

УДК 159.9.01
DOI: 10.26140/anip-2020-0904-0094RECENT RESEARCH SUPPORTING A SPECIFIC-MOTIVE-BASED
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Abstract. Mottus and his colleagues recently reported research which showed that *individual items* from Big 5 questionnaires were better able to predict changes with age than either factor scores or scores derived from sub-sets of items designed to index “facets” of personality. They further speculated that these items were linked to specific sequences of genes and that some of these dispositions led those concerned to select themselves into environments which enhanced and strengthened their differential effect. These data strongly support Hayes’ (1962) claims to that effect. In fact, these had already been reinforced by Bouchard’s extension and re-analysis of the item bank behind the Big Five and research by Johnson. The present paper sets these results in the context of a seemingly more parsimonious theoretical framework grounded in the work of David McClelland and further developed by the author. This develops a Linnaeus-type classification of motivational dispositions and elucidates a number of components of competence which enable people to translate their motivational dispositions into effect. As Scarr hypothesised, people can, and do, select themselves into environments which enable them to hone the components of competence needed to translate their motivational dispositions into effect. Research conducted in homes, schools, and workplaces conducted by the author and his colleagues documents how many parents, some managers, and a few teachers create developmental environments which contribute to this process. Particular attention is paid to the emergent nature of competence and the nature of the environments which facilitate that emergence. In the course of the paper, the development of the theoretical framework needed to think about individual differences, their development, and release in this way is described in some detail. I am deeply indebted to Steve Hughes and Oleg Yarygin for their encouragement to prepare, and help in preparing, this article.

Keywords: Nature of competence; personality; motivational dispositions; achievement motivation; Big Five; indexing of individual differences; experience-enhancing drives; developmental environments; assessment of competence; Linnaeus classification; genome-sequencing, emergence; collective intelligence; early childhood education; project-based education; multiple talents; multiple intelligences; teacher competence; managerial competence; critical-incident methodology.

ПОСЛЕДНИЕ ИССЛЕДОВАНИЯ, ПОДДЕРЖИВАЮЩИЕ МОДЕЛЬ КОМПЕТЕНТНОСТИ,
ОСНОВАННОЙ НА СПЕЦИФИЧЕСКОЙ МОТИВАЦИИ

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Аннотация. Р.Моттус (Эдинбургский университет) и его коллеги недавно сообщили об исследовании, которое показало, что *индивидуальные задания* из опросников «Большой пятерки» (Big Five) позволили лучше предсказывать изменения с возрастом, чем факторные оценки или оценки, полученные на основе подмножеств заданий, предназначенных для индексации «аспектов» («граней») личности. Далее они предположили, что эти элементы были связаны с определенными последовательностями генов и что некоторые из этих предрасположенностей побуждали их обладателей оказываться в среде, которая могла расширять и усиливать дифференциальный эффект предрасположенностей. Эти данные убедительно подтверждают утверждения, сделанные ранее К.Хейсом (К. Hayes, 1962) [9] по той же проблеме. Фактически, эти утверждения уже были подкреплены расширением Т.Бушара (Т. Bouchard) и повторным анализом набора заданий, лежащих в основе «Большой пятерки», а также исследованиями В. Джонсон (W. Johnson). В настоящей статье эти результаты рассматриваются в контексте кажущейся более сжатой теоретической основы, представленной в работе Дэвида Макклелланда (D. McClelland) и развитой автором (J. Raven Jr.). Это развивает классификацию типа Линнея для мотивационных склонностей и разъясняет ряд компонентов компетентности, которые позволяют людям реализовывать свои мотивационные склонности. Как предположила С. Скарр (S. Scarr), люди могут и действительно выбирать себе среду, которая позволяет им отточить компоненты компетентности, необходимые для претворения в жизнь их мотивационных склонностей. Исследования, проведенные автором и его коллегами в школах, в домашних условиях и на рабочих местах, подтверждают, что многие родители, некоторые менеджеры и некоторые учителя создают среду развития, которая способствует этому процессу. Особое внимание уделяется эмерджентному характеру компетентности и природе среды, которая способствует её возникновению. В статье подробно описывается разработка теоретической основы, необходимой для рассмотрения индивидуальных различий и их развития.

Ключевые слова: природа компетентности; личность; мотивационные предрасположенности; мотивация достижения; Большая Пятерка; индексация индивидуальных различий; приводящие к опыту; среды развития; оценка компетентности; классификация Линнея; секвенирование генома, эмерджентность; коллективный разум; дошкольное обучение; проектное обучение; множественные таланты; множественный интеллект; компетентность учителя; управленческая компетентность; методология критических ситуаций.

Prelude

In 1924, Charles Spearman, the originator of the concept of *g*, wrote:

Every normal man, woman, and child is ... a genius at something ... It remains to discover at what ... This must be a most difficult matter, owing to the very fact that it occurs in only a minute proportion of all possible abilities. It certainly cannot be detected by any of the testing procedures at

present in current usage. But these procedures are capable, I believe, of vast improvement. [33]

The current article summarises research, which supports a theoretical framework, and set of procedures, radically different from anything suggested by e.g. Gardner (1983) [7], for doing just that.

Background

I begin by saying something about what happened as a

result of having, by chance, attended a seminar led by Rene Mõttus.

His team (Mõttus, *et al.*, 2018; McCrae & Mõttus, 2019; Mõttus & Rozgonjuk, 2019) [20, 17, 19] had accidentally discovered that much better predictions of changes in “personality” with age could be made from *individual items* extracted from “Big Five” questionnaires than from either scores on the Big Five factors or carefully selected clusters of items deemed to measure “facets” of personality.

Here are some of the results:

Table 1. Correlations between actual ages and ages predicted by elastic net models based on the Big Five domains, facets, items and their residuals.

	Big Five	Facets	120 items	300 items	Residuals of 300 items
Mean	.28	.44	.54	.65	.65
SD	<.01	<.01	<.01	<.01	<.01

NOTE: The mean and standard deviation (SD) are across 100 replications with the training sample of 67% of the total sample.

And here are some of the conclusions drawn.

First, the Big Five domain scores excluded over half of the age-sensitive information available in the data.

While the accuracy of the Big Five-based predictions averaged at $r = .28$

the 30-facet-based predictions had an average of $r = .44$

and the 300 item-based predictions achieved more than two times higher correlations with age with average $r = .65$.

...

But the fourth finding was the most dramatic:

Individuals at different ages differed in specific behavioural, cognitive, affective and motivational patterns indexed by individual items, not because they differed in the domains and facets per se but because they differed in something that the items uniquely reflected – that is, nuances.

Clearly, we will need an empirically based and comprehensive taxonomy of nuances and tools for measuring them if we are to tap into this currently almost hidden, but vast, personality variance, be it for predicting outcomes, studying personality development, or other purposes.

One way forward would be to restart the kinds of taxonomic research programs that led to the Big Five. This could either be based on the lexical approach or start from unstructured item pools, not with the goal to identify the few major but the many dimensions of personality. Historically, the goal has been parsimony, achieved by aggregating and filtering out as much information as possible. For the development of a taxonomy of nuances, however, the goal should be capturing as much of individual differences in personality traits as is possible with measurement tools that are still usable.

Among other possibilities, we think that this can be achieved by creating measurement instruments that explicitly focus on the psychometric quality of single items such as their unambiguity and construct-relevance, retest reliability, cross-rater agreement, and low evaluativeness, while also avoiding wasteful redundancy among items. (Note that the test-retest reliability of many items is in the .70s (although it is considerably lower for many others).

Reasonably high reliability is thus achievable for even single items.

Explicitly relying on only high-quality items will allow measuring more traits with fewer items.

We imagine that it would be possible to measure at least 100 nuances with, say, 200 or 300 good-quality items.

I am, of course, delighted with these conclusions because they support what I have, for many years, been saying about the specificity of the motives which determine behavior and, enacted with the aid of a number of components of competence, make for multiple types of competence.

Some nit-picking

But, before we move on, I feel I must draw attention to some limitations of the study which may have implications for the conclusions drawn and, more importantly, because I believe that wider consideration of such things would have major implications for the interpretation of the mountains of

studies which have relied on “Big Five” questionnaires.

Mõttus’s studies were based on a “sample” of 24,000 drawn from a huge data set available to the research community.

But these participants had completed their questionnaires on the internet...

So: Question 1: Who, actually, are these people? Which 50 year olds fill up internet questionnaires?

Next, the sample had a mean age of 25 and a SD of 10.

So the “sample” of 50 year olds comprise extreme outliers in this distribution.

This brings me to Question 2: Who, exactly, are these 50 year olds? As extreme outliers they will obviously differ from the younger groups in many ways besides age.

And note this too. Most of the results are reported in terms of means and standard deviations. But how legitimate is it to calculate and talk about “Standard Deviations” derived from a population with such a skewed, non-Gaussian, distribution?

These are not minor issues.

Neglect of such issues, to which the APA Task Force on Statistical Inference would have drawn attention had its final report ever been published, lies behind the “replication crisis”.

Worse, they lie behind the vast mountains of misleading publications which fill our journals.

I have been made acutely aware of these problems as a result of my work with the Raven Progressive Matrices (RPM). I encountered thousands of DRIP (Data Rich, Information Poor) and DPIP (Data Poor Information Poor) studies based on tiny and unrepresentative “samples” accompanied by the gross misuse of elementary statistics, never mind wildly inappropriate applications of multiple regression, factor analysis, and “sophisticated” Item Response Theory (IRT) programs.

Because the RPM has directly affected the lives of billions of people worldwide, these misleading studies have had a huge social impact.

The “Big Five”

It has not been my interest to study these things in relation to the Big Five. But I did stumble across some indications of the importance of doing so some 60 years ago. At that time, I was studying people’s housing preferences and had the idea that these might be related to their personality as assessed by the “16 Personality Factor” (16PF) questionnaire. So I found myself trying to administer the 16PF to a dustman. There were questions like “Would you rather go to a lively party or work on a boring assignment?” Not surprisingly, the dustman (and others) responded with blank incomprehension.

I concluded that either Cattell had not administered his test to a cross section of the population or his interviewers had, as is standard practice if asked what a question means, been told to say that they did not know but the respondent should answer as they thought best. (In point of fact, I have encountered exactly the same response when I have asked what questions I have been asked in recent surveys actually mean.)

Puzzled by this, I went to see Peter Saville who was then a young researcher working on the 16PF at the NFER. “Ah”, said Peter, “we have recently administered the test to a sample of the general population, and the only group for which we get a meaningful factor structure – any structure at all, never mind Cattell’s 16 factors – is among educated urban males”.

That confirmed my suspicions and, over years, my grounds for suspicion have been reinforced.

In the course of our work with the RPM we acquired something of a reputation for knowing something about psychological measurement – including factor analysis. Accordingly, several researchers wrote to us saying that they had been working with the 16PF but had not obtained the 16-factor structure. When they had written to Cattell about this, he had responded “send the data to me”. When they did

this, back came the 16-factor structure.

The trick was, of course, performed by inserting “marker variables”.

Back to Möttus

So much for my suspicions about the factor structure of the Big Five and related questionnaires.

But now to go back to Möttus.

After listening to the main presentation, those who attended the small seminar I mentioned set about seeking possible explanations for the unexpected results.

These included...

The fact that factor analysis of sets of Likert-type items always yields what are, in effect, arbitrary metrics. (American Psychological Association, 2006, Pierce, 2019) [1, 18].

[The measures are “arbitrary”, first, in the sense that the same score can be achieved in many different ways – i.e. a given score can, in reality, mean very different things. (In this sense they differ from measures which conform to the requirements of Item Response Theory). And, second, in the sense that the number and location of the vectors extracted as a basis on which to reproduce the large covariance matrix derived from correlating every item with every other item from a smaller number of “underlying” variables is also largely at the discretion of the investigator.] (See Raven & Fugard (2008/2020) [28] and Pierce (2019) [18] for an expansion of this remark).

But, having ambled around these issues, the discussion veered off, first, into a discussion of the possibility of finding genome specifications for the hundred or so “facets” (or item responses) that might be envisaged.

And then into the possibility of capitalizing on the fact that people seem to have a predisposition to select themselves into environments which enhance their genetic predispositions.

And then the possibility of finding additional items having high predictive validity by extending the coverage of the item bank.

Veering away

At this point I started to say that there existed a perhaps a more parsimonious/elegant framework for handling the observations, problems, and possibilities that had been mentioned... as well as highlighting the areas in which it might be fruitful to pursue developments ... and offered a two minute outline. It is the purpose of this paper to expand that outline.

But the next development was even more unanticipated and exciting.

After the seminar, I contacted a mutual colleague and asked her what she thought of Rene’s work.

This produced a remarkable collection of articles, all of which are cited in the references section below [3,4,9,10].

Given the importance of this material, it is tempting to go on a long digression ... which needs to be avoided if we are going to complete this paper in a reasonable space.

But there are a number of issues which simply must be highlighted.

One has to do with the limited coverage of the items which comprise the “Big Five” factors and the arbitrary nature of the factor structure which has been imposed upon them.

The second has to do with the way in which people seem to select themselves into environments which enhance their genetically-determined dispositions and the possibility of creating environments which enhance that effect.

The first set of issues is exemplified in a remarkable paper by Tom Bouchard (2016) [4].

Bouchard hugely expanded the nature and type of the item pool from which the Big Five had emerged by including items derived from numerous other tests – such as the Strong Vocational Interest Blank and the Allport-Vernon-Lindzey Study of Values.

Factor analysis of the resulting matrix yielded 12 factors, which could be collapsed to 4.

Both frameworks are substantially different from those conventionally extracted by those who favour the Big Five.

The 12 were: Realistic, Helping, Analytical, Aggressive, Pathology, Affiliative, Sensation-seeking, Traditional, Self-reliant, Cultured, Persuasive, Entrepreneurial, Dangerous, Authoritarian, Powerful, and Down-to-Earth.

Pressed to reduce the number of basic factors still further, these collapsed to four: Dangerousness, Authoritarianism, Powerful, and Down to Earth.

The nature of the difference in the descriptors from those typically applied to the “Big 5” is striking, but it is not something we need to go into here.

The overlap with the Big Five and their sources are shown in the Table 2.

Clearly, here we have a much wider pool of items, with many of a very different nature, to those that Möttus and his colleagues have so far tapped in their quest for individual items having high predictive validity.

But – and even more important from my point of view – among the collection of papers were some associated with a paper published by Hayes in 1962, and entitled *Genes, Drives, and Intellect*. [9]

Hayes’ paper was supported by others by Bouchard and his colleagues (1996, 2016) [3, 4] in papers entitled *Genes, Drives, Environment, and Experience: EPD Theory Revised and Experience Producing Drive Theory: Personality “Writ Large”* and by Johnson in a paper entitled *Extending and testing Tom Bouchard’s Experience Producing Drive Theory* (2010) [10].

In his conclusions to his long paper Hayes writes:

“Innate intellectual potential (appears to consist) of (motivational dispositions) to engage in activities conducive to learning, rather than inherited intellectual capacities, as such. These tendencies (may be) referred to as experience-producing drives (EPDs)” (p. 337).

He continues:

“The following conclusions appear to be warranted:

(1) Although it has been customary to assume that activity preferences are determined by experience, there is ample evidence to show that such preferences may be genetically controlled.

(2) Genetically controlled tendencies to engage in specific kinds of activity lead to the acquisition of corresponding skills and information.”

In saying these things he appears to have anticipated the process, later noted by Scarr (1983, 1996) [31, 32], whereby people with particular motivational dispositions select themselves into environments which cyclically enhance those dispositions.

It is worth expanding on this observation in a footnote. Until Rich Harris published her book *No Two Alike* in 2006 [8], few suggested that the widely observed relationship between parental behaviour and children’s characteristics might be explained by the children having caused their parent’s behaviour rather than the reverse. Scarr was one of the few to suggest that children interacted with the wider environment of peers, schools, and community in a cyclical and recursive fashion: Children (and parents) selected themselves into, and created, environments which amplified their pre-existing (genetically-determined) predispositions. It was not that the environments had no effect but that those aspects of the environment that have an effect have somehow been “chosen” by the children themselves! [Unfortunately, this suggestion largely fell on deaf ears until Plomin (2018) [22] embraced it.]

I find the phrase Experience Producing Drives confusing and prefer to settle for saying that people with particular motivational dispositions tend to select themselves into environments which cyclically enhance the capacity to enact those dispositions. (I might, however, settle for the term *Experience Enhancing Drives*.)

These papers were of particular interest to me because of the work we had done on the nature of developmental environments in homes, schools, and workplaces. (See Raven 2014 [27] for a summary.)

Table 2. Comparison of the twelve factors with a select number of descriptive/explanatory theories/schemes dealing with interests, values, attitudes and personality

Schemes	Realistic	Helping	Analytical	Aggressive	General Psychopathology	Affiliative	Sensation-seeking	Traditional	Self-reliant	Cultured	Persuasive	Entrepreneurial
Twelve Factors												
Campbell Interest Orientations	Producing	Helping	Analyzing				Adventuring			Creating	Influencing	Organizing
Spranger Values (Allport-Vernon_Lindzey)		Social (Love of people)	Theoretical (truth, systematic, reasoning)					Religious (understanding of cosmos)		Aesthetic (beauty and artistic harmony)	Political (power)	Economic (accumulation of wealth)
Schwartz Values		Benevolence/Universalism				Security (family security)	Simulation / Hedonism	Tradition/Conformity	Achievement	Self-direction	Power	
Social Attitudes (Saucier)								Traditionalism		Liberalism		Materialism
Big Five				Agreeableness	Neuroticism					Openness	Extraversion	
Big Nine				Agreeableness	Adjustment	Affiliation		Dependability/Locus of Control	Rugged Individualism Achievement	Intellectance	Potency	
Tallegen MPQ scales				Aggression/Control	Stress Reaction +	Social Closeness	Harm Avoidance	Traditionalism	Achievement/ Alienation	Absorption	Social Potency	

Developmental Environments

Expressed in terms that were not available to us at the time, many parents, some managers, and a few teachers created environments in which people could pursue their idiosyncratic motivational dispositions and, in the process, hone the components of competence needed to pursue them effectively.

Parents

We were alerted to look for this process among parents by one of the Educational Home Visitors involved in an educational home visiting programme we had been asked to evaluate (Raven, 1980) [24].

The programme involved trained teachers, who were also parents, visiting the homes of 2-3 year old children in order to interact with the children in the mothers' presence.

The aim was to model mothering process that were likely to enhance the children's cognitive development.

In the course of the evaluation, we had regular meetings with the Home Visitors. At one point we had given them transcripts of some of their visits. One of them came to the next meeting in a clearly distressed state. Asked "Why"? she said that, while she was supposed to be modelling parenting behaviour, "there I was being a teacher and not doing all sorts of things I would have done as a mother".

Further discussion revealed that, among other things, she felt that there she was asking closed questions instead of following the child's interests. She could not behave "naturally" because she did not know the child, what his or her interests were, or the meaning of gestures. Besides, she was supposed to "make something happen" in a very short period of time.

Further investigation revealed that some parents made a particular point of studying their child's interest ... what engaged them, what turned them on ... and then creating situations in which their children could pursue those interests (even if they themselves, as parents, were not particularly attracted by those interests) and, in the process develop qualities like persistence and the willingness to overcome obstacles, the tendency to reflect on the nature of barriers and find information (eg by talking to others), and experience the delights which occur after overcoming frustration.

They also sought to model such activities in their own behaviour.

Not all parents did this, of course, and some parents would actively discourage children from doing things they disapproved of and try to force them to do other things.

Teachers

Further evidence of the need for an individualised developmental framework came from an evaluation of environmentally based project work in primary schools. (Raven *et. Al.*, 1985) [29].

The following account relates to a mixed-age, mixed-ability, class of 8 to 11 year old children.

At the time we studied them, the pupils' project involved trying to do something about the pollution in the local river.

Some pupils decided that the first thing to do was to measure the pollution in the river. They set about collecting samples of the river water and trying to analyse it. Of

course their teacher did not know how to do it. They could not find the information they needed in the books they had available. Encouraged by their teacher, this quest took them

to the not-so-local university where they worked with lecturers trying to engage with this –apparently difficult –problem. They sought to write up what they had learned in something approaching a standard scientific format.

Note that these pupils were developing the competencies of the scientist: the ability to identify problems, the ability to invent ways of investigating them, the ability to obtain help, the ability to familiarise themselves with a new field, and the ability to find ways of summarising information.

This contrasts sharply with the ability to recite out of date information from textbooks and is, indeed, a competence that would be valuable to most adults rather than specialised scientists ... perhaps showing up as "critical thinking".

Nevertheless, other pupils declared loudly that this was a waste of time; no one would take any notice of the report.

Some pupils decided that more progress was to be made by studying the dead fish and plants along the river bank.

Still others argued that all this was beside the point: The river was clearly polluted: the problem was to get something done about it. Some then set about drawing pictures of dead fish and plants from the river bank and displaying them in places like the school hall with a view to releasing community action. The objective was not to depict what was seen accurately, but to represent it in such a way as to evoke emotions that would lead to action.

Note the implications for "Language"/writing ability and "the ability to communicate".

While the "scientists" mentioned above sought to report the results of their work in what might be termed a classic academic format, other pupils again argued that that was irrelevant and set about generating slogans, prose, and poetry that would evoke emotions that would lead to outrage and action.

In both cases, however, the criteria for what constituted effective reading and writing differed markedly from those which dominate most classrooms and they varied from pupil to pupil.

Still other pupils argued that, if anything was to be done about the river, it was necessary to get the environmental standards officer to do his job. (It turned out that he knew all about the pollution but had done nothing about it.) This led some pupils to set up domino-like chains to influence politicians and public servants.

This in turn led the factory that was causing the problem to get at the pupils' parents saying that, unless this teacher and her class was stopped, they would all lose their jobs. So then the class had another social problem to deal with!

Unabashed, some pupils set about examining the economic basis for the factory's claims, viz the claimed economic consequences of various options with debatable costs.

Note that this teacher was not so much concerned with enhancing pupils' specialist knowledge in each of these areas as to nurture a wide range of different competencies in her pupils.

These competencies were not limited to substantive areas of investigation but also included the ability to contribute to group processes, including such things as: the ability to put people at ease, the ability to de-fuse the intolerance which develops between people who contribute in very different ways to a group process (e.g., the intolerance of "artists" for

“scientists”), the ability to publicise the observations of the quiet “ideas person”, and the ability to “sell” the benefits of the unusual educational process to parents.

The teacher in fact devoted considerable attention to highlighting the different types of contribution which different children were making to the group process.

As a result, they stopped thinking of each other in terms of “smart vs. dumb” and instead noted what each was good at.

Note the “measurement” model implied here.

The words I have used imply, as a background, some kind of descriptive framework of the kind used in biology.

Pupils are not being rated on “scales”. More specifically, the pupils are not being graded on a scale running from “high” to “low” “ability”. All pupils are good at something; the question is: “What?”

So here we have the development of a wide variety of high-level competencies the “existence” of each of which depends on tapping each individual’s motives and creating situations in which they are able to develop and display their idiosyncratic talents and patterns of competence.

But that is not all.

Without the context of others engaged in related tasks they could not have developed these competencies.

Indeed many of those talents could only exist in those contexts.

Outwith that context those concerned could not even be said to possess them: They were *emergent* competencies.

Not only that, the class as a whole displayed an emergent property which might be described as “collective intelligence” or “a climate of enterprise”.

And it was this, and not the “outstanding” properties of any individual that brought about the desired change.

Note that this emergent competence of the group, qua group, did not exist in anyone’s head. Indeed it did not “exist” anywhere. It was a systems property.

Yet it was a real emergent property just as the properties of copper sulphate are distinct from the properties of copper, sulphur, and oxygen.

Nevertheless, it was produced by, and reciprocally affected, the emergent individual competencies of the pupils in the group.

But now let us look at what the teacher is doing: i.e. let us look at the nature of her competence as a facilitator of growth.

Just as the educational process for pupils largely took place in the environment outside the school so, too, did the work of the teacher.

Among other things, she spent a great deal of time with the parents of the children in order to legitimise the educational process she was implementing. She spent time with school administrators and the heads of secondary schools undermining their faith in traditional tests as meaningful measures of such things as reading and mathematical ability ... and assuring them that the futures of these children in their schools and the schools themselves (via “performance-based” assessments) were not being jeopardised as a result of the activities in which they were engaged.

These components of competence deployed by these teachers as managers of pupil development can be captured in the figure below, which was developed by Lees (1996) [13] as a basis for discussing managerial competence in other organisations.

What it shows is that effective teachers, and, as I shall show in a moment, managers more generally, have first to develop a very different, if largely unverballed, image of the varieties of human talent and their development from the conventional human resource management view sketched in the central box.

They have to think about the individual motives and talents of each of their pupils or subordinates and create situations in which those pupils or subordinates can work together to develop those talents on an individual and collective basis. They have to abandon conventional notions of

selection and reward. They have to think about the emergent properties of groups.

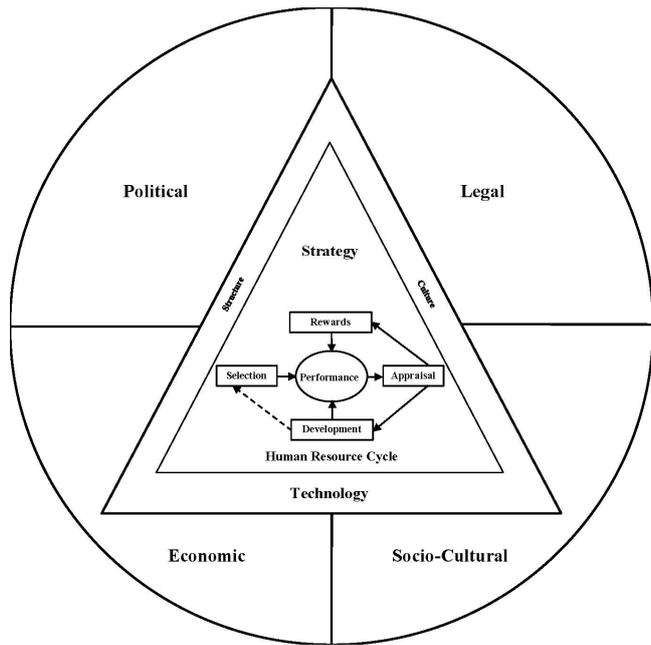


Fig.1 - Components of competence deployed by these teachers as managers of pupil development (Lees, 1996) [13].

These things cannot be done for them by anyone else (such as HR specialists).

It is an integral component of their job.

Workplaces

What about competence in the workplace more generally?

My first study grew out of a series of surveys of pupils’, parents’, teachers’, and employers’ perceptions of the objectives of education. (Raven, 1994) [26]).

These had shown that their top priorities included the development of such qualities as self-confidence, initiative, problem solving ability, and the ability to work with others.

So the next question was: “Are such qualities actually of value, particularly in the workplace?”

I set out to check this by going round the country interviewing a very wide range of people ranging from small farmers and blacksmiths through hotel owners and CEOs of trans-national companies to heads of government Departments.

I would begin by asking them to “Tell me something about your job and your life” and following up with further questions especially when they got excited about some problem they had.

The results not only confirmed the pupils’, parents’, teachers’, employers’ opinions but yielded important insights into the nature of competence.

This personal study was followed by a review of some more systematic studies of competence in the workplace that had been carried out by the staff of the consulting firm (McBer) that David McClelland had set up to try to apply the results of his research.

By the time I reviewed them in 1982 (Raven, 1984) [25] there were about 80 of these.

And 300 or so by the time Lyle Spencer produced *Competence at Work* in 1993 [34]. And more by the time we published *Competence in the Learning Society* [30].

These studies relied on *Critical Incident Methodology* (Flanagan, 1954; McClelland, 1978) [5, 15].

In critical incident methodology one first asks people to think of real occasions in which they have seen people – managers, machine operatives, mothers – doing something they consider particularly effective.

On then asks them to describe what those people did, how others reacted, how did they respond to those reactions, etc.

One then transcribes these accounts to index cards, and then sorts the cards into piles such that those in one pile have something in common with others in the same pile but differ from those in other piles.

And then one seeks to identify what is common to the incidents in each pile.

Note that this is very different from relying on some external criterion like making a profit or conforming to a rule as the criterion of competence.

One then repeats the operation in relation to ineffective behaviours.

Here is the list of types of behaviour cited as examples of effective behaviour in a study of managers (actually Naval officers) conducted by Klemp, Munger and Spencer in 1977 [12].

- Initiative: Initiates new activities, communications, proposals; Exhibits resourcefulness, persistence in the face of obstacles.

- Set goals and reconsiders and redefines them.
- Coaches, by setting example and sharing information and thought processes.

- Influences by persuasion, mustering arguments, building political coalitions, making others feel strong.

- Conceptualises, analyses, and finds new ways of thinking about things.

- Builds teams, acts to promote co-operation and team work.

- Provides feedback to enable others to monitor their own performance. Helps them analyse problems and develop strategies for tackling them.

- Provides rewards and official recognition for contributions.

- Controls impulses, especially annoyance. Avoids snap decisions based on incomplete evidence.

- Plans and organises, including "domain planning".

- Delegates.

- Optimises: Analyses the capacity of individuals and resources and requirements of job, matches the two and fully utilises the resources available.

- Monitors own behaviour and that of others.

- Resolves conflicts.

- Listens actively and initiates opportunities to give others a chance to talk.

- Accurate empathy: Makes explicit unexpressed thoughts and feelings of others.

- Helps.

- Positive expectations of others' competence.

There are many things in this list of high-level competencies that it would be worth expanding and which I would encourage the reader to ponder upon, but it is worth saying a little more about the behaviours which have been grouped into the category "Coaches, by setting example and sharing information and thought processes."

What emerges from this and related studies is that some managers set about developing the competencies of their subordinates by engaging them in doing *their* jobs and thus sharing the normally private components of competence that make for effective behaviour.

Thus they will take them through sequences of thought and action like "Oh. Oh. We seem to have a problem here. Not sure what it is or what to do about it. Let's try *this*. Oh. Oh. That didn't work. Let's try *this*." Competence depends on what Schon has called "experimental interactions with the environment".

Besides modelling effective behaviour in this way, some managers, realising that some subordinate did not share their own motives and concerns, would try to place him or her with other managers whose motives and concerns they did share and in this way develop appropriate components of competence.

This was related to the category of "building teams". Some managers would think of the specific motives and tal-

ents of different individuals and try to place people who had complementary talents together to create teams with emergent group characteristics.

So much for Klemp, Munger, and Spencer. Here are the results of another study, this time by Flanagan and Burns in 1955, of a very different group of people: machine operatives [6].

The names given to the groups of behaviours which had come to mind as instances of effective behaviour were:

- Dependability
- Accuracy of reporting
- Tendency to respond to the needs of the situation without having to be given instructions
- Ability to get on with others
- Initiative
- Responsibility

And here is another interesting study, this time conducted by Price, Taylor and others between 1950 and 1970 (published 1971 [23]) and focussing on doctors (physicians).

25 different types of excellent doctor were identified.

Some were experts at offering different types of patient care, others had extraordinary ability to work with and through nurses, others made contributions to medical organisations, others generated academic output, and others made contributions to non-medical organisations.

None of these were positively correlated with assessments made when those concerned were students.

Furthermore, patients wanted very different kinds of doctor. Low Socio Economic Status patients particularly wanted their doctors to be decisive and authoritative while High SES wanted attention to emotional and psychosomatic disorders and to discuss treatment.

Summary statement about competence

Drawing together these and other data it emerges that Competence unexpectedly depends on:

- Value-laden motivational dispositions like initiative and the ability to influence.

- Perceptions of society and one's role in it.

- Understandings of terms like:

- Participation
- Wealth Creation
- Management
- Democracy

- Emergent properties of groups that depend on a wide variety of people contributing in very different ways.

At this point I think it is important to highlight something which distinguishes these studies ... ie those conducted in homes, schools, and workplaces ... from most other studies in the area.

Instead of looking for tests that would predict some externally determined criterion such as "academic" performance or profitability we have been seeking to identify what people were good at.

The problem was that there was a lack of an appropriate conceptual framework for thinking about and discussing these things ...

But, actually there was and is...

And it is to this that I will now turn.

But before doing so, I must mention one more reason for moving toward a specific-motive based paradigm rather than scores on a scale: In the evaluation of psychotherapy Kazdin (2006) [11] has shown that people change in all sorts of different directions and even that different aspects of thought and behaviour within the individual change in different directions.

These changes cannot be captured in any group based study deploying off-the-shelf "measures".

Toward an alternative framework

The alternative framework for thinking about individual differences to be discussed here derives from the work of David McClelland and his colleagues.

Unfortunately that work is generally thought to have been discredited because the measures that were developed

do not have the properties that those who are steeped in factor-analysis and Item Response Theory demand.

The work stemmed from Murray's 1938 book *Explorations in Personality* [16].

So the framework and tests that emerged were first envisaged as having to do with "Personality". Then as having to do with "Motivation" and, finally, as the nature of the scoring system that had emerged became more explicit, "Competence".

Actually, the very word "competence" was introduced by McClelland's team to distinguish their work from that conducted by the dominant HR industry – which was concerned with identifying the "knowledge, skills, and attitudes" "required" for "high level" performance at predefined jobs.

Unfortunately the attractive word "competence" has been seized upon by this wider community and corrupted back to refer to the knowledge, skills, and attitudes deemed necessary for high level performance at a predefined job (see e.g. Mulder, 2017 [21]).

Background

The framework and measurement procedures were derived from experimental studies in which attempts were made to influence "motivation" by starving people, provoking sexual arousal, etc. and then looking for the effects in the stories those concerned made up about the thoughts, feelings, and behaviours of people depicted in variants of Thematic Apperception Test (TAT) pictures.

From content analyses of these stories it emerged that when people were e.g. hungry, they saw the characters in the pictures as thinking about how to get food, making plans to get it, persisting, persuading other people to help, and so on.

The same cluster of things emerged when other motives were aroused.

So then McClelland and his colleagues turned this procedure around.

If one could find out what people were spontaneously thinking about, planning to do, persuading others to help them do, persisting at doing, etc. one had an indication of their motivational disposition.

If one then counted the number of these different activities they engaged in in relation to each of their motives one had a motivational profile.

So from a pool of, as I recall, some 300 pictures they selected half a dozen relating to workplace-type situations and asked people to make up stories about what the characters in the pictures were thinking, feeling and doing.

Here are the instructions given to people in connection with the stories they were asked to write:

On the following pages, you are to make up and write out some brief, imaginative stories about each of a series of six pictures. You will have about five minutes for each story. There is one page for each story.

To help you cover all the elements of a story plot in the time allowed, you will find four questions repeated over each story page. They are:

1. What is happening? Who are the people?
2. What has led up to this situation? That is, what has happened in the past?
3. What is being thought? What is wanted? By whom?
4. What will happen? What will be done?

Please remember that the questions are only guides for your thinking and need not be answered specifically in so many words. That is, your story should be continuous and not simply a set of answers to these questions.

There are no right or wrong stories. In fact, any kind of story is quite all right. You have a chance to show how quickly you can imagine and write a story on your own. Don't just describe the pictures, but write a story about them.

Try to make your stories interesting and dramatic. Show that you have an understanding of people and can make up stories about human situations.

Fig. 2 - Instructions given to people in connection with the stories

There are some pictures on Figure 3 (a, b, c, d, e, f) (somewhat obscured to discourage reproduction).



a)



b)



c)



d)

of components of competence down the side.

Affiliation Motivation—The Three Clear Signs

Prime Test: Determine whether one of the characters wants to establish, maintain, or restore a close personal relationship or friendship with another person.

Aff = Affiliation Imagery—There are three ways in which the Affiliation Motive manifests itself most clearly. Thus, in every story, you should look for evidence of:

- a strong feeling of warmth and friendliness;
- a social setting or situation that is warm and friendly; or
- a feeling of concern for the disruption of a relationship that had apparently been warm and friendly.

If one of the three is present in the story, score the story plus one (+1) for Aff. If Aff has been scored, it is possible to score for affiliation subcategories similar to, but not identical to, the subcategories identified with the Achievement Motive.

Power Motivation—The Three Clear Signs

Prime Test: Determine whether any of the characters in a story desires to influence, or control the means to influence others.

PI = Power Imagery—There are three ways in which the Power Motive manifests itself most clearly. Thus, in every story, you should look for evidence of:

- emotions which relate to the gaining or maintaining of influence, or a position of power;
- actions through which a character seeks to consolidate a position of power, or to gain control over another character; or
- an implied, traditional power relationship.

If one of the three is present in the story, score the story plus one (+1) for PI. If PI has been scored, it is possible to score for power subcategories similar to, but not identical to, the subcategories identified with the Achievement and Affiliation Motives.

Fig.6 - Procedure of identifying of the affiliation and power motives

A variety of types of behaviour which people may be said to value or be strongly motivated to undertake have been listed across the top of the grid.

For presentational reasons and to link the framework developed by McClelland and his colleagues these behaviours have been grouped under the headings of Achievement, Affiliation, and Power.

Down the side are listed a number of components of competence which, if engaged, are likely to result in any particular activity being successful ... but these components of competence cannot be identified or even said to exist in an individual unless some motive has been engaged. These components of competence include cognitive activities such as making plans and thinking about obstacles to goal achievement, affective activities such as enjoying the activity or longing to complete that a necessary but distasteful task, and conative activities such as exercising willpower, being determined, and persisting [27, 28].

This version of the Grid is by no means complete and intended for heuristic purposes only.

One way in which it is incomplete is that it lists only a few of the motivational predispositions observable in the population [27, 28].

For the sake of argument, one might say that there are perhaps a couple of hundred idiosyncratic concerns or motives. If this sounds like a lot, consider how many species of animals are encompassed within the biological classification framework [27, 28].

An inclination to undertake any one of these activities does *not* imply an indication to pursue any other activity which may on the face of it seem similar and for this reason may have been placed next to it in the list on the top of the grid. In other words, these motivational predispositions are not groupable by applying factor analysis – although it may eventually turn out that they can be grouped in the cyclical manner of the periodic table of elements [27, 28].

Our present impression is that there are many fewer cumulative and substitutable components of competence than there are potential motivational predispositions... just as the number of organs from which thousands of animals are constructed are fewer than the number of species [27, 28].

Table 3. Model of Competence as extended list of activities which people might be strongly motivated to undertake (across the top) and the list of components of competence (down the side).

	Examples of Potentially Valued Styles of Behaviour										
	Achievement			Affiliation				Power			
	Doing things	Inventing	Doing things	Developing	Providing	Establishing	Ensuring that a	Establishing	Ensuring that	Articulating	Setting up
Cognitive											
Thinking (by opening one's mind to experience, dreaming, and using other sub-conscious processes) about what is to be achieved and how it is to be achieved.											
Anticipating obstacles to achievement and taking steps to avoid them.											
Analysing the effects of one's actions to discover what they have to tell one about the nature of the situation one is dealing with.											
Making one's value conflicts explicit and trying to resolve them.											
Consequence anticipated: <i>Personal:</i> e.g. "I know there will be difficulties, but I know from my previous experience that I can find ways round them."											
<i>Personal normative beliefs:</i> e.g. "I would have to be more devious and manipulative than I would like to be to do that."											
<i>Social normative beliefs:</i> e.g. "My friends would approve if I did that": "It would not be appropriate for someone in my position to do that."											
Affective											
Turning one's emotions into the task:											
Admitting and harnessing feelings of delight and frustration:											
using the unpleasantness of tasks one needs to complete as an incentive to get on with them rather than as an excuse to avoid them.											
Anticipating the delights of success and the misery of failure.											
Using one's feelings to initiate action, monitor its effects, and change one's behaviour.											
Conative											
Putting in extra effort to reduce the likelihood of failure.											
Persisting over a long period, alternatively striving and relaxing.											
Habits and experience											
Confidence, based on experience, that one can adventure into the unknown and overcome difficulties, (This involves knowledge that one will be able to do it plus a stockpile of relevant habits).											
A range of appropriate routineised, 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.											

Another, and perhaps more important, limitation of the grid is that omits any reference to the importance of people's perceptions of organisations, societies, how they work and their role in them.

For example, as we have seen, more effective machine operatives are distinguished from their less effective peers in that they trouble themselves to find out how their organisations work and take it upon themselves to intervene in them when things go wrong.

Others believe that it would not be appropriate for someone in their position to do this. Again, an understanding of how an organisation works may be used to advance oneself in one's career, to sabotage the organisation, or to secure resources for a scientific project.

Again the competence to build up such an understanding may appear as a component of competence or as a much broader motive or preoccupation to which other components are harnessed [27, 28].

In a sense, we used this framework, as it emerged, to guide the open-ended enquiries summarized earlier. It was a circular process. In the process we noticed that the generic titles across the top really do not work. For example, people who focus on one type of achievement are not necessarily attracted by other types of what might be termed achievement activity.

And we noted things about the kinds of environment which facilitate people's use of the environment to hone the components of competence they need to pursue them.

But, in concluding this section, I would like to draw attention to the fact that all the motivational dispositions listed across the top end in "ing".

Future work

The problem now is first to refine this list of possible motivational dispositions. Factor analysis is not going to help us because the dispositions are idiosyncratic.

What we need is something like Linnaeus's framework for classifying species or the periodic table used to arrange chemical elements in a meaningful way.

And then we need to refine the list of components of competence down the side.

A cautionary tale

To illustrate the difficulty of moving forward it is useful to report what happened when Lyle Spencer set out to publish a book which would review and interpret the available studies of competence within the kind of framework described here ... which, at the time, we called an "atomic theory of competence". The publisher said "If you do that no one will buy it; so we won't publish it! Lyle retracted and wrote his book in something approaching a conventional framework. (It remains the best-selling book on *Competence at Work* [34])

I had a similar experience when I responded to a request to write a chapter on *Our Incompetent Society* for Mulder's (2017) [21] book.

Despite the fact that the book runs to 600 pages of articles couched in the conventional model, no room could be found for my chapter! (The contrast between the contents of Mulder's and the Spencer's books could not be more dramatic.)

Perhaps Rene and his colleagues – or one or more of the readers – will take up the challenge.

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The author is deeply grateful to Steve Hughes and Oleg Yarygin for their support in preparation and assistance in preparing this article

Статья поступила в редакцию 10.09.2020

Статья принята к публикации 27.11.2020