# *The Colour of Conceptual Learning*

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**EDGAR STONES,** ***Liverpool University***

## INTRODUCTION

In this paper I should like to discuss some aspects of psychology and education that have interested me for a number of years but which have recently attracted particular attention through the work of Jensen. I refer to questions concerned with children's learning and the problem of improving this learning in school. This pedagogical orientation is, of course, different from Jensen's main preoccupation which seems to be with ethnic differences in learning ability or intelligence. However, he has suggested pedagogical procedures on the basis of his work and it is this aspect of his work that I wish to focus on.

Jensen has argued that there are two different types of learning ability which he calls level I and level II, These correspond roughly to rote and conceptual learning. While level I is distributed similarly in different populations, level II is distributed differently. Children with white faces seem, according to Jensen, to have the monopoly of level II ability. Jensen argues that these abilities are distributed in this way according to genetic laws and that inherited factors are the most important in determining an individual's learning ability. Various critics have taken up Jensen's arguments with varying degrees of acerbity and have dealt with such things as the theoretical foundations of his arguments about heritability, the validity of the statistical underpinning to his thesis and his conceptualising of the nature of intelligence. One commentator has also drawn attention to Jensen's frequent misquoting of evidence to back up his thesis. (Deutsch 1973).

It is not my wish, to join in the debate about nature versus nurture or about the statistical validity of Jensen's argument, but I would like to consider what seems to me to be quite fundamental to the whole issue, that is the nature of the abilities under question and the means adopted to assess them. I am not referring to the question of intelligence testing, but to children's learning abilities

During the past ten to fifteen years the study of school learning has increasingly attracted the attention of academic psychologists and there has been a corresponding de-emphasis on studies in the field of intelligence testing. It is, therefore, somewhat surprising that it was necessary for Deutsch to remind us that the view of intelligence adopted by Jensen (the one proposed by Spearman in 1923) is only one among many theories none of which

have been 'proven'; not to mention the fact that intelligence tests measure essentially what children have learned, not how well they might learn something new. It is the latter point that I wish to address myself to because it seems to me that Jensen misconceives the nature of the learning he claims to be investigating and the nature of instruments that might assess that learning. I think that the instruments he uses do not operate in the way he argues and wish to examine his rationale for using them and to adduce some experimental evidence that bears on the issue.

**ASSESSING ABILITY**

Studies of cognitive processes in different ethnic groups have, in the main, focussed on performance on standardised tests or specially constructed test material designed to test existing competence in a variety of fields. Various attempts have been made to devise 'culture fair' tests to allow of meaningful comparisons among different cultural groups. (Anastasi 1965, Lesser et al 1967). There has been some disagreement about the validity of the concept of 'culture fairness' and it has been asserted that it is virtually impossible to devise a truly culture fair test. (Wesman l968). However, Jensen (1973b) has argued at length that it is possible to look upon some nonverbal tests of intelligence as being what he refers to as 'status free'. From among these tests he singles out the Raven's matrices test as the most appropriate measure.

Among the reasons he gives for supporting the Raven's test is that there have been no studies that demonstrate gains in relatively noncultural or nonverbal tests like Cattell's Culture Fair Tests or Raven's Matrices. This is not strictly true, although I suppose we can forgive Jensen for not being acquainted with the findings of an unpublished master's thesis in an obscure European university. In fact a study carried out by Renhard (Renhard 1971) under my direction not only addresses itself to this question but also exemplifies the general approach adopted in the empirical studies reported in this paper and, I believe, develops a more appropriate approach to school learning than does that of Jensen.

Our point of departure in this study was to examine the extent to which performance in the Raven's test could be improved by teaching. It is important to stress that we were interested in <u>teaching</u> not coaching on the test itself. We adopted a self instructional programmed learning approach and set as our criterion of success the ability to achieve a higher score on the matrices after teaching than at the beginning. However, the instruction given to the children at no time made use of the actual Raven's material. Instead a teaching programme was devised that made use of a variety of materials as specific exemplars of the principles behind the matrices. Some of these materials were pictorial, some were abstract and some were in the form of numbers. At no time was there any attempt to drill. The examples were programmed with the intention of providing a sufficient variety of exemplars and non exemplars for the children to acquire the necessary concepts. In other words, the teaching was much in line with the approach that one would adopt in helping children to learn new concepts or principles in school teaching. The criterion test was the Raven's matrices test. After using the self instructional programme for approximately 2½ hours children in the first year of

secondary education in an industrial town made significant gains on the matrices test as compared with a control group that did not work through the programme.

Apart from the evidence of gains following the use of the programme, there is an important point in the way the Raven's test was used. In this experiment it was used as a test of learning related to specific teaching or learning activities. In other words we were not attempting to sample a hypothesised ability but to see to what extent the mental skills involved in coping with the problem were influenceable by teaching.

Jensen, (1968, p. 1331) himself, would seem to be in favour of this approach since he argues that 'since standard intelligence tests contain items intended to assess how much the individual has learned in his natural environment, a more direct and relatively culture-free index of intelligence might be the rate or amount of learning in a novel laboratory task". He has, in a variety of studies, adopted this approach to the assessment of what he terms level I abilities, i.e. what might be generally referred to as rote learning tasks, and he has presented children with such tasks as paired associate learning and digit span. However, when he has turned to his so called 'level II abilities he has not used a comparable complex-learning task to assess the ability to cope with conceptual learning. Instead he has made considerable use of the Raven's matrices test, not in the way that Renhard used it, as a test of learning related to a specific learning task, but as a general indicator of the ability to cope with higher mental processes that depend upon elaborations and transformations of informational input, and upon comparisons of the informational input with previously stored information". After extensive test programmes he found that the children of low SES status from different ethnic backgrounds obtained similar scores to high SES white children on rote learning tasks such as paired associate learning and digit span. However, low SES children made lower scores on standard intelligence tests. He found low correlations between intelligence scores derived from the Raven's Progressive Matrices, and rote learning scores in low SES populations but substantial correlations among the measures in high SES populations. In attempting to account for these differences he advanced three hypotheses.

a) There are two genotypically independent cognitive processes: one (level I) appropriate to rote learning and one (level II) appropriate to the solution of Matrix problems which involve abstraction, generalisation and symbolisation.

b) Level II processes are functionally dependent upon level I. That is the growth rate and asymptote of a child's performance on level II depends on his status on level 1.

c) Level 1 ability is distributed approximately the same in all socio economic classes. Level II ability is distributed about a higher mean in the higher socio economic classes.

Although Jensen points out that in the experiments which led to these hypotheses, race was confounded with SES, he argues later that 'Because short term achievement measures reflect factors other than intelligence, Negroes and whites differ slightly less on such measures than they differ on intelligence tests. . . . The problem of Negro-white

inequality in educability is thus essentially the problem of Negro-white differences in intelligence'. (Jensen 1973a p. 355).

I think that Jensen's confounding of SES and ethnic group is very much open to question. Ghuman, in a very thorough investigation of the ability of children in different ethnic groups found that the cultural and socioeconomic background of the children was the crucial factor in achievement at different levels of learning. Children of the same ethnic group in their native country performed differently from their counterparts in England and those in England performed similarly to their English peers. (Ghuman 1974)

However, Jensen does not hesitate to argue that his analyses have important educational implications. Traditionally (he avers) schools have been organised to employ teaching methods based on conceptual learning (his type II ability) and therefore have disadvantaged low SES and particularly negro children who learn better by type 1 associative methods. Schools should therefore, address themselves to developing methods of teaching which capitalise on the rote learning abilities of these children and '... provide thereby a means of improving the educational attainments of many of the children now called culturally disadvantaged'. (Jensen 1968 p.1337).

I believe there are several issues here that are open to question. I wonder, for example, how his assertion that schools employ teaching methods based on conceptual learning, would stand up to scrutiny. No doubt some do but I suggest it is a bold stance to assert that this is the method, as he seems to do. Although I believe this question is very important and one which would well repay investigation, it is not the main focus of my discussion. My concern is to question the basis upon which his recommendations are founded.

The aspect of Jensen's work that I want to examine is his use of rote learning tasks to assess his hypothesised type I ability and conceptual tests to assess his type II ability. As I suggested earlier when referring to Renhard's work, Jensen measures rote learning direct but conceptual learning by inference. The former samples competence in new learning, i.e. learning new stimulus combinations, the latter samples existing competence related to the solution of the matrices problems when the only learning allowed for is in the trial items. I would argue that this is a weakness in his approach that needs careful scrutiny and believe that a more appropriate method of investigating ability in any supposed different types of learning, would be to set up different types of learning tasks and compare performance on these. Jensen's approach to assessing rote learning seems satisfactory but it seemed to me essential to employ some kind of concept learning task followed by a concept learning test in order to sample performance in a conceptual learning task rather than existing competence in an intelligence test.

A very similar point made by Deutsch (1973) bears on the question of the approach to the investigation. This is that Jensen's approach has been entirely psychometric: to the extent that the problem is worthy of investigation other approaches should be adopted. I should like now to describe some work I have carried out with the help of teacher colleagues that attempted to provide two kinds of learning task in experimental situations and which I

hoped would make possible a more meaningful appraisal of the supposed differences in learning abilities with particular reference to different ethnic groups.

## THE EXPERIMENTAL STUDIES

The aim was to investigate experimentally the actual learning of different groups of children in tasks involving rote learning and conceptual learning. The test of rote learning was of the same genre as paired associates and has thus comparable with some of Jensen's instruments. On the other hand the conceptual learning task was a genuine test of learning and was quite different from Jensen's use of the Raven's matrices. The learning task used the Vigotsky concept learning apparatus and transfer test equipment that I had designed specially for use in earlier investigations into the processes of learning fairly complex concepts by primary school children. (Stones and Heslop 1968, Stones 1970).

The conceptual learning apparatus was originally used by Vigotsky as a method of investigating the role of language in concept learning. (Vigotsky 1962) He was interested in the actual processes of concept learning. Subsequent users of the apparatus have employed it as a test of intelligence. (Semeonoff and Laird 1952, Hanfmann & Kassinin 1937). None of these made use of transfer tests nor is there any record of such tests being used by other workers. Vigotsky examined the way subjects manipulated the experimental material in an attempt to investigate the underlying cognitive processes, and testers have used the material as a classificatory sorting test of existing cognitive competence using as indices of success such things as number of unsuccessful groupings before solution and time taken to complete the sorting. In my use of the apparatus I have used the Vigotsky sorting task as a learning task and the transfer test equipment as material for investigating whether or not the children had actually acquired the concepts underlying ability to succeed in the Vigotsky task. Thus the novel feature of these studies and those reported here is that the grouping of the blocks is not scored but treated as a learning experience in the course of which the subject learns new concepts. The test of the learning is success in classifying novel material according to the same criteria. In assessing rote learning, this form of transfer test is not appropriate since the arbitrary nature of the connexions made precludes transfer, whereas in conceptual learning the acid test of success is the ability to transfer.

## THE APPROACH

In order to examine children's learning two learning tasks were devised. One of these was a rote learning task with a specified level of competence as the criterion of success. The other was the conceptual learning task with a transfer test of competence. The Raven's nonverbal test of intelligence was also used.

## Apparatus

The apparatus used for the rote learning task consisted of five cards each with a simple geometrical shape on the one side and a digit on the reverse. The shapes comprised circle, rectangle, triangle, semi-circle, and elongated rectangle with one rounded end. The digits on the reverse were arbitrarily determined as 8, 6, 3, 4 and 7.

The apparatus used for the concept learning task was the standard Vigot sky blocks. These comprise twenty-two small wooden blocks of five different colours, six different cross sections, two different heights or thicknesses, and two different cross sectional areas. Under each block is written one of four nonsense words: LAG, BIK, MUR, and CEV. The problem is to classify the blocks in four groups so that all the blocks in any one group have common properties which unequivocally mark them off as members of that group and as non-members of any other group. The criterial attributes for 'correct' grouping are cross-sectional area and height. The nonsense syllables relate to the criterial attributes, and may, in fact, be considered as 'names' of the concepts exemplified by the blocks. Thus, the LAG blocks are tall and fat, the BIK blocks are small and fat, the CEV blocks are small and thin, and the MUR blocks are tall and thin. There is no other consistent way of making four groups of the blocks.

In the experiment the blocks are spread at random on a table, nonsense words down. The learning task is to arrange the blocks in the four groups. The child is shown an example by the experimenter's turning over one of the blocks and showing the nonsense word. The child is asked to arrange the blocks in the four groups and is told that he is free to move blocks from one group to another or back to the pool of unsorted blocks whenever he wishes. He is not allowed to turn over any of the blocks. Whenever the child completes a sorting incorrectly, the experimenter turns over one incorrect block grouped with the original specimen and shows that it is different from the specimen and encourages the child to try again. With each wrong sorting the number of upturned blocks increases and provides additional clues to the child. Thus as the number of upturned blocks increases the child is able to obtain a basis for discovering to which characteristics of the blocks the nonsense words refer. When the child makes this discovery he is able to complete the task with facility.

The apparatus used to test the children's learning of the concepts involved in successful sorting of the Vigotsky material, comprised seventeen small objects which could be classified according to the same criteria as the Vigotsky blocks. The objects were sufficiently dissimilar in size, shape and colour from the blocks to preclude transfer by primary stimulus generalisation. They comprised the following objects which were of a variety of colours, shapes and materials.

Group 1 LAG (tall and fat): cardboard box, irregular plaster block, toy building brick, plastic mug.

Group 2 MUR (tall and thin): candle, cardboard cylinder, torch battery, toy giraffe.

Group 3 BIK (small and fat): rubber wash plug, flat square plastic block, flat plastic disc, tablet of soap, matchbox.

Group 4 CEV (small and thin): packet of chewing gum, pencil sharpener, die ring.

The validity of the grouping was checked by trying out the apparatus with adults who knew the Vigotsky material and no disagreement was found with respect to the sorting of the objects in the different categories.

In addition to the two tests of learning, the Raven's test of nonverbal intelligence was used. Two versions were employed, the Coloured Progressive Matrices (Raven 1969) for the younger children, and the Standard Progressive Matrices (Raven 1960) for the older children. The Matrices are held to ' ... provide five opportunities for grasping the method and five progressive assessments of a person's capacity for intellectual activity'. (Raven 1960). It should be noted that this test, unlike the Vigotsky learning task, does not allow for the subject to receive any feed-back as to the correctness of his efforts.

## THE CHILDREN

### Study 1

In this first investigation 30 children of West Indian origin and 30 white children (15 boys and 15 girls in both cases) were given the learning tasks and the Raven test. The sample was drawn with the classroom as the unit of selection in such a way as to include all the children of the ethnic group with fewer members in the class and an equivalent number of the other ethnic group drawn randomly. The children came from two inner ring primary schools in a large industrial city and were aged between ten and eleven years. Almost all the children lived in municipal housing in the vicinity of the school so that although no attempt was made to measure socio economic status, it seems reasonable to assume that the sample was homogeneous with regard to SES.

### Study 2

This investigation was a replication of the first study and adopted exactly the same procedure except that on this occasion the children were aged 13 to 14 and were in second year of a secondary school. Twenty three white children on this occasion were compared with 23 Pakistani children in the same classes and from the same neighbourhood. There were 15 white and 15 Pakistani boys and 8 white and 8 Pakistani girls.

## THE EXPERIMENTAL TASKS (BOTH STUDIES)

### The rote learning task

This task is considered to be rote learning because there is no logical or conceptual relationship between the two stimuli, the geometrical shape and the digit. The connexion between the two is arbitrary as in paired associated learning experiments. The child has to learn the connexion between the shapes and the digits.

The tasks were administered individually in a quiet room. After rapport had been established, the experimenter presented the experiment in the form of a game. He explained to the child that each card has a shape on one side and a number on the other. The child has to learn the number that goes with each shape. The experimenter shows the first card, shape towards the child, and then turns it over to expose the digit and says the number. The experimenter repeats the process with the remaining four cards. He then shuffles the cards and exposes the first card, shape towards the child, and asks him to give its number. Whatever answer the child gives, the experimenter turns the card to expose the digit.

The experimenter repeats the process with the remaining four cards. He then repeats the procedure until the child gives the correct numbers when shown the shapes for three successive trials of five cards each. The experimenter shuffles the cards between each trial. The index of learning is number of trials taken to criterion: the lower the number of trials the quicker the learning.

**The concept learning task**

This task was conducted in the same session as the rote learning task and was presented as a game in which the child had to find out the basis of grouping the blocks that the experimenter has decided upon. No suggestion was made that the groupings decided upon were the 'correct' groupings. Apart from encouraging the child to keep on trying no attempt was made to teach or help in any way. The learning task was to make use of feedback from the words on upturned wrong blocks to discover the basis of grouping which was according to the standard criteria of height and size of cross section. (See Stones and Heslop 1968).

The first step was for the child to group the blocks correctly. When a child had grouped the blocks correctly they were brushed up and presented again to the child for regrouping. On this occasion only one attempt was allowed. The initial operations in discovering the basis of grouping involved, in most cases, several incorrect attempts followed by feedback from the wrongly placed upturned blocks. This phase of the child's activity was considered not as a test but as a learning activity. The first correct grouping was taken to be a possible indication that the child had learned the basis of grouping. The regrouping was taken to be a test of the retention of the learning. Finally the 17 heterogenous objects were presented as a transfer test of the learning after the blocks had been removed from sight. The child is asked to put the objects in the same groupings as the blocks. Successful grouping of these objects was taken to be the most reliable evidence of the learning of the conceptual basis of the grouping operations. The data collected in this task were success or failure in the initial grouping, success or failure in regrouping the

blocks and success in sorting the new objects correctly. The criterion of success in each case was completely accurate grouping.

**The nonverbal tests of intelligence.**

The Raven's matrices were administered as group tests to all the subjects. Several experienced teachers familiar with the administration of the test were present to ensure that the children were clear about the nature of the task.

## RESULTS

### The rote learning task

All groups of children in the two studies performed similarly in this test. The number of trials to criterion ranged from three which was immediate learning after the demonstration, to a discontinued test after 28 trials. The average number of trials for all groups was about 11. To investigate possible differences in performance by the different groups of children, the scores were split into high and low at the median and chi square analysis carried out. There were no significant differences in performance between the two groups. Full details are given in tables 1 and 2.

TABLE 1 ROTE LEARNING TASK: STUDY 1

| Children | Trials to criterion | |
|---|---|---|
| | Mean | S.D. |
| West Indian | 12.31 | 5.85 |
| White | 10.91 | 5.14 |
| Total Group | 11.61 | 5.66 |

| | High/Low Split | |
|---|---|---|
| | High | Low |
| West Indian | 18 | 12 |
| White | 15 | 15 |

Chi square = 0.61. (N.S.)

TABLE 2 ROTE LEARNING TASK: STUDY 2

| Children | Trials to criterion | |
|---|---|---|
| | Mean | S.D. |
| Pakistani | 11.80 | 4.1 |
| White | 11.66 | 5.12 |
| Total Group | 11.73 | 4.73 |

| | High/Low Split | |
|---|---|---|
| | High | Low |
| Pakistani | 13 | 10 |
| White | 10 | 13 |

Chi square = 0.78 (N.S.)

## The concept learning task

A difference was observed in the performance of the children in the two studies. Children in the second study, who were about two years older than the ones in the first study, were more successful overall. Whereas 7 (out of 60) in study one failed to group the blocks successfully in the learning task, all 46 succeeded in the second study. Similarly a larger proportion of the total group in the second study succeeded in regrouping correctly and transferring their learning to the test material. In study one, the only marked difference in performance on the transfer test was between West Indian boys and White girls. This difference shows up in the black/white differences in transfer with ten West Indians succeeding as opposed to 16 whites, in both cases out of a possible 30. On the other hand, the West Indian children were more successful than the whites at regrouping. In study two there is hardly any discernible difference between the performance of the Pakistani and white children. To investigate further the differences between the performance of West Indian and White children chi square analysis was carried out dividing the groups into those who succeeded in transferring their learned ability and those who did not. The performance of Pakistani and White were so similar that significance tests were unnecessary.

Full details may be seen in tables 3 and 4.

TABLE 3: PERFORMANCE OF CHILDREN ON THE CONCEPT LEARNING TASK: STUDY 1

| | Failed | Grouped correctly only | Grouped and regrouped correctly | Grouped & regrouped correctly and transferred correctly |
|---|---|---|---|---|
| West Indian | 4 | 2 | 14 | 10 |
| White | 3 | 7 | 4 | 16 |

Difference between the groups on successful transfer is not significant (Chi-square = 2.44).

TABLE 4: PERFORMANCE OF CHILDREN ON THE CONCEPT LEARNING TASK: STUDY 2

| | Failed | Grouped correctly only | Grouped and regrouped correctly | Grouped & regrouped correctly and transferred correctly |
|---|---|---|---|---|
| Pakistani | 0 | 1 | 6 | 16 |
| | 0 | 0 | 8 | 15 |

Significance tests on these data were considered unnecessary.

## The nonverbal intelligence test, (Raven's matrices)

Mean scores for children in study one were well below the average according to the published norms for the test and were all roughly about the 25th percentile. The children in study 2 were somewhat below the published norms but not to the same extent as in study one. In study one the West Indian children did slightly better than the white children and the white children did slightly better than the Pakistani children in study 2. There were, however, no significant differences among any of the groups in this test. Full details of mean scores may be seen in tables 5 and 6. As in the case of the rote learning scores a high/low split was carried out and the distributions checked for significance by calculation of chi square.

TABLE 5: SCORES ON THE RAVEN'S MATRICES TEST:

| | Mean | S.D. |
|---|---|---|
| West Indian | 24.14 | 5.48 |
| White | 23.09 | 6.80 |

| | High/Low Split | |
|---|---|---|
| | High | Low |
| West Indian | 12 | 18 |
| White | 15 | 15 |

Chi square = .61 (N.S.)

TABLE 6: SCORES ON THE RAVEN'S MATRICES TEST: STUDY 2

| | Mean | S.D. |
|---|---|---|
| Pakistani | 41.74 | 10.80 |
| White | 43.57 | 6.94 |

| | High/Low Split | |
|---|---|---|
| | High | Low |
| Pakistani | 10 | 13 |
| White | 10 | 13 |

Chi square = 0

## Correlations among task performance and matrices score

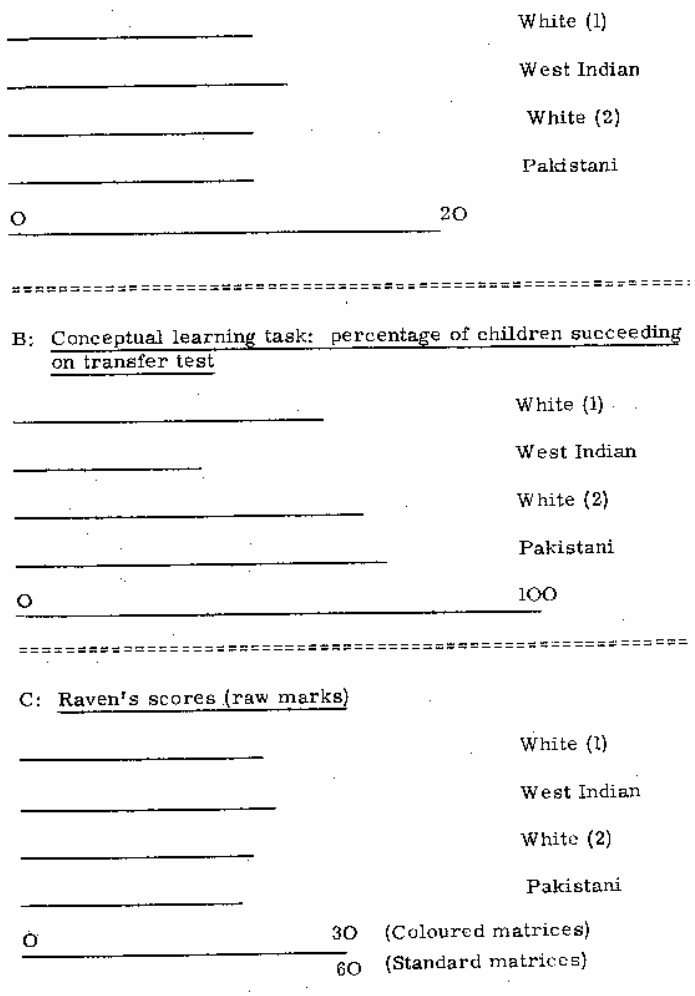
In addition to the analyses of performance in the two tasks and the matrices test, contingency coefficients (C) were calculated among the three sets of scores for the combined groups (106 children). Raven's score was correlated with number of trials to criterion in the rote test and with the concept learning test but the concept learning test scores did not correlate with the rote scores. None of the correlations reached significant levels.

TABLE 7: CORRELATION (CONTINGENCY COEFFICIENT) AMONG TASK PERFORMANCE AND MATRICES SCORES: ALL CHILDREN (N = 106)

| | | 1 | 2 | 3 |
|---|---|---|---|---|
| 1 | Concept learning (Vigotsky) | | 0 | .141 |
| 2 | Rote learning | | | .149 |
| 3 | Raven's score | | | |

From among the results presented above, data relating to the overall comparisons between blacks and whites have been set out in figure 1 to present a synoptic overview of the relative performances of the different ethnic groups.

FIGURE 1: OVERALL COMPARISONS OF DIFFERENT GROUPS ON THE LEARNING TASKS AND THE NONVERBAL INTELLIGENCE TEST




## DISCUSSION

Clearly the most interesting thing that emerges from this investigation is the fact that children of different ethnic groups with similar socio-economic backgrounds in English schools do remarkably similarly on tests of learning, both rote and conceptual. The

results resemble Jensen's insofar as rote learning is concerned. On the other hand, the instrument designed to assess conceptual learning as it happened, yielded very different results from those of Jensen. The low correlations between the test of conceptual learning reported here and the scores on the Raven's matrices are also of interest. If we accept Jensen's view that the Raven's test is a test of conceptual learning ability, and if you accept the test I have described also as a test of conceptual learning, then the low correlation between the two suggests that the two instruments may be identifying two different types of learning. We nom have three types (levels?) of learning. The point, of course, is not to argue the relative merits of the Raven's test and the test used in my experiment, but that to suggest that human learning can be parcelled out into neat disjunctive categories is simplistic in the extreme.

The results obtained on the Raven's matrices test raise quite different issues. The two separate investigations reported here both fail to substantiate Jensen's findings of ethnic differences in scores on the Raven's test. However, it should be pointed out that Jensen's arguments relate essentially to American negro children and he suggests that other population such as American Indians and Mexicans perform better than negroes but not so well as whites (Jensen, 1973, p. 360). In his earlier writings on the subject of level I and level II abilities he laid more emphasis on the influence of SES. Later he argued that racial differences and differences in SES are so much related that matching groups for SES also matches them for genetic factors as well as he claims that the average skin colour of negroes becomes lighter in higher SES categories. (Jensen 1973, p. 359). It is unlikely that these arguments have much relevance to the studies reported here. They could possibly have some bearing on the study of West Indian children but not at all on the results obtained from the study of Pakistani children. I suggest, therefore, that our investigations give a picture of ethnic comparisons in the learning ability of children in British schools and that those reported by Jensen are of little relevance to our conditions. The results of our studies, however, accord with those of Ghuman who found that different ethnic groups perform similarly if they have similar cultural backgrounds.

There is a further point about the conceptual learning task used in these studies. Apart from the fact that it attempts to assess learning that has actually taken place during rather than before the interview, it is a test of ability to cope with a specific learning task that can be objectively observed. It is not a norm referenced test devised on a statistical basis, it is a criterion referenced test, the criterion of success being the ability to apply a newly learned concept in a novel situation and not to obtain a higher score than the norm for one's age. There is more than academic interest in this difference between the tests. The pedagogical implications of the different approaches are profound. At best the Raven's score may be 'noted', or, if we follow Jensen's advice, we devise teaching procedures appropriate to the child's Raven's score; rote methods for the low scorers, 'conceptual methods' for the high scorers. I think we have been here before in this country in the immediate post war tripartism period with hewers of wood and drawers of water in different schools from the children capable of abstract thinking. If, however, we adopt the approach used in the Renhard study and implicit in the conceptual learning task I described, we draw very different pedagogical inferences. The test results in such cases are taken as diagnostic and indicators of necessary remedial action with the child for the

improvement of the teaching. Deutsch makes an important point when discussing the question of diagnosis in Jensen's arguments. Referring to the fact that Jensen enters frequent caveats with respect to not assuming a certain level on the part of any given individual on the basis of known group differences, he '... does not include any suggestions as to how one can identify a potential conceptual thinker in early childhood other than by his skin colour'. (Deutsch 1973 p. 26).

## CONCLUSIONS

In this paper I have looked at methods of investigating children's learning. In particular, I have scrutinised the methodology employed by Jensen in assessing the learning of children in different ethnic groups. I suggest that for this Association there are some important lessons to be learned from the way in which the original promulgation of the hypothesised two levels of learning were taken up and the line of argument in the subsequent controversy. Probably the most important is for us to consider the way in which research investigations and theoretical disputations of considerable sophistication can be built on simplistic views of pedagogy. The recherche debates about the exact proportion of ability that might be 'heritable' took as read Jensen's basic (and as I have contended, mistaken) views concerning the assessment of conceptual learning. Once those views are challenged the rest is noise.

Another example of Jensen's pedagogic naivety is when he assumes that schools teach for conceptual learning. Some teachers undoubtedly do, but their teaching is likely to be on an intuitive basis rather than on firmly grounded theoretical principles acquired in teacher training. It is true that experimental psychologists have acquired some understanding of the way concepts are learned but we still have far to go. Further, there is no shortage of research to suggest that teachers in educational institutions at all levels are pristinely innocent of awareness of such evidence as we may have. And it is equally true that few training institutions have developed methods of teaching teachers to teach for conceptual learning in any explicit and systematic way.

In the work that I have reported I attempted to avoid what I saw as Jensen's errors and mistaken assumptions. Groups of children from complete classes were given the opportunity of learning fairly complex concepts from scratch and in these conditions different ethnic groups performed similarly. Thus the results of these studies lend no support to the thesis that there are racial differences in conceptual learning and I believe that the findings of these investigations would be applicable in comparable conditions, i.e. in typical British mixed school populations.

I suggest that the work I have reported challenges the validity of Jensen's diagnosis. I think we should all challenge his prescription however we view the evidence, because along with his presumption in claiming to be able to divide up humanity into two categories is an implicit assumption that we know all there is to know about teaching for conceptual learning. If this were not the case he could hardly argue with any consistency for concentrating on rote methods of teaching for his type I people unless he has other reasons for denying them the benefits of new pedagogical insights we might acquire. I

think that few would argue that we have nothing more to learn about teaching for conceptual learning. I think this is far from the case and I suggest that we have so much to learn about teaching concepts to children of all ages that instead of trying to match the type of learning to the colour of the children we should all be far more fruitfully employed developing methods of enhancing the ability of children to cope with learning of all colours.

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