers, and other practitioners daily commit against their fellow citizens in homes, schools, and workplaces by failing to record the talents they possess and thereby denying them access to educational and occupational programmes from which both they personally and society as a whole could profit.

Instead of distinguishing academic, practical, and social "intelligences", Sternberg and Gardner should have noted that these activities demand the application of eductive ability and other components of competence in the pursuit of differentially valued activities. Had they made this observation it is probable that they would then have noticed the wide range of alternative goals the achievement of which might be facilitated by eductive ability. They might also have noticed the wide range of other competencies which can be deployed cumulatively and substitutively to undertake valued activities effectively. Finally, they might have noticed that few of these competencies can be displayed except whilst people are pursuing goals they care about.

These remarks suggest that one key development which is needed in our thinking about ability, in our psychometric models, and in our thinking about psychological development and education is to get values up front. Another is to lay our measurement model on its side and discriminate between people mainly in terms of their values and the competencies they deploy in the course of undertaking activities they care about rather than in terms of their knowledge of activities selected by psychologists.

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A Model of Competence

GRID 1

Valued styles of behaviour

	Achievement				Affiliation				Power		
Components of effective behaviour	Doing things which have not been done before.	Inventing things.	Doing things more efficiently than they have been done before.	Finding better ways of thinking about things.	Providing support and facilitation for someone concerned with achievement.	Ensuring that a group works together without conflict.	Establishing warm, convivial relationships with others.	Establishing effective group discussion procedures.	Ensuring that group members share their knowledge so that good decisions can be taken.	Articulating group goals and releasing the energies of others in pursuit of them.	Ensuring effective compliance with one's demands.

Cognitive

Thinking about what is to be achieved and how it is to be achieved.

Anticipating obstacles to achievement and taking steps to avoid them.

Monitoring the effects of one's actions to discover what they have to tell one about the nature of the situation with which one is dealing.

Making one's value conflicts explicit and trying to solve them.

Having an appropriate understanding of how society works.

Believing that other people whose opinion one values will expect one to engage in activity.

Believing one's actions to be in the best interests of mankind.

Affective

Turning one's emotions into the task.

Selecting tasks one enjoys and facing up to the need to complete necessary but unpleasant tasks.

Anticipating the delights of success and the misery of failure.

Conative

Putting in extra effort to reduce the amount of risk involved in the activity.

Summoning up energy, determination and will-power.

Persisting in the face of difficulties.

Habits and Experience

A range of appropriate routine, but flexibly contingent, behaviours each triggered by cues which one may not be able to articulate and which may be imperceptible to others.

Experience of the satisfactions which have come from having accomplished similar tasks in the past.